
THE SPATIAL LOGIC OF ZACUALA, TEOTIHUACAN

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Abstract

This paper presents an application of space syntax to Zacuala, a residential compound in the ancient Mesoamerican city of Teotihuacan. Previous attempts at understanding Teotihuacan through spatial analyses are briefly summarized. In order to hypothesize the social logic of Teotihuacan domestic space, the larger urban order must be addressed. A analysis of the access patterns generated by Zacuala reveals that its residents adhered to a finely tuned hierarchy of spaces. The role of mural painting and burials in reinforcing this hierarchy is considered. Spatial syntax holds much promise as a technique for evaluating theories of Teotihuacan social organization.

Introduction

Teotihuacan, located some 42 kilometers northeast of Mexico City, was a city that at its peak sometime in the 4th century CE, covered some 20 square kilometers and housed a population of over 100,000. Its precisely ordered grid, aligned to 15° 25' east of north, speaks to the level of planning that went into its foundation and organization. The grid centers on the 2-kilometer long 'Street of the Dead', punctuated by three main pyramids: the west-facing Pyramid of the Sun, apparently finished in the 1st century CE, but still largely unexcavated; the Pyramid of the Moon at the Street's northern terminus, built beginning in the 1st century CE and expanded throughout the following centuries; and the Temple of the Feathered Serpent, dedicated with over 200 hundred sacrificial burials sometime around the beginning of the 3rd century CEⁱ.

Teotihuacan had a profound influence on its contemporaries and followers. Hieroglyphic texts from the Maya region testify to Teotihuacan's political and perhaps military intrusion in the Peten late in the 4th centuryⁱⁱ. Although the central portion of Teotihuacan was sacked, burned, and looted sometime in the 7th century, it remained the home of tens of thousands for some time. The Aztecs of the 14th-

16th centuries used the city as the backdrop for their creation myth, and gave the city and most of its major structures the names still in use todayⁱⁱⁱ.

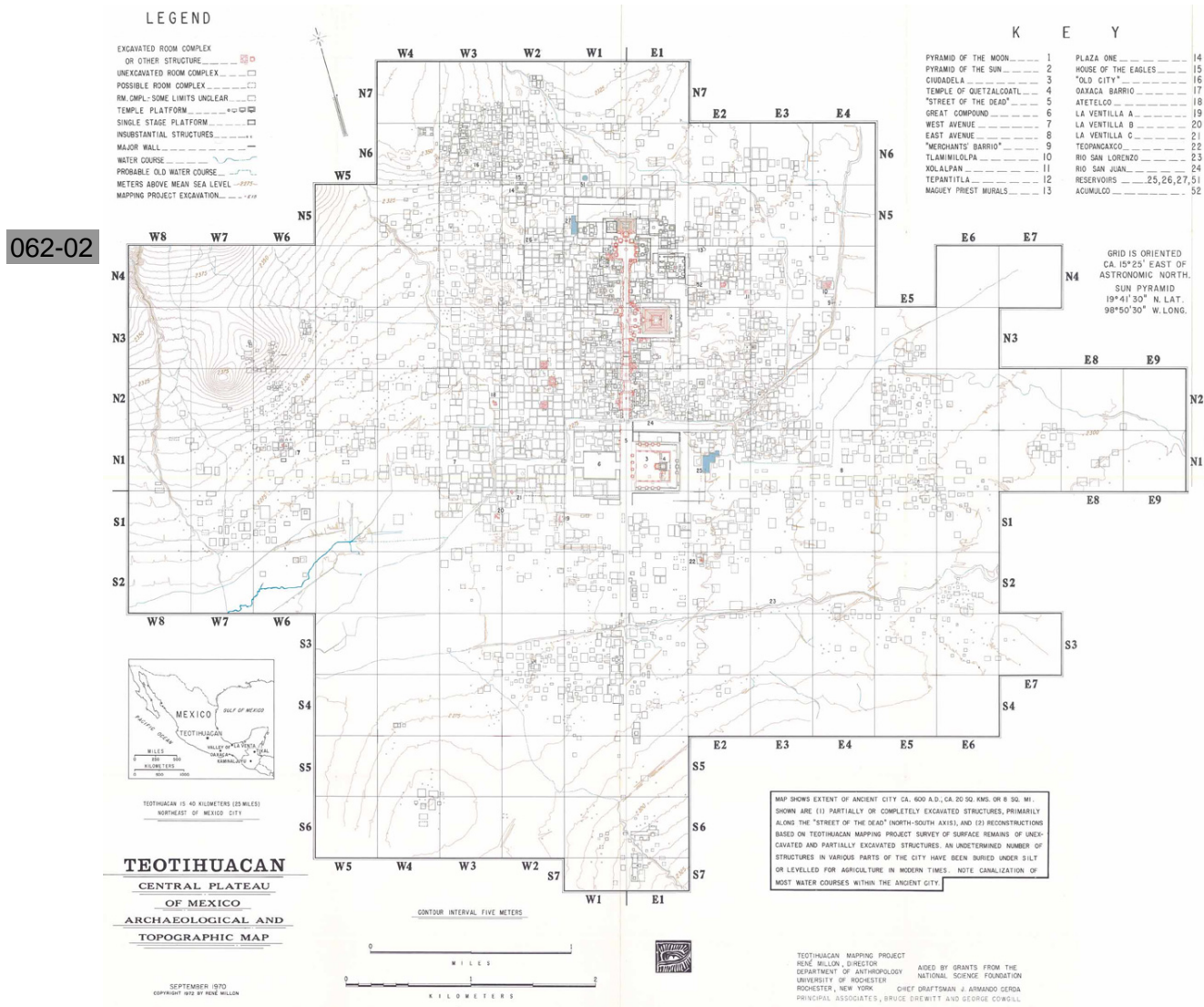


Figure 1:

Map of Teotihuacan. (Millon, 1973): Map 1

For all of Teotihuacan's presence in Mesoamerican history, we do not know what its citizens called their city. With one possible exception, we do not know the names of its rulers. Despite its evident successes culturally and economically, the city apparently lacked a writing system of the kind documented for its contemporaries^{iv}. This means that we comprehend Teotihuacan only through its material remains. Art history interprets its mural painting and sculpture; archaeology documents its burials and its ceramic and architectural stratigraphy. Even when combined, the two create an at best incomplete picture of Teotihuacan's urban culture.

Paradoxically, it is the very lack of emic perceptions of Teotihuacan – contemporary texts describing its urban experience, architectural guidelines containing its codified measuring units and designations of its building and room types – that make spatial syntax an appealing methodology. Although the applicability and appropriateness of deploying space syntax in non-Western environments has been raised, its fundamental approach and techniques continue to be used by archaeologists in both the world of classical antiquity and the ancient American southwest^v.

Hillier briefly analyzed the city as a 'strange town,' but domestic analyses of the kind detailed by Hanson have yet to be done at Teotihuacan, one of the ancient world's primary urban environments^{vi}. Teotihuacan thus provides an almost ideal set of circumstances for testing some of the basic precepts of spatial syntax. At the same time, spatial syntax may prove fruitful as we attempt to understand how Teotihuacan worked on a practical and cultural level, how its structures encoded certain social ideas, and what building 'genotypes' may have been present.

Teotihuacan's residents lived in so-called 'apartment compounds.' There are almost 2000 compounds of various size and social status within Teotihuacan's urban grid. Most were built in the 4th century CE. Such large-scale, sustained urban development was an unprecedented phenomenon within Mesoamerica. The compounds served as housing for extended families devoted to a particular craft. Although their role in fostering Teotihuacan's economic base is well understood, little attention has been paid to how the compounds served at the primary units of spatial and social integration for the city's population. This paper explores Zacuala, a Teotihuacan residential compound, and hypothesizes how the city's spatial system as seen by Hillier may be reflected in Zacuala's plan, major burials, and mural program.

The Spatial Logic of Teotihuacan

In 1996's *Space is the machine*, Hillier argued that the Street of the Dead integrated the city at a symbolic rather than an instrumental level. In no sense do the 'everyday structures' of Teotihuacan – the apartment compounds – contribute to the overall axial structure. The grid, as defined by the Street of the Dead with its abundant monumental construction, dominates all other organizational principles. An axial map of downtown Teotihuacan clearly demonstrates that despite its centrality and scale, the Street of the Dead is one of the *least* integrated areas of the city^{vii}.



Figure 2:

*Axial Map of Teotihuacan.
Adapted from an original
made by Ruben Garnica*

Access to the Street of the Dead appears to have been very restricted. There is no significant entry except at its southern end, in the gigantic plaza known as the Great Compound. Although this space has been seen as a marketplace, there is little archaeological evidence to prove this^{viii}. Seen syntactically, it seems far more like an entrance to a shrine. The Great Compound allows for the coordination and synchronization of a vast number of inhabitants; 'stage doors' for elite access can be seen near the Plaza of the Moon^{ix}.

Rather than making the shrine an enclosed, contracted space, the Street of the Dead turns the axial progression typically associated with the shrine literally inside-out. Those granted access to the Street's southern terminus would have immediately observed the alignment of the Pyramid of the Moon with the looming bulk of Cerro Gordo distant on the northern horizon.

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Figure 3:

The Street of the Dead, looking north. Author photograph, April 2005



Yet the Street did not offer easy, direct access. After crossing the Rio San Juan, visitors and inhabitants would have scaled the large transverse platforms of the Street of the Dead Complex. With their staircases, these platforms created distinct convex spaces that alternated between providing and prohibiting vision of the pyramid at the street's end. The Street of the Dead Complex itself provided ample opportunity to control access to the entire northern sector. Teotihuacan's primary, distinguishing spatial feature is thus an inversion of one of the world's most basic building types. Socially, this has the effect of potentially making public and transparent what is often held to be private and opaque^x.

If the Street of the Dead was the largely unseen engine that drove the city's spatial machine, we would nonetheless expect to see its impact in the domestic sphere of the residential compounds. Although scholars have noted the heterogeneity of the interior plans, the consistency of their areal dimensions, repetitive inclusion of key features like the central patio with adjacent rooms, and the apparent stability of plans over time all testify to the compound's fundamental nature in building Teotihuacan's spatial and social identity. Mary Hopkins examined Teotihuacan apartment compounds with concepts similar to spatial syntax in mind and René Millon once referred to the 'indivisible bond' between the architectural unit of the compound, the social unit that inhabited it, and the state apparatus that encompassed both^{xi}. It is this indivisible bond that spatial syntax allows us to characterize with more clarity – the bond of experiential reference that

created a sense of shared civic identity and helped foster the city's social stability.

Guarding Zacuala

The compound of Zacuala provides ample evidence of this indivisible bond. A single-story multi-room apartment building located about 100 meters beyond the modern highway that surrounds the ceremonial core of Teotihuacan, the complex consists of around 40 rooms spread out over an area of 4000 square meters^{xii}.

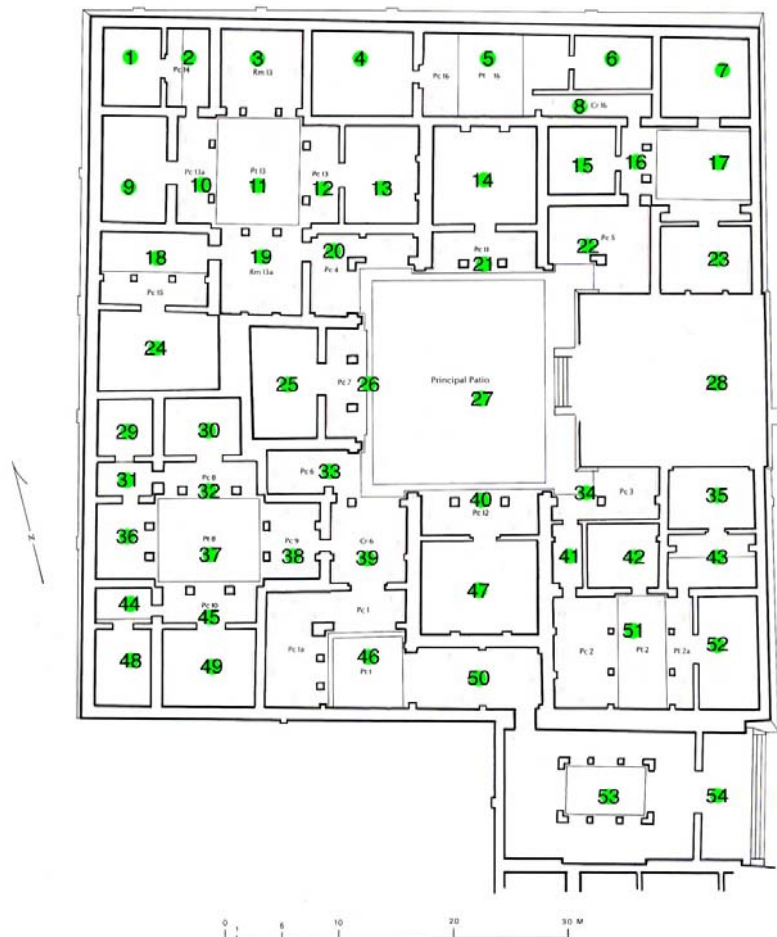


Figure 4:

Plan of Zacuala, with nodes for justified access graph. Adapted from (Miller, 1973): plan 11

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Radiocarbon dates, stylistic assessments of the extant mural paintings, and ceramics associated with the main burials of Zacuala indicate it was built and inhabited sometime early in the Xolalpan phase, roughly 350-550 CE^{xiii}. René Millon placed Zacuala at the third level of a six-level social hierarchy, at the top of Teotihuacan's hypothesized 'middle class'^{xiv}. This conclusion seems largely based on a sense of Zacuala's comparatively high-quality construction, spacious room design, elaborate mural paintings, and a lack of architectonic sculpture.

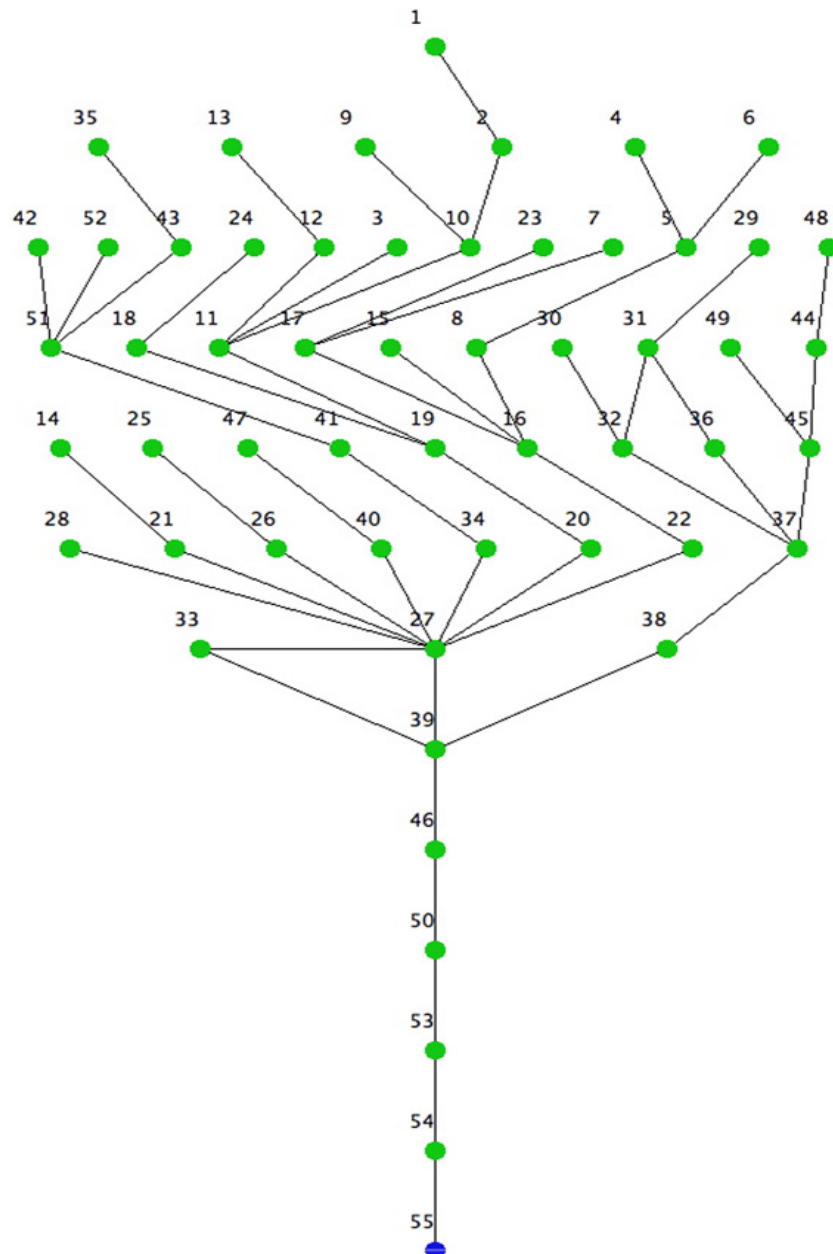
The layout and carefully regulated access within Zacuala suggests it housed a finely tuned social hierarchy. The rooms, patios, temple, and paintings work as a unit, one that refers directly to larger programs of space, architecture, and sculpture seen elsewhere in the city, particularly the Temple of the Feathered Serpent and recently excavated burials from the Pyramid of the Moon. Combined, these parallels suggest that Zacuala served as a primary node in the distribution and promulgation of Teotihuacan's state ideology to a particular audience.

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Seen in plan, the fundamentally recursive nature of Zacuala's layout emerges (Figure 4). A large patio with room and portico groups on the cardinal axes marks the center; smaller 'sub-patio' groups on the intercardinal points repeat the pattern. In this arrangement, Zacuala's closest matches are the palaces located north and south of the Temple of the Feathered Serpent. This cruciform layout, seen throughout the city, is a spatially generative pattern. The open corners encourage the development of secondary spaces and room complexes to fill in the remaining space in the compound footprint. At Zacuala, these secondary spatial sequences resemble the central patio, whereas in other compounds we see more variety. The function of the repetitive spaces in Zacuala's corners was probably similar to the function of the central patio^{xv}.

Figure 5:

Justified access graph for Zacuala; node 55 is the carrier. Graph generated using JASS



Using the techniques developed by Hillier and Hanson, we see that Zacuala has fifty-five nodes (including the carrier) and that there are twelve steps between the carrier and the deepest node (Node 1). When justified for the carrier, the justified access graph shows an exceptionally tree-like structure, with a long sequence of steps before reaching the Principal Patio (Node 27). The integration value for the entire compound is 1.49^{xvi}. Zacuala shares some of the same

syntactical features as the 'House Delta' example developed by Hillier and Hanson.

Although there are a considerable number of nodes with very similar values, the most integrated space by far is Node 27 (the Principal Patio), with a value of 0.723, and the most segregated spaces are the carrier (2.198) and Node 1 (2.137), a room secreted in the northeast corner. The value for similarly nested rooms is around 2. These rooms also all have a small step or platform at their entrances, an architectural feature that further differentiates them from their immediate surroundings. The apparent symmetry of the compound's design does not promote equal access to its similarly structured patio groups. Instead, access is increasingly controlled and limited, and the subtly rising numbers for integration suggest that a great deal of attention was paid to ensuring correspondingly precise social differences.

We might at first glance have expected the architecturally prominent temple structure on the compound's east axis (Node 28) to function as a shrine, and take its place among the most ritually important and thus removed sites in the compound. But the graph indicates that the principal temple does not share in the shrine 'genotype.' Instead, it is closer in value (1.018) to the Principal Patio than the mean for the compound. It is not the most segregated space in the compound, nor does it appear to have a 'stage door' for entrances and exits that would interfere with perception of the rituals performed there.

Given its proximity to the central patio, it likely shared in the patio's integrating function. If the main temple did not function as a shrine *per se*, this also suggests that Zacuala's spatial function was not primarily religious. Given the placement of multiple burials in its interior and the building's iconographic similarities to the Temple of the Feathered Serpent, Zacuala's main temple seems derived from its model. This nested hierarchy of spaces – open patio, enclosed portico, restricted room – also implies that though the Principal Patio served as the primary space for integrating the spatial and social relationships of Zacuala's residents and that these relationships were likened to the major civic spaces surrounding the Temple of the Feathered Serpent, the patio did not serve to integrate those same relationships with members of the city at large. Zacuala was for Zacualans.

Understanding Zacuala's access graph as tree-like offers some insights into the basic spatial and thus the social functioning of the compound. Zacuala's central patio and temple represent the compound's most integrated spaces. Yet they are not shallow within the overall depth of the compound. This indicates that Zacuala's residents paid a high level of attention to the boundary separating insider from outsider. The interior spatial hierarchy could further distinguish between residents with more extensive rights of access. Indeed, Hopkins noted that "one strategically-placed person could have regulated the comings and goings of everyone in the compound"^{xvii}. The presence of a single burial at the compound's entrance reinforces the subtle yet powerful level of control Zacuala's plan alone exerted on its inhabitants.

Archaeologist Laurette Séjourné found Burial 27 at the foot of the entrance stairs in Zacuala's southeastern corner, near node 54^{xviii}. The cross-section indicates a simple shaft burial of approximately three meters in depth for the burial's single adult male^{xix}. There seem to have been no surface indications that it was present just under the floor. The body was apparently placed in a seated, flexed position, exposed to some level of fire, and coated with red pigment. These traits are all suggestive of a burned mortuary bundle, similar to the practice outlined by Headrick^{xx}. Mortuary bundles were used in

ancestor worship rituals, typically in the interior patios of the compounds. The eventual removal of the bundle from view had the effect of opening up space in the political and social system.

The grave goods and accoutrements suggests the occupant of Burial 27 was a member of the Teotihuacan warrior class, perhaps one who either lived in Zacuala or was responsible for its protection. This interpretation is in keeping with identifiable material and iconographic parallels within the site. Since no similar burials are recorded at the entrances to other compounds, the placement and ideological content of Burial 27 also suggests that it should be understood as parallel in meaning to the burials in front of the Temple of the Feathered Serpent and the earlier structures of the Pyramid of the Moon. These are burials that occupy a liminal architectural space, marking the termination of one structure as much as they also mark preparations for the construction of its successor. Burial 27 is an expression of civic ideas and spatial rules that were designed to evoke and emulate the paradigmatic nature of Teotihuacan's major public monuments. The presence of Zacuala Burial 27 in the compound's entryway indicates that its function was twofold: to limit the presence of the deceased in the contemporary environment while at the same time to delimit and define the entrance to the compound itself, a subcutaneous reminder of the military structures that protected the compound and the city as a whole.

The extant murals within the compound also reinforce aspects of the spatial hierarchy outlined above. Any interpretation of this kind is, of necessity, fragmentary. Paintings have only survived on the lower portions of the sloping walls known as taluds. We know so little of the program of a single wall, much less an entire room or the compound as a whole. Yet these fragments served as more than just the physical foundation of the walls above them. The murals in Zacuala have been called some of the most stylistically consistent at the entire site^{xxi}. Through the presentation of the deity known as the Storm God and anthropomorphized figures like the chimerical Feathered Jaguar and its companion the Net Jaguar, the murals described and proscribed the actions that took place in the compound.

The wide staircase at the compound's entrance was immediately countered by the narrow entrance just after the stairs. This primary access led into a spacious courtyard that contained a sunken patio surrounded by eight rectangular columns (Node 53). The walls in this space were probably all red without any figures. Following this open, non-figurative space, a visitor or resident would have walked through a narrow doorway into a corridor painted with figures (Node 50)^{xxii}. With its prominent goggle and fanged mouth, the figure emerging from the circular element shows the Storm God, hand outstretched in the process of scattering seeds and shown as speaking^{xxiii}.

Passing through Node 50 (Corridor 1), a visitor to Zacuala would have continued into the compound's second sunken patio (Node 46; Patio 1). Walking east, the viewer would have seen a north-south wall painted with six additional Storm God roundels, half facing north, half facing south. Typically this flanking arrangement would frame a doorway, but here the Storm Gods provide a visual focus point for the viewer, one that doubles as a spatial 'stop sign.' This sense is reinforced by the similar arrangement of four east-facing roundels on the south wall. These would have provided a similar effect for a viewer exiting the building when combined with the blank central section and the west-facing roundels of Corridor 1. The four roundels on the northern wall of Portico 1a reinforce the spatial end of the Storm God sequence as they face west, suggesting a line of continuity with the west wall. Yet these murals would have been largely obscured by the

column in the northeast corner of the patio, limiting their immediate effect on a visitor emerging from Corridor 1. The murals immediately flanking this doorway, as well as those on the eastern wall, all direct the viewer towards this northern doorway. They show a character known as the Feathered Jaguar^{xxiv}. Rarely seen in the art of the city, the Feathered Jaguar is an image still poorly understood in Teotihuacan iconography^{xxv}. Where it does appear, it is consistently shown in aggressive postures with claws raised, or as in this example, carrying a shield. These martial associations recall the sentry burial at the entrance to the compound, and their presence on the walls inside implies the continuation of observational control.

Spatially, these opening areas continue the alternation between transitional zones and open rooms seen from the entrance. A visitor would leave the street (arguably the primary transitional zone) into the compound's first patio. From there, he or she would go through the transitional corridor into the second patio, whose space was subdivided into two zones by the dual images on the north wall. The next corridor leads into the Principal Patio (Node 27), presumably the ceremonial heart of the compound as well as its functional center. These alternating rhythms are not precisely mapped in terms of proportion, but they are suggestive as ways of understanding how spatial organization and pictorial composition functioned to integrate the compound.

Having arrived in the center of the Zacuala compound, a visitor or resident would have been struck at the sudden spatial opening the created by the vastness of the Principal Patio. As we have seen, this Patio provided the greatest access to the greatest number of spaces; it would not have been possible to walk to a majority of rooms in Zacuala without going through the Principal Patio. The Patio itself was the largest room in the compound, measuring some 285 m².

Figure 6:

*Zacuala's Principal Patio.
Author photo, March 2006*

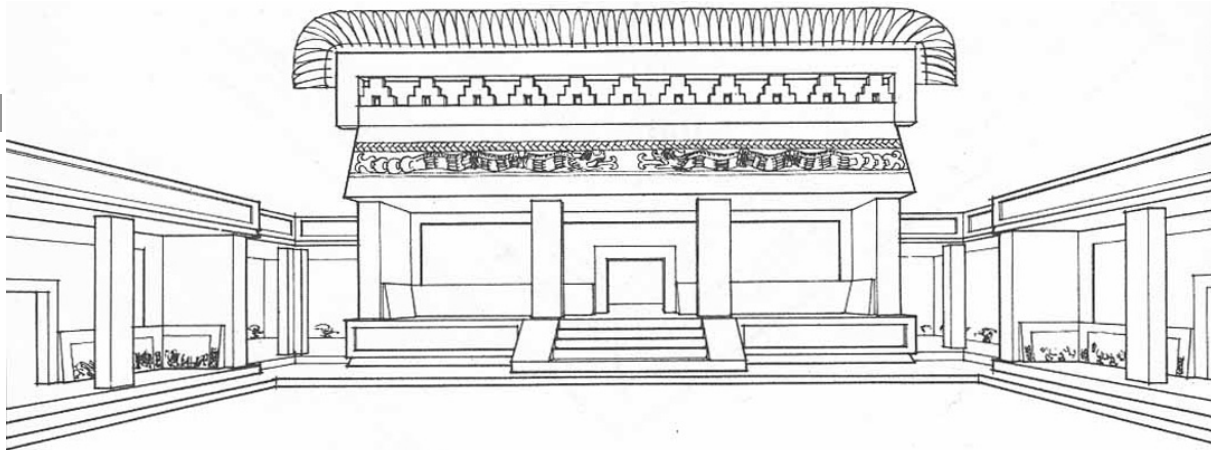


The multiplicity of potential options for movement was tempered by another of the pictorial and spatial isolations seen in the entrance spaces. The four intercardinal rooms – Porticos 3, 4, 5, and 6 (nodes 34, 20, 22, 33) – all carried the same mural imagery on their lower walls. These porticos all served as transitional spaces to the additional subpatio and room groups in the corners, with the exception of Portico 6. As a cul-de-sac, it may have stood in relation to the Principal Patio as the three others stood in relation to their sub-patios, providing a small zone where a resident could have observed the comings and goings of other residents and visitors, while also facilitating controlled access to the compound's most important and restricted spaces.

The figure seen in these porticos carries a large net filled with colorful maize cobs on its back^{xxvi}. Some hold plant stalks as they walk, and speech scrolls emerge from their mouths. We see the goggles and fangs of the Storm God. With their body colors and fully mature maize plants, these figures continue the narrative of agricultural growth begun by the seed-scattering Storm Gods of the entrance rooms. The repeated presence of the maize-carrying Storm God in these transitional zones suggests that the images defined spaces where

Figure 7:

Zacuala's Main Temple.
(Séjourné, 1966a): fig. 56



The iconography of the Main Temple (node 28) also helped define this 'exterior' quality of the Principal Patio. This temple consisted of a single, west-facing platform with a short staircase that served as its only access. A mural fragment also echoes the iconography and composition of the façade of the Temple of the Feathered Serpent, where the stone mosaic ophidian body undulates within the tight confines of the tablero^{xxvii}. Although we lack the head and tail of the Zacuala mural fragment, it seems most likely that the mural was originally placed in the tablero of the Main Temple.

Figure 8:

Mural fragment from
Zacuala. (Séjourné, 1959):
fig. 12



The structuring principles of the imagery from both temples – a feathered serpent, shown moving through a watery realm indicated by the shells that surround its body, as well as carrying a distinct headdress – are the same, even as the media differ. The relationship between the two programs may be as much historical as ideological, and testifies to the impact the Temple of the Feathered Serpent had on the layout of the entire city. A secondary staircase, known as the Adosada, built sometime in the 4th century CE, hid the front of the Temple of the Feathered Serpent from public view and access^{xxviii}. Its façade had thus been hidden for perhaps a century when the main temple of Zacuala was constructed. Some have argued that the Adosada's construction indicates a wholesale rejection of an increasingly autocratic regime, and the move toward a more pluralistic government^{xxix}.

When we consider that the Feathered Serpent appeared not just at Zacuala but in several other compounds throughout the city, it seems less likely that this imagery was so negatively charged. Instead, its iteration within the main, integrating space of the compound reads as an attempt to revive and refocus the power associated with the last and most publicly accessible of the city's main pyramids. It is not simply a question of repurposing a similar iconographic program in a less expensive medium for a smaller audience – the entire spatial configuration of Zacuala seems designed with the Ciudadela and the Temple of the Feathered Serpent in mind. The design of at least two of the extant portico murals provides support for this interpretation.

On the north side of the main patio, a typical two-columned portico served as the entrance into a capacious square room (node 21). No traces of mural painting from the back room are known, but the portico itself retained the bottom sections of four murals that repeat the same motif^{xxx}. The Portico 11 Murals represent a pictorial version of the sculptural program seen at the Temple of the Feathered Serpent. A ruler, warrior, or priest standing atop the entire pyramid, or an array of priests standing on its entablatures, would have had exactly the same visual relationship with a feathered serpent below his feet that we see on the Portico 11 mural.

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The southeast sub-patio group also contained mural fragments. On the lower walls of the room surrounding Patio 2 (node 51), Zacualans painted a series of front-facing figures^{xxxi}. In the hallway leading to this section of the compound, Séjourné reported four red circles painted on the typical red background, with one of the circles placed to the north of the pilaster visible on the plan, and the remaining three to the south^{xxxii}. As sequential circles demarcating the transitional space of a corridor, they seem like visual references back to the initial 'Storm God' medallions of Corridor 1.

The available wall space allowed for as many as a dozen iterations of the central image, and the surviving examples allow for comparative reconstruction. The figure wears a feline headdress, but rather than the feathers seen in the earlier rooms, the costume appears held together by a net. This is the Net Jaguar, a character who appears with some frequency in the city's late murals. In the left hand, the figure holds a rectangular shield marked with a scroll pattern and footprints. Although this object has been seen as a censor or shield^{xxxiii}, I interpret this image as the representation of the Net Jaguar costume itself, already worn by the frontal figure shown painted at the moment of offering the costume to another person. This section of rooms in Zacuala may have been where costumes of the Net Jaguar were either kept or put on, or perhaps both.

The Net Jaguar has been variously interpreted as an almost purely aesthetic trope of representing invisible space or the depiction of light on the surface of moving water^{xxxiv}. In contrast, I believe it is meant to show the body of the jaguar as trapped and ensnared. This is based largely on the presence of feline skeletons in Burials 2 and 6 at the Pyramid of the Moon. Available evidence suggests that some of these great cats were buried alive^{xxxv}. Although we are only beginning to understand how the animals were captured and brought to the Pyramid, their acquisition and their subsequent placement in one of the city's primary structures strongly suggests a collective and coordinated effort.

The presence of the Net Jaguar at Zacuala could be a depiction of the costume worn by hunters as they sought their prey. As an image of controlled power, the Net Jaguar simultaneously symbolized members of the hunter and warrior class while providing a reminder of their obligations to capture and deliver animals for sacrifice, making clear

their connection and subservience to the apparatus of the state. Presumably, these animals would have been taken into the Great Compound, past the Ciudadela, up the Street of the Dead past the Great Puma mural (the largest at the site), and eventually placed in the Pyramid of the Moon. The image of the Net Jaguar, as an anthropomorphic version of the captive predator, was a powerful representation of the state's ability to control the domain of the city and the larger world beyond it.

Conclusion

Although archaeologists and art historians have studied Teotihuacan for over a century, we still lack answers to some basic questions about the city's political, religious, and social organization. Our data will, of necessity, always be fragmentary. As a result, students and scholars must be ready to approach the city with new techniques in order to glean as much information as possible from the ruined structures. This paper has outlined some of the ways in which the methods and theories of spatial syntax can integrate data from these two disciplines and provide new insights into the structures that provided the foundation for Teotihuacan's urban form. Much more could be done – the axial map of the city needs to be updated to reflect current data. More compound layouts could be examined to isolate spatial phenotypes that are shared with the rest of the world and those that are specific to Teotihuacan.

One final observation emerges from a larger consideration of Teotihuacan's spatial culture. Many of the city's murals depict figures in the process of walking, often as they scatter seeds or speak with flowery scrolls. Residents of the compounds were not surrounded by quotidian versions of themselves, but instead were confronted with a variety of deities, priestly figures, warriors, and costumed supernaturals. The liturgical and perambulatory aspect of these images indicates that Teotihuacan had developed a cultural value that defined and imbued the act of walking with deep ritual importance, always in reference to the city's ultimate pedestrian pathway, the Street of the Dead.

Even this brief analysis demonstrates the necessity for incorporating spatial syntax into future research at Teotihuacan. The precision of spatial order as seen in the Zacuala plan, with its almost assiduous maintenance of boundaries from carrier to compound, and from patio to sub-patio, suggests it housed a complex social unit with rigorously maintained distinctions. This in turn suggests that part of the function of the compound was to create these distinctions while at the same time providing one key integrating space where residents could come together as a group. As a derivative of the larger urban order as articulated at the Temple of the Feathered Serpent, Zacuala provides evidence that the spatial and social orders of Teotihuacan were specifically developed to create a microcosm of its hierarchies in its domestic spaces. Rather than creating an urban society where power was visibly held by a select few, Teotihuacan's rulers deployed a spatial vocabulary that subtly managed their subjects through repeated patterns of access and restriction, at levels large and small. The 'indivisible bond' Millon wrote of was not an exchange between laborers producing goods in the compounds, farmers bringing in food from the fields, and warriors and rulers providing protection and some measure of spiritual satisfaction. Instead, it was a bond that placed the citizens of Teotihuacan in a chain of scrupulous spatial and behavioral control.

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Space in the machine so clearly implied about the shrine-status of the Street of the Dead.

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Software:

Mindwalk (<http://www.mindwalk.com.br/software/>)

JASS (http://www.arch.kth.se/sad/projects/body_projects_software.htm)

Webmap (<http://bat.vr.ucl.ac.uk/webmap/>)

- i. For a summary of Teotihuacan, see (Cowgill, 1997); for recent summaries of work at the Temple of the Feathered Serpent and the Pyramid of the Moon, see (Sugiyama, 2005) and (Sugiyama and Lopez Lujan, 2006).
- ii. (Stuart, 2000).
- iii. (Boone, 2000).
- iv. The status of Teotihuacan's visual system as a writing system is still a matter of some debate; for a positive view see (Taube, 2000).
- v. (Osman and Suliman, 1994); (Laurence, 1994); (Shapiro, 2005).
- vi. (Hillier, 1996); (Hanson, 1998).
- vii. I thank Bill Hillier for providing me with a version of the axial map of Teotihuacan made by Ruben Garnica. I used Webmap and Mindwalk for generation of images and preliminary analyses.
- viii. (Millon, 1973): 18-20. The identification recalls the marketplace/parade ground problem posed by Hillier (Hillier, 1996): 233.
- ix. It is important to remember that the Street of the Dead is a construction with its own history. What is represented on the map and what the visitor sees today are representations of the past, not the past itself. The spatial elaboration described here is valid only as much as the map achieves its goal of representing the city ca. CE 600.
- x. (Hillier and Hanson, 1984): 181-183.
- xi. (Hopkins, 1987a); (Millon, 1981): 210.
- xii. Test excavations by Pedro Armillas in 1944 and 1945 confirmed the presence of a structure in this location. Laurette Séjourné carried out three seasons of excavations here and at the associated rooms of Zacuala Patios from October 1955 through 1958 and published her results in *Un palacio en la Ciudad de los Dioses*. (Armillas, 1950): 56; (Séjourné, 1959). Séjourné's book was republished in 2002 (Séjourné, 2002).
- xiii. (Coe, 1962); (Millon, 1992); (Sempowski, 1994); (Rattray, 2001). Although Séjourné documented only one burial in Zacuala, Millon reported a later communication with Séjourné in which she described an additional four burials from Zacuala's main temple. (Séjourné, 1959): 64; (Sempowski, 1994): 13.
- xiv. (Millon, 1976): 227.
- xv. Altschul, noting this structural pattern, felt that each of Zacuala's four distinct patio sup-groups could have served as the focus for an equal number of domestic groups (Altschul, 1981): 184.
- xvi. The graphs and values were created using JASS.
- xvii. (Hopkins, 1987b): 377.
- xviii. (Séjourné, 1959): 61.
- xix. (Séjourné, 1966b): 233-237; (Spence, 1994): 405.
- xx. (Headrick, 1999); (Sanchez, 1993): 111.
- xxi. (Miller, 1973): 108.
- xxii. (Séjourné, 1966a): fig. 14.
- xxiii. (Miller, 1973): fig. 202.
- xxiv. (Miller, 1973): fig. 200.
- xxv. (Berrin, 1988): 185-194.
- xxvi. (Miller, 1973): fig. 206.
- xxvii. (Sugiyama, 2005): fig. 17a.
- xxviii. (Sugiyama, 2005): 7.
- xxix. (Millon, 1992): 396.
- xxx. Only one of these fragments has ever been published [(Fuente, 1995): 338; fig. 21.6] and Séjourné does not describe in any detail the condition of the other three other than to indicate the murals all faced in, to the door in the northern wall.
- xxxi. (Séjourné, 1959): plate 28.
- xxxii. (Séjourné, 1959): 27.
- xxxiii. (Kubler, 1967): fig. 27; (Fuente, 1995): 336.
- xxxiv. (Pasztor, 1997): 185; (Conides, 2003).
- xxxv. (Sugiyama and Lopez Lujan, 2006): 28; 48.

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