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THE CASMA VALLEY OF PERU: A CRADLE OF PRE-INCA ASTRONOMY

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ABSTRACT

The earliest large-scale structures in Peru that suggest intentional astronomical orientations are found during the Late Archaic in the Supe Valley of Norte Chico and in the Casma Valley dating to 2500-3500 BCE. Major features were sunken circular plazas, stairways, pyramids, and plazas suggesting the ritual movement across a tripartite cosmos, as well as orientations to December solstice sunrise/ June solstice sunset. This architectural theme continued to be expressed into the Early Horizon (1000-200 BCE) in twelve major sites in the Casma Valley. Nine have orientations to the June solstice or December solstice sunrises. The mound of Sechín Alto, the largest in the Americas, is topped with a U-shaped structure facing June solstice sunrise. Chankillo, one of the most extensively studied sites in the Casma Valley, has a labyrinthine U-shaped structure facing December solstice sunrise. The Casma Valley may have been a major pilgrimage route to Chavín de Huantar, which continued this tradition of the tripartite cosmos as well as adding a water cult. The role of replicating cultural units is discussed with respect to maintaining cultural continuity within the Casma valley and its neighborhood.

KEYWORDS: Chavín de Huantar, Chankillo, Sechín Alto, mounds, ritual stairs, shamanic ascent

1. INTRODUCTION

The first people to reach the western coastline of South America may have arrived by boat, navigating by the sun, moon, and stars (Dixon 1999). They may have collected food from tide pools and relied on their knowledge of cycles of the moon for anticipating low tides. Human presence in South America is recorded at Monte Verde in Chile around 14,500 calibrated radiocarbon years before the present (RCYBP) (Gruhn 2006). Recent work at Huaca Prieta by Dillehay et al (2012) provides evidence of occupation of along the northern Peruvian coast dating to 13,500 calibrated RCYBP.

Coming out of Asia, these people would have had shamanism, with its tripartite cosmos and themes of transformation and ascent, as part of their heritage. It did not take long for them to ascend to the highlands. Early connections between the coast, the highlands, and the tropical forest beyond are demonstrated at Guitarrero Cave north of Huaras in the Callejón de Huaylas, between the Cordillera Blanca and the Cordillera Negra (Gruhn 2006). The lowest level has yielded a date of 14,500 calibrated RCYBP. Its collection of textiles, basketry and evidence of early domesticated beans and chili pepper (ca. 12,000-10,000 calibrated RCYBP) indicate trade routes between the coast, the mountains, and the jungle.

The great ice covered mountains of the Cordillera Blanca, sources of rain and springs, provided the iconic counterpoint to the dry deserts of the coast. These sacred mountains and their waters were essential for survival and were incorporated into ceremony and ritual. Symbolism of ascent appears present in the stairways, linking the dark underworld of caves, sunken circular plazas, and labyrinths to world of the heavens.

Cosmological motifs contained within ceremonial architecture can be traced to 3500-3700 BCE in the platform mounds and semi-subterranean circular plazas found in Norte Chico as well in the Casma Valley at Sechín, Chupacigarro-Caral Bajo, and other sites along the Supe River. Some 180 km to the north, Sechín Bajo in the Casma Valley had a similar architectural tradition. These show a preference for orientations to December solstice sunrise and June solstice sunset (Shady Solis 2006; Haas and Creamer 2006; Malville 2014). This tradition of movement across a tripartite cosmos persisted in the Casma Valley until approximately 200 BCE. Orientations were roughly equally divided between June solstice and December solstice sunrises. Sechín Bajo was re-orientated from December to June solstice sunrise (Fuchs et al. 2006; Fuchs and Lorenz 2011).

The mechanisms by which cultural traditions can be transmitted over a period of more than two millennia without the aid of writing deserve attention. An interesting and perhaps fruitful approach to understanding this continuity involves units of culture (concepts, ontologies, symbols, themes), which can be transmitted from one person, group, or generation to another through speech, rituals, or other imitable phenomena. In the Andes where there are great contrasts in elevation, a dominant cultural unit is that of shamanic ascent across cosmos, which we see expressed in stepped pyramids, massive mounds, sunken plazas, subterranean corridors, and stairways.

As we continue to consider sunken circular plazas, monumental stairways, and truncated pyramids to be signifiers (Geertz 1973, 1983) of a Andean tripartite cosmos, it is worth noting that Barnes (1992) speculates that Spanish evangelizers were responsible for introducing the Trinitarian concept of three worlds. However, Pease (2004) finds evidence in chronicles and dictionaries for an pre-Hispanic Andean tripartite cosmos, consistent with our analysis of the archaeological record.

2. CHAVIN DE HUANTAR

While not in the Cama Valley, Chavín de Huantar served as a major pilgrimage center throughout the Early Horizon (1000-200 BCE) (Burger 1992) and left its mark on the

cultures of the Casma Valley. Ritual movement from the dark underworld to the heavens is expressed in stairs leading upward and downward in its dark labyrinthine interior, which contains the 4.5 meter-high carved granite Lanzón shaft, an expression of the *axis mundi.* Stone channels above the Lanzon may have carried water, *chicha* (corn beer), or blood to animate the carved stone. Through Inca times, the Lanzón was a continuing destination of pilgrims, many of whom would have walked through the Casma Valley (Cummins 2008).

Chavín is filled with images of shamanic transformation, flight, and movement between the worlds (Berger 1992). The interior corridors connected by stairways show evidence of colored plaster, leading Kembel (2008) to suggest a symbolic of movement between different worlds, each designated by a different color. Rick (2008) reports that an early U shaped structure was oriented to December solstice sunrise, continuing the astronomical tradition found in Sechín Bajo. Engravings show processions, of winged participants, perhaps shaman-priests, ascending staircases to the top of the temple.

Among the many innovations incorporated in the temple is an intricate network of water channels which exceed any need for drainage. These channels may have been fed by the Wachewsa River, which appear to demonstrate an early architectral manifestation of an Andean water cult involving *camay*, i.e. the transformative power of water (Contreas and Keefer 2009).

3. CASMA VALLEY

3.1 Period (2150-1000 BCE)

Casma Valley was home to the Sechín Alto complex with its immense mound, which was one of the most advanced polities in the New World (Pozorski and Pozorski 1987:125). The Sechín Alto complex (Pozorski and Pozorski 1987, 2002, 2012) covered over 10 sq km and included other major temples oriented to June solstice sunrise. The primary mound of Sechín Alto became the largest structure in the western hemisphere. With a base of approximately 73000 sq meters and a height of 35 meters, its volume is larger than 2,000,000 cubic meters. Averaging the orientation of its four sides measured from Google Earth, gives an orientation in the direction of June solstice of 65.3° along the line connecting June solstice sunrise with December solstice sunset. Benfer (2012) reported an orientation of 66°. Both the effort involved and orientation of this huge structure to the solstices point to a powerful hierarchy operating with carefully preconceived plans. By comparison, Monks Mound of Cahokia has a volume of 622,000 cubic meters; the Pyramid of the Sun in Tenochtitlan has a volume 1,200,000 m^3, while the Pyramid of Khufu tops the list with a volume of 2,500,000 m^3.

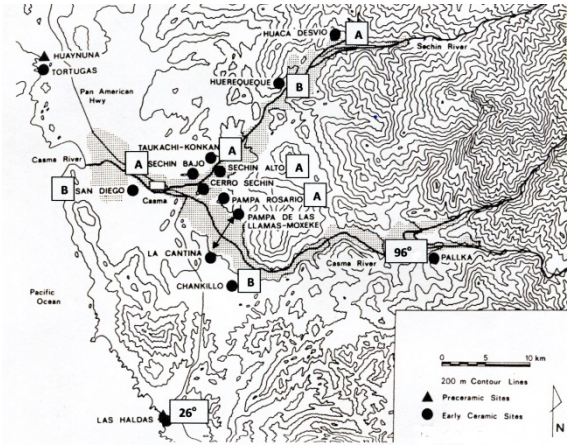

Figure 1 Major sites in the Casma Valley: A- June solstice sunrise; B- December Solstice Sunrise (After Pozorski and Pozorski 1987)

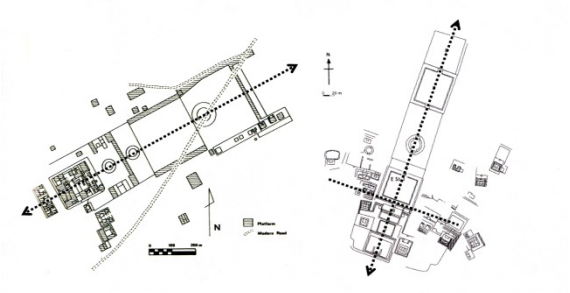

Figure 2 Sechín Alto- June solstice sunrise and December solstice sunset- (left) and Las Haldas- December solstice sunrise and June solstice sunset- (right)(Pozorski and Pozorski 1987)

The main mound of Taukachi-Konkán (see Table 1) has a U-configuration and a

well-defined axis with length of 1136 m and an orientation of 64°. Sechín Bajo is the smallest of the three, with an axial length of 330 meters. It also contains a U-shaped structure opening to June solstice sunrise. All of the sites of the Sechín Alto polity have circular as well as rectangular plazas, ranging in size from, 170,000 m^2 to 1800 m^2. These were essential parts of the ceremonial architecture of these places, probably to be used for public attendance at ceremonies performed by the leaders on the mounds. Because participants at ground level may have observed rituals on the highest platform that were back-lighted by the setting sun at December solstice, it is not clear whether solstice sunrise or sunset was the day of primary significance.

The intentionality of these solar orientations seems clear. As detailed in Table 1, the primary axes of six out of the seven sites in the Casma Valley at this time contained orientations with June solstice sunrise or December solstice sunrise. Azimuths were obtained from Google Earth, except in the case of Chankillo. The axis of Las Haldas is perpendicular to December solstice sunrise, notably similar to the configuration of the Temple of the Amphitheater of Chupacigarro-Caral and the tower-platforms of Chankillo.

Pallka, which lies on the route along the Casma Valley to Chavín de Huantar, was occupied during both the Initial Period and the Early Horizon. Similar to many of the other sites in the Casma Valley, it contains a series of linked rising platforms. Its ceramics indicate a close connection to Chavín (Echevarria 2011). The construction style is similar to that of Sechín Alto and the Chankillo fortress. Its platforms open to 96°, one of the few instances of a ceremonial axis close to east-west. The rising platforms suggest ritual processions, similar to those of other temple mounds of the Casma Valley. An unusual feature of this site is that its sunken circular plaza is not on the axis. Processions from the lower world to the upper world may have moved across the plaza to start the ascent at the lowest platform.

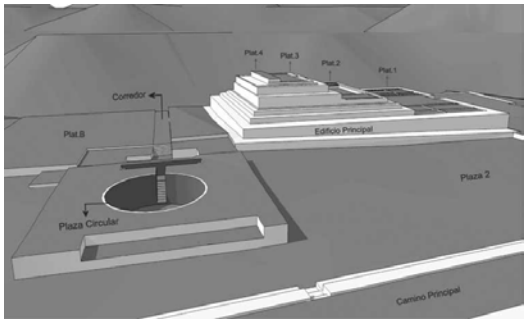

Figure 3 Palka (Echevarria 2011)

3.2 Early Horizon (1000-200 BCE)

The best-known site of the Casma Valley, Cerro Sechín, with its carvings of brutal dismemberments, may record a massacre of local inhabitants around 1290 BCE. The Pozorskis suggest it records an invasion from the highlands of Callejon de Huaylas, a region dominated by the culture of Chavín de Huantar (Pozorski and Pozorski 1987). Other interpretations of the Cerro Sechín carvings include ceremonial (mock) battles or warfare brought about by environmental stress. Whatever the cause, this watershed event ended the temple traditions associated with the Sechín Alto polity and marked the start of maize cultivation, the brewing of chicha, and domesticated animals. The new cultures showed little respect for the temples of the Initial Period, dismantling walls on the Sechín Alto mound and dumping rubbish in the stairways of Las Haldas.

The new sites were San Diego, Pampa Rosario, Huaca Desvio, La Cantina, and Chankillo. Unlike the communities of the Initial Period, the area does not appear to be controlled by any central authority. Each new community developed its own style of layout, appropriating some of the architectural styles of the earlier temples and combining them with their own. Ritual processions along ascending platforms and a December solstice alignment continued to be important as is evident at Chankillo. San Diego contains small mounds which were climbed by means of a pair of ramps on opposite sides, similar to the towers of Chankillo. San Diego also has an overall orientation of residential structures and mounds with December solstice sunrise/June solstice sunset.

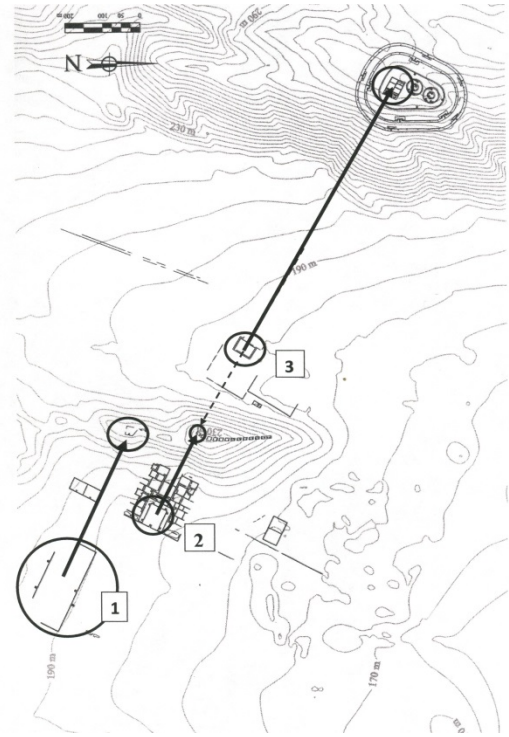

Figure 4 Major plazas of Chankillo and sight-lines to June solstice sunset. (after Ghezzi 2006)

3.3 Chankillo

Chankillo is one of the most extensively studied sites in the Casma Valley. (Fung and Pimental 1973; Ghezzi and Ruggles 2007, 2011; Kroeber 1944; Kosok 1965; Roosevelt 1935; Squier 1877; Thompson 1961). Radiocarbon dates of 342 ± 80 BCE and 120 ± 100 BCE were obtained from lintels of the fortress by Collier (1962:413; Pozorski and Porzorski 1987: 98). Recent calibrated radio carbon dating of the fortress by Ghezzi (Ghezzi and Ruggles 2007, 2011) confirms a range of dates from 400-100 BCE. The fortress is evidence of social unrest in the area.

In addition to the fortress, the most significant structure of Chankillo is the U-shaped "labyrinthine" compound to the east of the towers (Figure 6) (Thompson 1961:272; 1964:210) The building has 27 closed rooms and 8 partially open rooms, connected by baffled doorways, and an elegant bi-lateral symmetry around an axis with an orientation of 114.5°. The structure opens to December solstice and faces the longest and most carefully established solar axis of the Casma valley extending over a distance of 1870 m.

Similar to other sites of the Casma Valley, Chankillo contains rectangular plazas that suggest public solar rituals. The largest of the three plazas (#1) in Figures 4 & 5 is east of the ridge containing the towers, has an area of 22,200 sq meters, and is visually connected to a smaller platform on the ridge with an area of 464 m². Celebrants in the plaza would see the sun setting over that platform on June solstice and any ritual performed thereon. The shadow of the photographer (Figure 5) aligns with that plaza at a distance 455 m and azimuth of 114.8°.

Figure 5 Shadow of photographer on upper plaza aligned with largest plaza of Chankillo on June Solstice sunset.

The plaza of the labyrinthine compound (#2) in Figure 4 is crossed by the shadow of tower #13 near June solstice sunset. Participants in the sunset ritual, standing within the plaza could view celebrants on the tower back-lighted by the sun setting over that tower (Figure 6).

Figure 6 June solstice sunset over the eastern plaza of the labyrinthine structure showing shadow of tower #13.

The third and smallest plaza, (#3) in Figure 4 lies between the towers and the Fortress. Participants within it would see the June solstice sun setting over the Fortress (Figure 7). The eastern wall of the Fortress was constructed with sufficiently low height that allows those in the plaza to view ceremonies performed within it. The Temple of the Pillars is the main feature of the Fortress and opens to plaza #3 as well as tower #13. It has two stairways, which are aligned with the plaza, one of which is shown in Figure 8.

Figure 7 June solstice sunset shadows from the Fortress on to Plaza #3. Note tower #13 beyond the plaza.

Figure 8 June solstice sunset shadows from the Fortress on to Plaza #3. The descending stairway in the foreground aligns with the plaza.

In addition to rituals performed in the three plazas at June solstice sunset, the thirteen towers may have served as successively higher platforms for ritual processions, similar to most of the other temples of the Casma Valley.

Figure 6 The Rising Tower-platforms of Chankillo

Figure 7 Stairway of Tower #1.

The towers are similar to Las Haldas in that they utilize a rising land form to achieve height. Whether intentional or not, the long axes of the towers gradually rotate from a terrestrial (north-south) to become aligned with the major solar axis of Chankillo (Figure 8). The tower-platforms have stairs on both sides, except for the highest which has a stairway only on its north side, indicating that the highest platform the final destination for upward ritual movement.

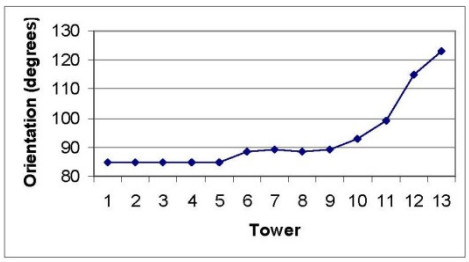

Figure 8 Orientation of the Short-sides of the Towers

Ghezzi and Ruggles (2007, 2011) have suggested that the thirteen towers functioned as a calendrical device, for which, unfortunately, there is no precedent in the Casma Valley. Among the other sites in the Casma Valley, there is no hint of interest in a constructed horizon calendar (Pozorski and Pozorski 1987). On the other hand, if the towers are considered to be a series of rising platforms interconnected by stairways, used for ritual movement, then they are abundant and redundant. The two locations at which Ghezzi and Ruggles propose calendrical observations might have been made are architecturally unremarkale, not the major plazas of the areas. If any calendrical observations were made, they must have been of minor significance, the unintended consequences of the original ritual function of the towers. (Malville et al. 2008; Malville 2011).

4. FINAL REMARKS

The absence of ethnohistory or ethnography of these sites in the Casma Valley does not preclude learning something about meaning and intent. Redundant patterns in the landscape provide evidence of continuities within the culture of the Casma Valley and its immediate neighborhood.

Recurrent cultural themes found in the archaeological record of the Casma Valley are suggested in Table 2. Together they form a web of cultural ideas, building upon themes of movement in a tripartite cosmos, the transformative powers of water and sun, and the nature of sacred mountains. Performers on the summits of the mounds, towers, and pyramids of the Casma valley may have been understood to be gods on mountain summits, controlling rain, thunder, lightning, and the sun. These performances would have been especially powerful when backlighted by the rising or setting solstice sun.

The power of these concepts and ontologies is attested by their longevity, some persisting for more than a millennia. Some were complex such as shamanic-like cosmic models and may have mutated over time. Others other were simple and digital such as stairways. Architectural themes replicate themselves better than their complex ideological counterparts, which are more vulnerable to change. The themes of Table 2 reveal elements of the long-lived cultural continuity in the Casma Valley, which can be especially useful guides when attempting to interpret pre-Inca astronomy in the area.

Stairways, both functional and nonfunctional, continued to be powerful cultural themes in Andean culture. In the Inca world symbolic stairways are found practically everywhere, expressed in non-functional forms on the cliffs of Ollantaytambo and on carved huacas of Cusco, Machu Picchu, Chinchero, and Saiwuite (Dean 2010; Malville 2014). These ever-present yet non-functional stairways in the Inca world has led Paternosto (1996:71) to describe them as "the obsessive metaphoric representation of a communication, a transition between the world of the here and now, the Kay Pacha, and the world beyond, Hanan Pacha." Dean (2010)has objected to Peternosto's description of them as obsessive. They are indeed remarkably ubiquitous. They are powerful references to the theme found throughout Andean culture of movement across the three worlds.

Figure 8 Rumihausi stone of Saiwuite. Note the smallest scale of steps on the left.

The symbolic power of the stairways, leading upward to the summits of sacred mountains or downward to the lower worlds, is emphasized by their fractal quality of scale independence, in which steps with different scales are juxtaposed, such as the Rumihausi stone of Saiwuite (Figure 8). They may be statements about the universality of movement across worlds: all stairways regardless of scale or particular design will succeed in reaching the worlds beyond.

Table 1: Major Sites in the Casma Valley

	Pre-Ceramic/Late Archaic (3000-1800 BCE)	Orientation of Principal Axis (perpendicular)	Mounds	Linked platforms stairs & plazas	Circular or Oval Plazas	U-Shaped structures
1	Sechín Bajo	114º	Y		Y	
	Initial Period (2150-1000 BCE)					
2	Las Haldas	26º (116º)	Y	Y	Y	
3	Pampa de las Llamas-Moxeke	46º	Y	Y	Y	Y
4	Pallka	96º	Y	Y	Y	
5	Sechín Alto	65º	Y	Y	Y	Y
6	Taukachi-Konkán	64º	Y	Y	Y	Y
(1)	Sechín Bajo	64º	Y	Y	Y	Y
7	Huerequeque	116º	Y	Y	Y	Y
8	Huaca Desvio	66º	Y	Y	Y	Y
	Chavin de Huantar		Y	Y		Y
	Early Horizon (1000-200 BCE)					
C	Chavin de Huantar		Y	Y	Y	Y
(5)	Sechín Alto	65º	Y	Y	Y	Y
(4)	Pallka	96º	Y	Y	Y	
9	Pampa Rosario ceremonial platform	68º	Y	Y		
(8)	Huaca Desvio	66º	Y	Y	Y	Y
10	Chankillo	114º		Y		Y
11	San Diego	114º	Y	Y		
12	La Cantina	47º	Y	Y		

Table 2 Recurrent Cultural Themes Involving Astronomy in the Casma Valley

Sacred mountains
Shamanic transformation and flight across three worlds
Ascent to the upper world by stairways
Mountains as source of water and life
Mounds and platforms as surrogate mountains
Ritual performance on mounds and platforms
Public plazas for observing rituals
Importance of solstice sunrise and sunset
Transformative powers of water and sunlight
Caves, labyrinths, and sunken plazas representing the lower world
U-shaped structures as collectors of sunlight

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