

ARCHAEOASTRONOMY AT JACANA, PUERTO RICO: EVALUATING THE EVIDENCE FROM THE ARCHAEOLOGICAL INVESTIGATIONS

Angel Rodriguez

Some 800 years ago, the prehistoric inhabitants of the Northern Caribbean, the Taino people built large, and precisely planned ceremonial centers, one of which contained the largest such structures in the Antilles up to the present. Such accomplishments reflect a tangible knowledge manifested in the architectural design and by related symbols or petroglyphs - carved images on boulders that outline these center's structures. The distinctive architectural designs of these structures, ball courts or ceremonial plazas, called batey, by their builders suggests that they were intentionally aligned toward specific astronomical events.

During the time 1990 to 2006, two elaborate petroglyph boulders were observed in different locations on the surface of the prehistoric Jacana Site (local identification PO-29), along the Portugues River, a major south coastal river in the Municipality of Ponce, Puerto Rico. As a result of these findings, extensive archaeological data recovery excavations took place between 2006 and 2007 by Espenshade (2010) as part of the Portugues and Bucana Flood Protection Project that was sponsored by the U.S. Army Corps of Engineers, Jacksonville District. Results revealed a rectangular plaza or ball-court (40m X 50m) bordered on its four sides with aligned boulders. Some of these boulders had petroglyphs on them or rock art. Most of the engraved boulders were in the north wall, followed by the west and south walls. In this paper, the focus is on the analysis of the data that was recovered during the excavations and how that data is relevant to archaeoastronomy. The discussion primarily involves the relations of the astronomical alignments of the ball court and its petroglyphs with the seasonal cycles and the symbolic meaning of the rock art in an astronomical context.

Many studies have pointed out the role played by the Milky Way and the Pleiades in the cultures of many societies around the world such as: Tamra Andres (2004:97,1998:47) in general, and more specifically: Anthony F. Aveni (1980:57), Mesoamerica; Gary Urton (1981:113), Clive Ruggles (2005:267), Kelley and Milone (2011:466), Quechua; Edmundo Magaña (2006:54-55), Quechua-Aymara; Ann Bingham (2004:84-85), Quechua and Maya; Susan Milbrath (1999:55-56), Maya; Fabiola Jara (2000:137) and William Curtis Farabee (1967:102),

Arawaks, Walter E. Roth (1915:260), Guyana Indians; Gerardo Reichel-Dolmatoff (1971:98), Tukano; Domingo Sánchez (2003:281, Warao) and Edwin L. Barnhart (1994) on Inca (Quechua), Tukano, Maya, Aztec, Apache, Pawnee, Cheyenne, Soix, Shoshone, Seneca and Kwatkiutl.

According to Owen Gingerich (1982: 334), ethnoastronomers emphasize the key role played by the Milky Way in the primitive cosmologies of the tropics. The densest part of the Milky Way rides high in the heavens and it is the most

striking feature of the night sky. Also, a second celestial marker that has a unique appearance in the night sky and therefore can not be mistakenly identified as first magnitude stars are the Pleiades Star Cluster. The 29th site registered with the Puerto Rico State Historic Preservation Office (SHPO) in the Municipality of Ponce, in South-Central Puerto Rico, is now commonly referred to as Jacana. In the 1980's, the site was surveyed in the watershed of the Portugues River by Oakley and Solis Magaña (1990); Solis Magaña (1985) and Pantel (1978). These early reports suggested a pre-Columbian ballcourt (batey) or ceremonial plaza in the area (**Figure 1**). Prior to these surveys, a petroglyph boulder was removed from its original location and planted in the backyard of a local person according to Oakley and Solis Magaña (1990:60-66). Between 1990 and 2006, two elaborate petroglyph boulders were observed in separate locations on the surface of this

site. These boulders suggested that others might be buried somewhere else on the site. The full extent and complexity of the site with its petroglyphs far exceeded expectations, as demonstrated by New South Associates Phase III data recovery during 2006-2007 at the site (Johannes Loubser, 2010:323). The company was hired by the U.S. Army Corps of Engineers (USACOE), Jacksonville District (Jacksonville District) to conduct archaeological investigations in order to mitigate the adverse effects related to the proposed construction of the Portugues Dam Flood Control Project (Christopher T. Espenshade, 2013:10). Excavations revealed a rectangular ball-court (40 ×50m) (**Figure 2**) bordered on four sides by a total of 284 aligned boulders, 26 of which have petroglyphs. Most petroglyphs came from the North Wall (n= 13), followed by the West Wall (n= 6) and South Wall (n= 6).



Figure 1. Illustration by J. Loubser (2013).

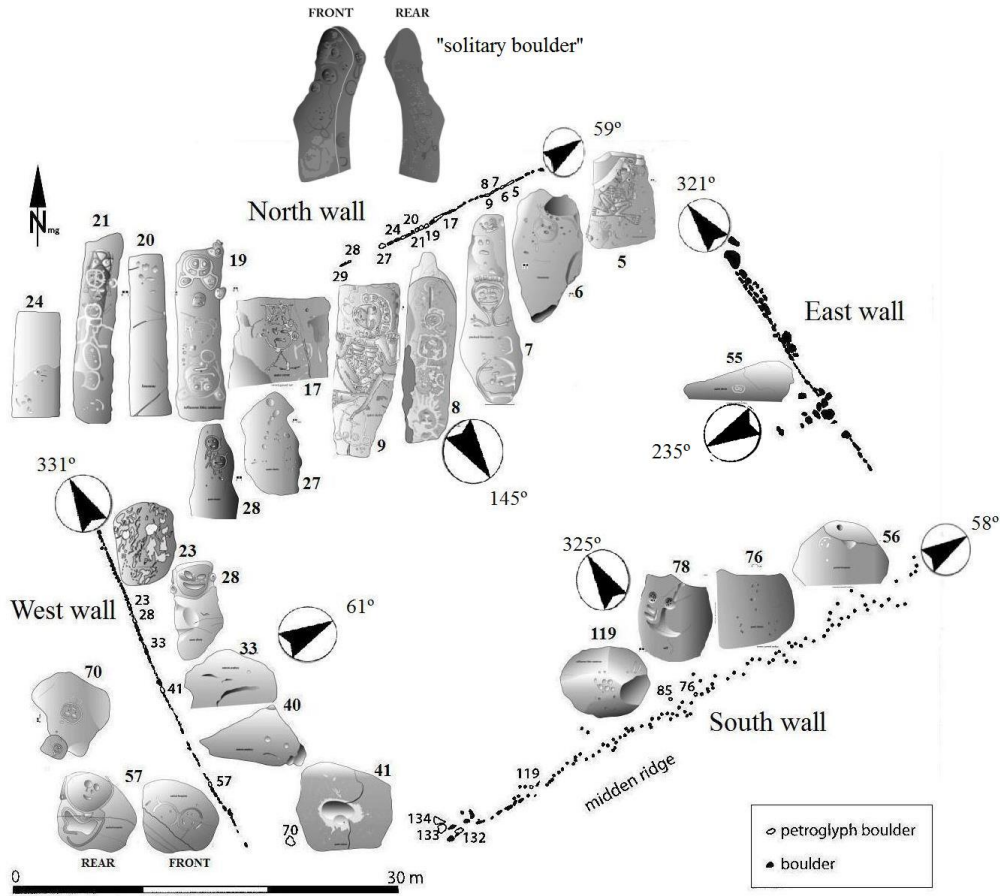


Figure 2. Astronomical alignments at the Jacana Ball-court. Plan view originally taken from Loubser (2010:324) and modified by Angel Rodriguez (2013).

The iconography of the Jacaná ball-court petroglyphs are reminiscent of those found at two multi-court complexes, nearby Tibes (also in the Municipality of Ponce) and Caguana (Municipality of Utuado) in Central-Western portion of the island (Johannes Loubser, 2010:323).

Two major Pre-Columbian components were revealed at the site, Jacana-2 and Jacana -4. In the Jacana-2 span (A.D. 600-900), the site contained numerous houses, thick midden deposits, human burials in and below the middens, a small midden mound, and possibly a batey or plaza. During Jacana-4 times (circa A.D. 1300-1500), the site centered

on a 40 x 50 meter ball-court or ceremonial plaza, which was bordered on all four sides by rows of rock slabs and boulders (Christopher T Espenshade, 2013:10). As a result, the Jacana Site belongs to the late prehistoric and early protohistoric period which was occupied by the Taino Indians, belonging to the Arawak culture of South America.

According to Rodríguez (2010:57-58), the Taino people were observers of the night sky and could noticed that the sunrise of the Sun (during the solstices and equinoxes), and other stars at certain times of the year coincided with the seasons and thus could predict seasonal

changes with relative accuracy. For example: the heliacal rising of the Pleiades Star Cluster during May indicated heavy rainfall, the sunrise during the Autumn Equinox could be associated with the final phase of the hurricane season and the rise of the Constellation of Ursa Major in January after sunset coincides with a decrease in rainfall. As a result, the Taino people could use the astronomical events as

celestial markers to select the most favorable season in which to farm, fish and exploit different resources of the ecosystem. The present paper attempts to develop the connections among the movement of the Milky Way, the heliacal rising of the Pleiades and the annual cycles of the rainy and dry seasons over the sky of Jacana (**Figure 3**) with the symbolic meaning of the rock art in an astronomical context.

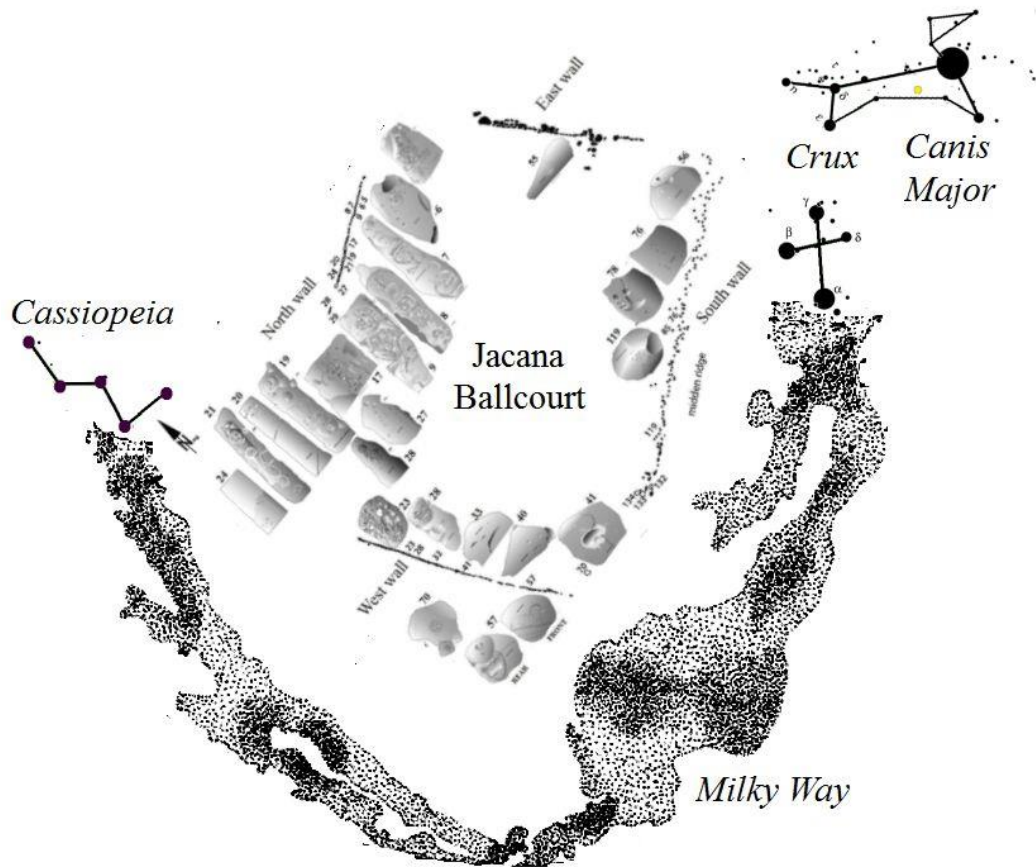


Figure 3. Position of the Milky way under Jacana on May until sunset. Plan view originally taken from Loubser (2010:324) and modified by Angel Rodriguez (2013).

Jacana site: A brief description

The Portugues is a major South-flowing river that empties into the Caribbean Sea

through the Bucana River in the city of Ponce along the South-central coast of Puerto Rico. Jacana is at 18° 04' 33" N and 66 ° 38' 02" W (Municipality of Ponce) on the Northern Bank of the

Portugués River. The elevation above sea level is 485 feet (148 meters). The area was visited for this paper on November 16, 2012 under the guidance of Isaac A. Rosario Santiago, Project Engineer US Army Corps of Engineers. The elevation of the horizon was measured using an Abney Inclinator and a compass. Results indicate that the Eastern Horizon has an elevation of 15°, Southern Horizon has an elevation of 10° and the Northern Horizon has an elevation of 15°. Also, the coordinates on site were taken using a Magellan Sportrack GPS.

The climate of the Ponce Municipality is tropical, but modified by the trade winds and by the land and sea breezes. The Ponce Municipality as a whole has less rainfall than other parts of Puerto Rico. In fact, the extreme Southwest corner of this district borders on aridity. The mountains along the Northern part received a copious supply of moisture from the sudden downpours which appear to be common in the area between June to September (Mitchell, 1922:232).

The tropical vegetation in most of the higher mountains forms a tangled mass. However, the mountains' slopes are not so heavily coated with plant growth, and some are mostly barren. Also, the present drainage is divided among 15 streams and their tributaries. The Eastern part of the area is drained by eight principal rivers that are: Jacaguas, Tallaboa, Guayanilla, Bucana, Inabon, Portugues, Canas, Yauco and Susua. These rivers, whose headwaters are in the mountains to the North, consist of the main streams that traverse the region. Most of these rivers are intermittent streams. Even the larger rivers, few of them rarely maintain a constant flow to the sea, and are subject to torrential overflows or reduced to stream channels

during low water levels (Mitchell 1922:237-38).

Astronomy at the Jacana site.

For the present study, we used the Jacana plan view (**Figure 2**) published in Loubser (2010:324). The plan view was made from the transit data, and later it was georeferenced in GIS to known land marks such as the roads, river and the like. The data and map in GIS were projected in NAD 1983 UTM Zone 19 North according to David Diener (personal communication, May 23, 2013), GIS Specialist at New South. In order to determine the alignments of the ballcourt walls on the Jacana Plan View, we employed the method used by Rodriguez (2008A:25) using parallel and straight rules. First, a meanline was drawn along the walls of the structure using a straight rule. Secondly, the direction of True North (0° degrees) was transported and intersected with each meanline drawn along the walls or sides of the structure using the parallel rule. Finally, on the point of intersection between both lines (the lines drawn using both rules), a circular protractor was placed to measure the angles between both lines. Originally, most of the walls of these plazas on Puerto Rico were almost straight, and made-up of lined boulders or rock slabs. However, weather phenomenon like hurricanes, river floods, rain and human activity have misaligned them. Based on the Jacana Plan View (taken from Loubser (2010:324), it seems that only the South Wall has been disturbed. In addition, we employed the computer programs: CyberSky by (Schimpf, 1995-2009) and Culture Diff (2013) in this study. The base year of 1400 AD was used for all our astronomical calculations because is the median value for the Jacana -4 time span.

Milky Way and the Pleiades. The Milky Way was considered by many groups to be a celestial snake, a heavenly river or a road of clouds in the heavens according to Bingham (2004:84). Over the skies of the Antilles, certain stars on the Milky Way were important for the ancient Taino people because they could have served as seasonal indicators for the dry and rainy season. The most important of all was the Pleiades which marked the rainy season. Rodriguez (2008A:233) in his study of the alignment of the ballcourts and ceremonial plazas on the Antilles has found that the walls of some of these structures were intentionally aligned toward the heliacal rise of the Pleiades. At Jacana, the Pleiades rises heliacally on May, 29 according to the program Culture Diff (2013). Also the date of this astronomical event coincides with an increase in the rainfall for the West Indies and indicates the coming of the Summer Solstice (June 21).

Results at Jacana indicate that the North and South walls (**Figure 2**) were aligned toward the heliacal rising of the Pleiades on May 29 that occurs at an azimuth of 64°. A similar alignment was reported by Rodriguez (2008A:214) on Plaza B at the prehistoric site of Caguana, in the Municipality of Utuado. Also, the petroglyphs along the West Wall at Jacana are aligned toward this astronomical event (**Figure 2**). Additionally, Scorpius and the Pleiades are visible on opposed regions in the sky on May 29 at Jacana. While the Pleiades rise heliacally at 64°, Scorpius set at 235° before sunrise. Both astronomical events coincided with the heaviest period of rain for Puerto Rico according to Rodriguez (2008A:262). It is important to point out that by May (**Figure 3**), most parts of the Milky Way remain under the horizon until sunset according to the program CyberSky (1995-2009). The

Milky Way stretched approximately from Cassiopea to Canis Major or about 100° of celestial space. At Jacana, we found a relation between water during the rainy season and rise of the Milky Way in the Sky after sunset on May. The *emergence* of the Milky Way (**Figure 3**) from beneath the horizon into the night sky could have been associated by the ancient Taino people with an increase of atmospheric moisture that announced the approach of rain. In order to understand the basic system we have described, we have only to combine it with the account compiled by Ramon Pane (Roman Paner). Accompanying Columbus on his second voyage to the New World in 1494 was a Catalan friar named Ramón Pané (Roman Paner). Columbus assigned Pané to live among the Taino people that were recently “discovered” on the island of Hispaniola (today the island shared by Haiti and the Dominican Republic), to learn their language, and to write a record of their lives and beliefs. Pané in Gaylord (1906: 318-338) pointed out that according to the natives, incipient humanity came from a cave in a mythic mountain, and also the sun and the moon. The sea and its creatures came to be when a gourd broke open. In keeping with this image, the ancient Taino saw their world as a Universe Womb or the notion that the reproductive anatomy of a woman replicates into the structure of their Primordial Universe. As a result, Incipient Humanity was housed and protected in the Womb of Mother Earth (Mother Earth embodied in *Itiba Tahuuaua* in the Pané (in Gaylord (1906:323) account and metaphorized in a womb-cave called *Cacibagiagua* (Pané in Gaylord (1906:320). From *Cacibagiagua*, Incipient Humanity emerged to populate the rivers and valleys of the Antilles. Within the Taino perception of their Primordial

Universe, nourishment came through the flow of a Universe (Cosmic) River. We pointed out that at Jacana, the Universe River is symbolized by the Milky Way in the night sky and represented on earth on the Portugues River. According to Rodriguez (2009), the ancient Taíno view the world enveloped in a continuous river or sea, in which the Celestial Waters above mix with the earthly ones below on the horizon. As a result, the heavenly bodies move on the night sky in the Celestial Waters and during the day in the Cosmic Sea below (Figure 4). At Jacana, there is a metaphor in this cosmic circulation of water between the Milky

Way and the clouds during the rainy season (May); it could be seen as the river of clouds in the sky feeds the Milky Way underneath before sunrise (Figure 3). At the same time, the Milky Way as a Cosmic River feeds the water flow of the Portugues River during this period, and the Portugues' waters flows into the sea. In this way, the celestial river of clouds, the Milky Way as a Cosmic River beneath acts in concert to feed the Portugues River and recycle water. As a result, water is the *medium element* because cycled through the three components: clouds, Milky Way and the Portugues River.

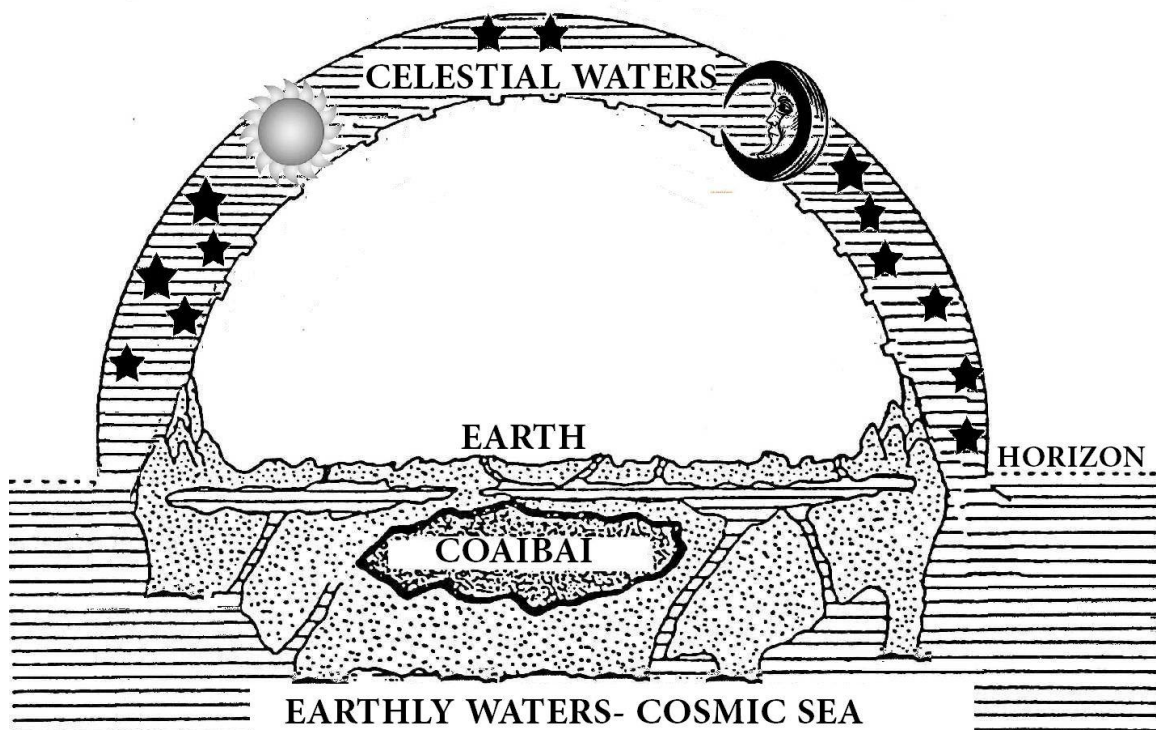


Figure 4. Taíno worldview based on the Pane's account. Angel Rodriguez (2013).

North Wall: As mentioned before, North and South walls were aligned intentionally toward the heliacal rising of the Pleiades on May 29 (Figure 2). However, petroglyphs along the North

Wall are facing 150°. These motives are generally aligned toward the heliacal rising of the Southern Cross (Crux) before sunrise on November 7 according to the program Culture Diff (2013). The

Southern Cross at Jacana rises at approximately 157° and stretched 5° of celestial space from Becrux (160°) to Acrux (165°). In his study of the astronomical alignments of the pre-Columbian ballcourts of the Antilles, Rodriguez (2008A:247) found that the Southwest entrance of Plaza 6 at the ancient site of Tibes in Ponce is aligned toward the setting of the Southern Cross (Crux). Both alignments at Jacana and Plaza 6 at Tibes are not supported by the ethnological evidence up to the present.

South Wall. The petroglyphs along the South Wall (**Figure 2**) are facing 330°. These images are facing the setting of Ursa Major at the end of September in the evening sky over Jacana after sunset. This astronomical event coincides within the period of greatest hurricane frequency for the Antilles according to Rodriguez (2008A:265). A similar alignment was reported by Rodriguez (2008A:205) on Plaza 9 at the nearby prehistoric site of Tibes.

East Wall. East Wall is aligned 321° toward the setting of Ursa Major at the end of September in the evening sky over Jacana after sunset. However, the inner faces of the boulders along East Wall (**Figure 2**) are facing the heliacal setting of Scorpius at 235°. This astronomical event occurs on October 20 according to the program Culture Diff (2013). Scorpius sets before sunrise at approximately 235° and stretched 30° of celestial space from Sargas (216°) to Graffias (246°) stars. This astronomical event is associated with a minor increase in rainfall or a second rainy season according to Rodriguez (2008A:260).

According to Pane in Gaylord (1906: 325), the Taino indians of Hispaniola.

“. . . And further
they say that the sun and
the moon came out of a
cave which is situated in
the country of a cacique
named Maucia Tiuel and
the name of the cave is
Giouuouaua” (Iouaboina
in Peter Martyr).

Herrera y Tordesillas (1725-26:86) mentioned for the natives of Hispaniola that the Sun and the Moon came from a cave called *Iouobaba*. Further, Robiou Lamarche (2000:12-13), suggests that the name of this mythical cave is *Iguanaboina* (Great Serpent, a mytheme rooted in similar Amazonian myths) and it could be represented by the constellation of Scorpius. Hatt (1941:185) established the symbolical connection of the snake with rain and pointed out that this belief must once have existed in the Antilles. He noted the cultural practice in which the *Guiana* Indians used the snake in rain magic. Also, among the *Kogi* Indians of Colombia, Scorpius is a snake called *Tarbi* (Juan Mayr, 1987:62). When the head of Scorpius, *Kwawar*, the anaconda appears, it foretells the coming of the December rains among the Central Arawaks according to Curtis Farabee (1967:102). Also, for the Antillean Caribs, the close neighbors of the Island Arawaks (Taino people), this constellation was idealized as a Celestial Serpent called *Bakámo* (Sebastian Robiou Lamarche,

1997:282). This evidence suggests that among the Taino people, Scorpius could represent the Celestial Snake *Iguanaboina* associated with a mythical cave that bears the same name. Hence, the East Wall (**Figure 2**) at Jacana may be associated with the realm of *Iguanaboina*, Scorpius and the second rainy season.

West Wall. West Wall is aligned 331° toward the setting of Ursa Major at the end of September in the evening sky over Jacana after sunset. In general, most of the petroglyphs along the West Wall (**Figure 2**) are generally aligned in the same direction as the North and South Walls or toward the heliacal rising of the Pleiades, with the exception of the enclosed body image on the rear of Boulder 57. However, it is important to mention that these motives are generally aligned toward other astronomical events such as: the sunrise during the Summer Solstice at 65° on June 21; and the second Zenith Passage at 68° on July 23. As a result, the rock art along West Wall is generally aligned toward both astronomical events as well. Based on environmental factors described by Mitchell (1922:232) for this region such as: aridity, little rain and barren vegetation, we advocate the view that the main reason for the ancient builders for aligning the Jacana ballcourt was with rain and as a result the main alignment was toward the heliacal rising of the Pleiades.

Iconographic Analysis at Jacana

Drawing on ethnohistorical accounts during the protohistoric Taino

contact period, modern South America native religious belief and anthropological studies on art and ritual, Loubster (2009) offers a comprehensive iconographic analysis and interpretation of the site.

North Wall. Of the four ball court walls at Jacana (**Figure 2**), the North wall has the most abundant petroglyphs and also the heaviest boulders. Loubster (2009:24), numbered the 29 boulders along this wall from East to West. According to him, 13 of these boulders have definite peck marks and one has natural features that resembles an owl. Only 9 boulders have unequivocal depiction of faces. Moreover, this wall is the only one where boulders with opposing faces on opposite ends (5 boulders) are evident. Possible cemís or spiritual being motifs occur on 7 boulders that could have been the possible pervue or providance of caciques or Taino chiefs. Loubster (2009:140,144) points out this wall is the domain of the cacique, and that is unique in terms of rock material because it is the only wall with limestone. According to a former property owner and occupant of a house north of the site, there is a solitary boulder in a secondary context that was inserted into the rip-rap immediately east of the unpaved road which intersects with the main asphalt-covered road. In terms of its shape, size, and contents, this boulder most probably came from North Wall very likely somewhere in the vicinity of Boulder 29 (Loubster, 2009:130). This boulder has petroglyphs on three sides. Most of them are simple faces that according to Hatt Gudmund (1941:179) are representations of the deceased.

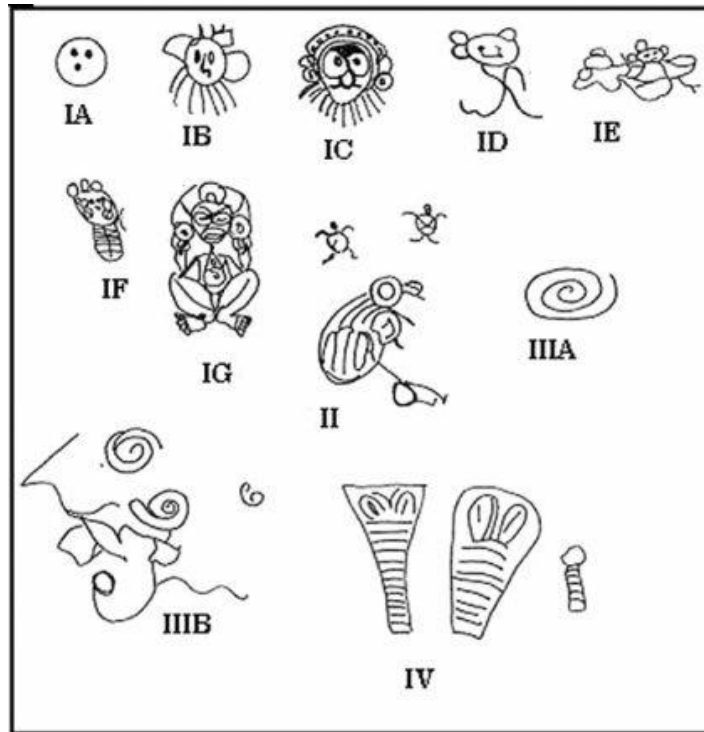


Figure 5. Petroglyphs Types for Puerto Rico according to (2008B:347-348).

The North Wall (**Figure 2**) contains almost all the types in the classificatory scheme (**Figure 5**) for Puerto Rican petroglyphs advanced by Rodriguez (2008B) ranging from simple faces to squatting anthropomorphic figures:

Wall	Petroglyph style according Rodriguez (2008B:347-348)	Wall	Petroglyph style according Rodriguez (2008B:347-348)
NW2	Natural feature that resembles an owl	NW19	Simple (IA) and developed faces (IB)
NW5	Squatting Anthropomorphic Figure (IG)	NW20	Simple faces
NW6	Developed faces (IB)	NW21	Simple (IA), developed (IB) and complex faces (IC)
NW7	Simple (IA) and developed faces (IB)	NW24	Simple faces (IA)
NW8	Simple (IA) and developed faces (IB)	NW27	Simple faces (IA)
NW9	Squatting Anthropomorphic Figure (IG)	NW28	Developed faces (IB)
NW17	Developed faces (IB)	NW29	Simple faces (IA)



Figure 6. Artist's rendition of the Beheaded Squatting Anthropomorphic motive on North Wall at Jacana.

Due to time constraints, we focus our attention on the rotated head or beheaded anthro-zoomorphic motif (**Figure 6**) on boulder NW9 because among all the motifs on North Wall it is the most elaborated of the known petroglyphs at Jacana according to Loubster (2009:46). Also, it is important to emphasize that this image is unique among the rock art designs reported for Puerto Rico. This motif may represent a mythical tradition of an earlier period rooted in the ancient Amazonian *mythical corpus*, and whose meaning may be maybe lost in time and not recorded by Pane or any other explorer.

Among the Guianas and the Orinoco valley, Magaña (1987:41, 43, 53, 79, 187) reported that there is a widespread mytheme [the essential component of a myth and a bridge between myths according to Lévi-Strauss

(1955)] among the *Wayana*, *Tareño* and *Kaliña* Indians regarding an old mother-in-law that loses her head like the beheaded anthrozoomorphic figure (NW9). In other myths, the lost head becomes a constellation in the skies (Magaña (1987:87).

In other similar myths compiled by Magaña (1987:245) among the Guianas Indians, the mother-in-law is substituted by an old step-frogmother. In this *Kaliña* myth, a woman gets pregnant from the sun and as a result a conflict arises among her brothers accusing each other of incest. They threatened to kill her, but the girl flees to the forest and meets an old-toad woman that gives her shelter. As the old woman is married to evil bird, the frog woman hid the girl into a *kasili* jar (cassava fermented drink). After several months, the girl gives birth to twins. The old frog woman no longer can hide the

girl that is then devoured by the evil bird. However, old frog woman manages to save the twins. When they grew up, the old frog woman told them that her mother was eaten by a nocturnal bird, but she does not reveal the bird's identity. The twins went in search of the murderer bird and during their quest, they find a bird who fears for his life. This bird tells the real murderer's identity. As a result, the twins killed Evil Bird and Old Frog stepmother. In addition, there is another version of the same mytheme in which a pregnant woman gets lost in the forest despite the fact that the twins in her womb tell her where to go. She arrives to a jungle village where the Old Frog woman *Kunawaru* hid her from the Jaguar. However, the Jaguar found the woman and eats her. One day, the twins discovered the truth about their past and killed the Jaguar and Old Frog stepmother *Kunawaru*.

The ancestors of the Tainos known as Saladoid originated in the Orinoco-Guiana region of South America, arriving in Puerto Rico around A. D. 250 according to Rouse (1992:30-31, 52). As a result, their myths are rooted in the South American tradition of the Guianas. Pane (in Gaylord, 1906:323) on Chapter IX of his account mentioned that: . . . *there came four sons of a woman whose name was Itiba Tahuuaua, all from one womb and twins; and this woman having died in travail they opened her and drew out these four sons.* . . . In this myth as metaphor, *Itiba Tahuuaua*, represents Mother Earth and the four twins the four quarters of the world. Just one of the four sons has a name: *Caracaracol*.

As observed by Rodriguez (2011: 82), among the Taino people, there were different versions of the same mytheme like the one reported by Pane (in Gaylord, 1906:324) in Chapter XI about opening

the back of a culture hero (*Caracaracol*) with an ax and a living turtle came out from the wound. A variant of this mytheme is represented on the pictographs in Sanabe Cave, Dominican Republic. In one pictograph, *Caracaracol* is represented as a turtle-man, however one of his brothers is portrayed as *Cobo* man (rounded shoulder and a somewhat low conical form shell from the species, *Citarrium pica*). This detail was never reported in Pane's account. The ethnological evidence mentioned above suggests that the rotated-beheaded frog woman at Jacana represents a myth similar to that reported by Magaña (1987:245) from Guiana in which *Caracaracol* beheaded his old-toad stepmother. In addition, we propose here that at Jacana the head of old-frog stepmother (**Figure 6**) becomes the constellation of the Southern Cross. However, this remains an interpretation subject to further investigation.

South Wall. Loubster (2009; 112, 127) numbered the boulders along the South Wall (**Figure 2**) from East to West. Of these, just 5 have definite signs of pecking and one has natural features that resemble a face. Only one boulder (South Wall 134) has definite petroglyphs depictions of faces (2 simple faces opposing each other). As a result, South Wall rock art is less elaborated and abundant than those along the North Wall. Loubster (2009; 112-127) observed that most of the petroglyphs along this wall are cupule or circular pit clusters and faces that are of the Simple Face Type according to Rodriguez (2008B: 347).

The rock art along South Wall is facing 330° or toward the setting of Ursa Major at the end of September in the evening sky over Jacana after sunset. This astronomical event coincides within the period of greatest hurricane frequency for

the Antilles. Pane in Gaylord (1906:333) mentioned the following regarding the hurricane deity: *And when Guabancex is angry, they say, that she raises the wind and brings rain, and throws down houses and shakes the trees.* Based on the astronomical data, it is expected that this wall will show depictions of *Guabancex*

or hurricane motifs like faces with flailing appendages or the same type of figures described by Ortiz (1947). However this is not the case, and as a result it is hard to relate the astronomical evidence, hurricane season and the rock art on South Wall.



Figure 7. Serpent-Like North Wall of Plaza A at Caguana, Utuado. Puerto Rico. At the back is oval-shaped Plaza C (photo: Angel Rodriguez Alvarez).

East Wall. According to Loubster (2009:130,143), the East Wall (**Figure 2**) probably has no petroglyphs, just some natural markings on one boulder that resemble two eyes. Of all walls, the boulders of the East Wall, are the most uniform in shape and color and mostly

have round edges and gray surfaces. The description mentioned above fits very well for the North Wall (**Figure 7**) of Plaza A at Caguana. The rock slabs along North Wall at Plaza A are also uniform in shape and color, and resembles a giant snake with its head and tail. Maybe it is

reminiscent of the mythical snake *Iguanaboína* mentioned above.

West Wall. Loubster (2009; 82,141) numbered the boulders along the West Wall (**Figure 2**) from North to South. Wrapped or enclosed body representations are limited to the West Wall. The two wrapped body figures (Boulder #28 and rear of Boulder # 57) together with an aborted stone collar suggest that this wall deals with departed *opía* or spirits of the dead. Frasseto (1960:386) called the wrapped figure motifs, *Swaddled Infant Type (Figure 5, Type IF)*. She described these motifs as zoomorphic images with rounded sacked limbless bodies, the ears often exaggerated, and rounded sacked bottoms. According to her, these motifs occur frequently in the Eastern part of Puerto Rico. This zoomorphic type represents bats that are associated with the underworld (caves), the afterlife and as messengers of spirits of the dead (*opias*). Also, they are always associated with water streams and were carved facing down stream. At Jacana, the Swaddled Infant Type of Eastern Puerto Rico (**Figure 5, Type IF**) is represented as a less elaborated motive “Jacana Style”.

According to Pane (in Gaylord, 1906:331), the ancient Tainos believed in a place after life called *Coiabai* that was ruled by Machetaurie-Guaiagua (*Maquetaurie Guayaba* in Serrano y Sanz (1932), “*who was lord of this Coiabai*”). Macorix stone heads are believed to represent the lord of the *Coiabai* because the similarity to a human skull (Rodríguez, 2011:100-11). Most of the faces along West Wall have eyes (deep and rounded) similar to the Macorix heads.

Despite the fact that most of the petroglyphs are on the West Wall, they are facing East toward the rising Sun

(**Figure 2**), with exception of the enclosed body image on the rear of Boulder # 57 that faced the sunset. Among the *Tukano* of South America, a congnate group to the Taino, the mythical place where the dead goes is called *Ahpikondia* or Paradise. It is a place under the Earth. On the side where the sun rises on *Ahpikondia*, there is a large lake that receives its water from the rivers of earth flowing eastwards. On the side where the sun sets, is found the Dark Place, a region where it is always night and a place of evil (Reichel-Dolmatoff, 1971:25). Based on the *Tukano* myth, it is possible to conclude that West Wall and its motifs represent the underworld of *Coiabai*, a place where the sun disappears in the underworld. Considering the above mentioned ethnographic data, it seems that the original intention of the ancient builders at Jacana was to align most of the petroglyphs along West Wall toward the sunrise during the Summer Solstice, and the image of the deceased on the rear of Boulder # 57 toward the sunset of this astronomical event.

CONCLUSIONS

The theme of this article has been primarily cognitive, the underlying interplay between relevant archaeological and ethnographic material based on astronomical data. Finally, it is possible to conclude, based on the evidence discussed above, that:

1. The site of Jacana in Ponce, Puerto Rico, lies in a region of the island that received less rainfall than other island areas, and at some locations borders on aridity according to Mitchell (1922:232). As a result, the main concern of the ancient builders of Jacana may have been water procurement, and

- they aligned the main axis of the ballcourt toward the heliacal rising of the Pleiades on May 29.
2. By May, the Milky Way remains under the horizon and rises after sunset possibly conceived as a celestial river. The *emergence* of the Milky Way during this time of the year might have been associated with the approach of rain.
 3. North Wall: The rock art along North Wall is facing Southeast at 150° toward the heliacal rising of the Southern Cross before sunrise on November 7 according to the program Culture Diff (2013). This alignment's symbolic meaning cannot be interpreted at present because the lack of ethnological evidence. Among the rock petroglyphs, we focused our attention on NW 9, the rotated-beheaded frog woman because it is the most elaborated petroglyph at Jacana. The ethnological evidence presented by Magaña (1987) in relation to this image pointed toward a mytheme rooted in an ancient Amazonian tradition.
 4. South Wall: The rock art along South Wall is facing 330° or toward the setting of Ursa Major at the end of September in the evening sky over Jacana after sunset. This astronomical event coincides within the period of greatest hurricane frequency for the Antilles. Based on the astronomical data, it was expected that this wall would show depictions of *Guabancex* or hurricane motifs. However this was not the case, and as a result it is hard to relate the astronomical evidence with hurricane seasons and the symbolic meaning of the rock art.
 5. East Wall: The most striking feature of East Wall is that it is almost devoid of rock art motives, just some markings that resemble two eyes. Also, the boulders are uniform in shape and color suggesting a giant snake (*Iguanaboina*) with its two eyes. In addition. The inner edges of the boulders along East Wall are facing the heliacal setting of Scorpius. This astronomical event coincides with the second rainy season. All these evidence suggest that among the ancient Taino people, Scorpius could represent the celestial snake *Iguanaboina* and that East Wall is the realm of *Iguanaboina*, Scorpius and the second rainy season.
 6. West Wall: The most impressive feature on this wall is that wrapped body figures are limited to the West Wall. These two images suggest a depiction of the deceased. Based on these rock art motifs, it seems that for the ancient builders at Jacana the West Wall is the realm of the *Lord of the Coabai*. The rock art motives on West Wall are aligned toward the sunrise during the Summer Solstice on June 21, but were carved on the side of the ball-court where the sun sets. This astronomical evidence points out that West Wall at Jacana is a place facing the Sun where the dead go, and the region where the sun sets. The ethnological evidence among the *Tukano* (Reichel-Dolmatoff, 1971:25) supported this idea.

Finally, we advocate the view from a shift from traditional rock art studies toward an astronomical orientation. As a result, this study expects to provide a more comprehensive approach to rock art studies. One major conclusion which can be drawn from the material presented in this paper is the correlation between astronomical data and rock art at Jacana. The universe of the ancient Taino was not made-up of a random series of beliefs, but rather an orderly system of thoughts in harmony with astronomical events and seasonal cycles.

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Angel Rodriguez
Department of Social Science
Pontifical Catholic University of Puerto
Rico
Ponce, Puerto Rico
(angel_rodriguez@pucpr.edu)