

**MUD, MESSAGES, AND MUSEUM SPACE***A Space Syntax Analysis Of The Casa Grande, Arizona*

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**0 Abstract**

Located near Coolidge, Arizona, between Phoenix and Tucson, the Casa Grande is a massive four-story, 13th century adobe structure that has variously been described as a temple, granary, fort, chief's house, and astronomical observatory. A century of archaeological study has provided an understanding as to how, and when the Casa Grande was built, but has not provided a complete picture of its intended or actual functions. Viewed from the perspective of space syntax analysis, the Casa Grande looks like a building designed to collect, manage, and disseminate special knowledge. The number of rooms, together with their vertical, stacked arrangement, impresses one with an almost museum-like quality of information management. The author is not suggesting that the Casa Grande was literally a museum in the conventional sense, but the nature of the room associations and their encouragement of communication finds its most analogous manifestation in the structure and movement patterns of museums. Just as museum visitors are spatially managed in order to receive appropriate messages from exhibitions, so too were the visitors to the Casa Grande spatially managed with respect to the receipt of culturally relevant information.

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**1 Introduction**

Within the field of Southwestern archaeology, it is difficult to select any site that has been described or analyzed more than the Casa Grande. Located near Coolidge, Arizona, between Phoenix and Tucson, and designated a National Monument in 1918 (Ambler, 1961:2), its defining element is the massive four-story Hohokam Civano phase (A.D. 1300-1350) structure that has variously been described as a big house, temple, granary, fort, chief's house, and astronomical observatory (Mindeleff, 1896; Fewkes, 1912; Wilcox and Shenk, 1977). Beginning with Padre Eusebio Kino in 1694, a myriad of explorers and travelers have sketched, measured, and mulled over this enigmatic edifice. Within the past 100 years, a veritable "who's who" of Southwestern archaeologists have analyzed the Casa Grande, and while a century of study has provided a good understanding as to how, when, and with what materials the Casa Grande was built, there has been less success in tying these formal aspects to the social and functional questions of why it was built or how it was used. This study uses space syntax analysis to investigate and interpret the set of built spaces that compose the Casa Grande.

**2 Background to the Classic Hohokam**

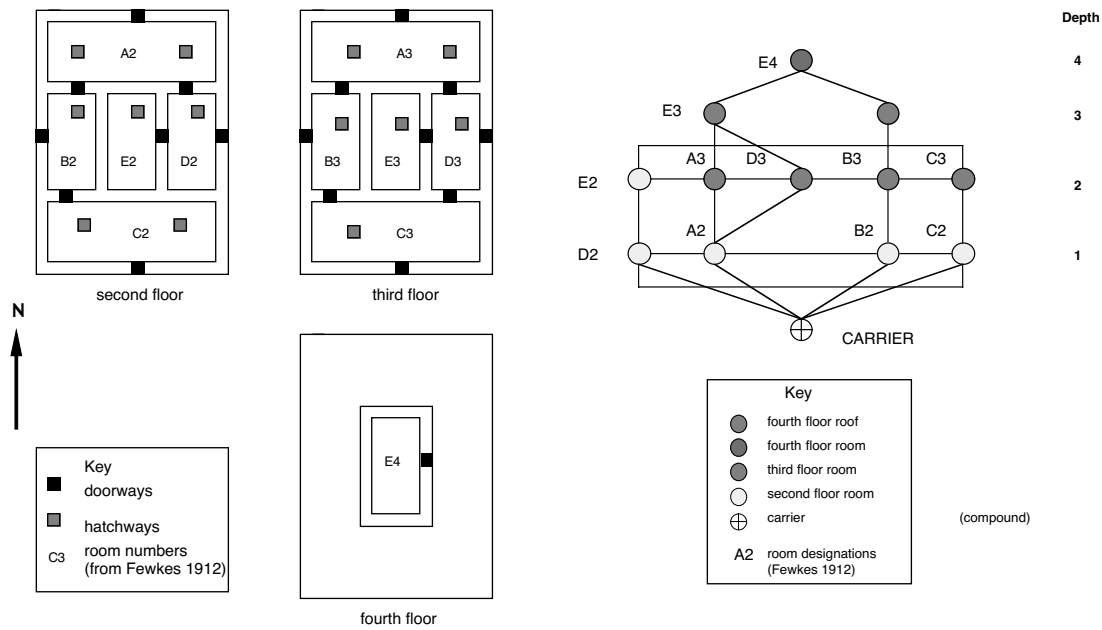
For more than a thousand years, the Hohokam culture evolved and flourished in the valleys of the Salt and Gila Rivers in Central Arizona. The Hohokam (literally, "those who have gone," or "finished ones," in Pima mythology) (Bahr et al, 1994:1), irrigated large areas in the Sonoran Desert in order to grow a variety of crops, including corn,

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beans, squash, cotton, and developed what many archaeologists believe to be one of the few complex societies in the prehistoric American Southwest. The origins of the Hohokam remain somewhat obscure, and archaeologists have considered the possibilities of indigenous cultural evolution in Central Arizona, together with a series of additional cultural contributions via diffusion from west Mexico. Beginning as early as 300 BC, the Hohokam began digging small canals and settling small pithouse hamlets in areas near modern Phoenix and Tucson. Over the course of the next several hundred years, the Hohokam expanded their settlements and canal systems to the point that by the tenth and eleventh centuries, more than 15,000 people were living in the Phoenix Basin, supported in part, by over 25,000 irrigated acres. Sometime after AD 1200, two new developments heralded the beginning of what archaeologists call the Hohokam Classic Period (AD 1100-1450). The overall geographic region occupied by the Hohokam was reduced, and settlements became both larger and fewer in number as populations became more aggregated. Secondly, the Hohokam abandoned their long association with semi-subterranean pit houses, and began building large adobe compounds, containing individual room blocks. It was during the Classic Period that multi-story “big houses,” such as the Casa Grande were constructed. These structures were large and impressive, measuring close to 40x60 feet, with walls up to seven feet thick at the base (Bahr et al, 1994:10). Archaeological evidence suggests that Classic Hohokam society had developed aspects of social inequality, with a small group of “elites” having more access to certain exotic items, and presumably having substantial influence over a much larger group of “commoners” (Crown, 1991; Wilcox, 1991). For reasons that are still debated among archaeologists, by the middle of the fifteenth century, Hohokam culture was in decline, and had entirely disappeared long before the Spanish arrived in the 17th century. It is most likely that overpopulation and environmental degradation, coupled with natural disasters, such as major floods, combined to stress Hohokam institutions beyond the point of repair (Haury, 1976).

### 3 Application of Space Syntax Analysis to the Casa Grande

Consisting of 11 rooms in three occupation levels (the first floor consisted of fill and served as a base for the 3 upper floors), the Casa Grande may be described as a structure that is ordered, symmetrical, and distributed. Its long axis is oriented in a north/south direction, an arrangement that is consistent with most, but not all, Classic Hohokam walled compounds (Gregory, 1991:167). Figure 1 illustrates the floor and room relationships, and even without space syntax analysis, one can appreciate that the Casa Grande is a very permeable structure. Space syntax analysis strengthens this impression, as the mean integration value (0.69) indicates a highly integrated system of spaces, and the justified access graph (Figure 2) reveals a relatively shallow system (depth = 4) with several alternate, connecting pathways. The permeable nature of the building suggests that except in connection with the fourth-floor room, neither internal spatial control nor privacy was a primary consideration of the builders. Insofar as the internal spatial arrangements are concerned, there were few physical impediments to movement within the building. Any interfacing between the “residents,” of the Casa Grande, and “visitors,” would have occurred at one of the entry points in the surrounding plazas. Once inside the building, an unrestricted potential for user participation and movement would have taken over. The potential for continuous flow would have facilitated social encounters, such as one might expect in a



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communal setting in which there are no obvious distinctions among space users. In this situation, not only is the internal space continuous in a physical sense, but potential social encounters are essentially simultaneous. Unfortunately, relatively little information is available regarding specific room functions, and the Hohokam left no written records to enlighten future scholars. Nevertheless, the general absence of spatial depth or containment, when coupled with the range of integration values presented in Table 1, permits some qualified inferences about what such an integrated, spatially egalitarian structure is doing in the midst of a society that most archaeologists consider to have been characterized by some type of social inequality.

Figure 1. The Casa Grande, Arizona: Schematic View of Rooms

Figure 2. The Casa Grande: Justified Access Graph Average integration = 0.69

Conventional wisdom has suggested that such a specialized structure must have had some ritual or religious purpose. "Shrine-like" structures are often composed of a deep and usually sacred, deepest space that synchronizes with a hierarchy of accessible shallower spaces. This arrangement, observed in structures as diverse as English parish churches and West African Ashanti shrines, implies a zone that is isolated and protected, yet remains intimately connected to a spatial system that facilitates communication among congregants (Hillier and Hanson, 1984:180-182; Oliver, 1997:720-751). Merely claiming that "religious functions" probably occurred in the Casa Grande does not add to our knowledge, nor does it fully convey the spatial impression provided by space syntax analysis. The number of rooms (or galleries), together with their vertical, stacked arrangement, impresses one with an almost museum-like quality of circulation and information management. The author is not suggesting that the Casa Grande was literally a museum in any conventional sense. Rather, it is the nature of the room associations and their encouragement of communication, and the co-presence of observer/participants that finds its most analogous manifestation in the structure and movement patterns of museums (Markus, 1993:171; Choi, 1997). In this context, the focus is on what museums do, rather than what they represent. Just as museum visitors are spatially managed in order to receive appropriate messages or esthetic experiences, so too were the visitors to the Casa Grande spatially managed with respect to the receipt of culturally relevant knowledge. The presumed source of the knowledge, namely the fourth-floor room, was segregated, but the

messages it generated are embodied in the architecture, and were recoverable as people moved through the spaces. Whether these messages took the form of iconographic symbols, exhibitions, or events is not known, but the potential ability to navigate through the building in a relatively unimpeded manner could have facilitated both sequenced ritual processions as well as probabilistic social encounters (Choi, 1997:16.7).

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This conception of the Casa Grande is consistent with the idea that the fourth-floor room functioned as an astronomical observatory (Wilcox and Shenk, 1977). By the time that the Casa Grande was constructed, the Hohokam had been farming the Salt and Gila River valleys for centuries. From a strictly functional standpoint, these desert farmers did not need priestly astronomers telling them when to plant or harvest their crops. To the extent that the prediction of celestial events may have had a critical function within a ranked or stratified social order, such as might be required in order to schedule important activities (Lindauer and Blitz, 1997:185), it would have been much easier to construct a large pyramid using available technology, or to have gone to the top of the nearest mountain if all that was needed was a site for an astronomical observatory. The implication is that something more complex was involved in the planning of a four-story structure having two identical, and very permeable, sets of rooms. If “knowledge is power” (Markus, 1993:169), then the time and materials invested in constructing the Casa Grande are significant. “Significance” is a relative concept, as it has been postulated that although neither a particularly large workforce nor complex social organization would have been necessary to build the Casa Grande (Wilcox and Shenk, 1977:123), the overall scope of the construction effort was several times greater than for any of the other structures within the settlement where this building is located (Wilcox and Sternberg, 1981:27). This “information-management” hypothesis allows for the possibility that cosmological specialists directed the construction and operation of the Casa Grande based upon their ability to wrest political power from their celestial observations (Wilcox and Sternberg, 1981). This group reinforced the ceremonial significance of their observations with an architectural choreography of space and activities (Howard, 1992:70).

From the perspective of space syntax, the Casa Grande looks like a building designed to collect, manage, and disseminate esoteric knowledge. In all likelihood, this knowledge was not distributed in a general manner, as that could have been accomplished using large plazas or other open areas where there would have been more direct interaction between information providers and other segments of the community. Instead, information disclosure within the Casa Grande was limited to those persons who were permitted to enter and circulate through the second- and third-floor rooms.

The structure of the Casa Grande makes other suggested functions, such as that of a chiefly residence, less probable. For example, it does not exhibit the spatial restrictions commonly associated with the exercise of hierarchical authority, such as those found within palaces (Hopkins, 1987; Moore, 1996), castles (Fairclough, 1992), asylums, prisons, (Markus, 1993), schools, or other kinds of institutions in which social control is facilitated through spatial control (Peatross, 1994). Such buildings are invariably asymmetrical in design with markedly segregated spatial arrangements in which one or more spaces exercises critical control over access to selected internal

areas (Zhu, 1994). In the Casa Grande, the symmetrical room relationships denote a general absence of any spatial hierarchy or inequality. The most restricted space is the fourth-floor room, which has two direct connections: to the room below and to the roof. As a result, this room exercises only limited control over adjacent spaces, implying that while it was protected, it was not a particularly dominant space within the entire network. The absence of any singular space through which surveillance of the entire structure could be achieved suggests that security was not an overriding concern.

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The internal permeability of the Casa Grande renders its designation as a storage facility unlikely, as other studies that have applied space syntax analysis to prehistoric sites in the Southwest have discovered that storage functions are often assigned to the deepest and most segregated zones (Bustard, 1996; Shapiro, 1997; Fangmeier, 1998). In contrast to the Casa Grande, several other buildings within the compound in which it is located, have spatial structures that would have been much more conducive to the storage of valuable commodities. Finally, the Casa Grande lacks the substantial degree of privacy commonly associated with structures having a residential or domiciliary function within socially differentiated societies. The existing spatial arrangements would not readily have permitted inhabitants to control the rate or pace of involvement with visitors (Peatross, 1994:38-39), an observation that is relevant in light of recent research concerning the increased value of privacy associated with Classic Hohokam domestic architecture (Crown and Fish, 1996). Societies tend to embody important social values in their architecture (Lawrence and Low, 1990), and to the extent that privacy had become an increasingly important consideration among the Classic Hohokam, it was not manifested in the architecture of the Casa Grande.

#### 4      **Clan House 1**

At least two investigators have suggested that Clan House 1, a separate structure located a few hundred yards away, may have functioned in a manner similar to the Casa Grande (Fewkes, 1912:107; Wilcox and Sternberg, 1981:28). Figure 3 is a schematic rendering of Clan House 1, based on Fewkes' drawing (1912), that shows a series of one-story rooms with very few doorways. Application of space syntax analysis results in a justified access graph (Figure 4), whose structure indicates that the spatial relationships within Clan House 1 were radically different from those in the Casa Grande. The annex (rooms K and L) was not included in the analysis, as that portion of the building was apparently built some time after the original structure, probably in connection with the presumed tomb or sarcophagus that held the remains of an important person (Fewkes, 1912; Wilcox and Shenk, 1977).

Where the Casa Grande's internal space was continuous, space within Clan House 1 was discontinuous; where social relations within the Casa Grande appear simultaneous, social relations within Clan House 1 appear unequal. Clan House 1's average integration value of 1.19, together with the form of its justified access graph, reveals a segregated structure with very few inter-room connections. Consistent with similar efforts, where direct evidence of doorways was not recovered archaeologically, an assumption was made that room ingress and egress was via rooftop hatchways. The justified access graph is candelabra-shaped and has a single, relatively shallow ring.

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Not surprisingly, the central plaza is the most integrated space, and it is assumed that most of the interior rooms had at least indirect access to one another through the plaza. The second-lowest integration value is exhibited by the large room (M) at the western end of the plaza, in which Fewkes discovered a large seat or throne. Unlike the Casa Grande, in which spatial differences were minimized, Clan House 1 exhibits a spatial hierarchy that implies the exercise of control, a not unexpected finding in a system of presumed social inequality.

Obviously, without more contextual information, assumptions about room functions are speculative. Nevertheless, the combination of spatial layout, internal access routes, and integration values strongly indicates that Clan House 1 was designed and used in a decidedly different manner than was the Casa Grande. To the extent that depth conveys power, Clan House 1 has a greater overall depth, with the potential for the exercise of greater internal control. In addition, the overall arrangement of spaces provides a much higher degree of physical privacy, which could have been manipulated for either social or economic purposes. If Civano Phase mound residents constructed large numbers of storage rooms (Wilcox, 1991:267), then one would expect Casa Grande residents to have had similar facilities. At Clan House 1, the series of six rectangular spaces bordering the internal plaza (spaces A, B, C, H, I, J) are all (with the exception of J) relatively deep and segregated. These rooms have no obvious doorways and were most likely entered from rooftop hatchways. They are precisely the kind of segregated and undifferentiated spaces that could have been used for storage. When this information is coupled with what is understood about Classic Hohokam society, it is likely that Clan House 1 was some type of elite residential compound, a conclusion that is consistent with supposed “high ranking” (i.e., the burial discovered in the annex) (Fewkes, 1912:109).

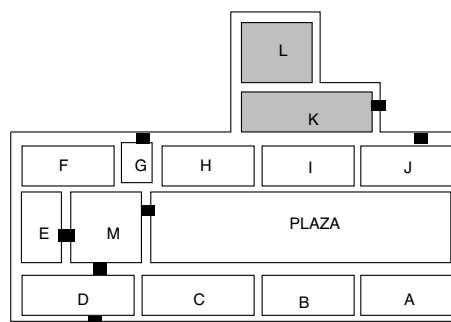


Figure 3 Clan House 1 Room Diagram

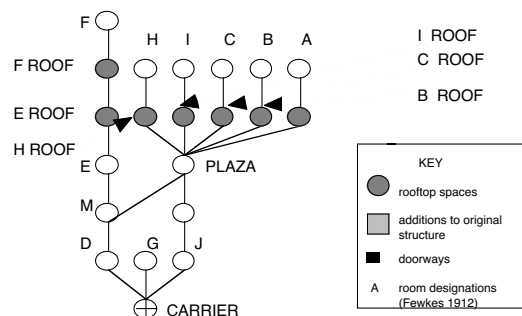


Figure 4 Justified Access Graph  
Average Integration 1.19

Figure 3. Schematic rendering of Clan House 1

Figure 4. Justified graph of Clan House 1

### 5 Compound A

The Casa Grande is not an isolated structure, but is one element within a large, walled compound, which is in turn one of several such compounds within the greater Casa Grande community. As part of this study, four additional adjacent structures within the compound were analyzed (Figures 5 and 6). Even though the structures all appear to reflect a general five-room construction pattern, they contain relatively few doorways (see Table 1), and all exhibit integration values which are significantly higher than those of the Casa Grande. Even the lowest value among these structures, namely the South West Building, with an average integration value of approximately 1.1, is still very segregated compared to the 0.69 of the Casa Grande. All of the justified access graphs have dendritic, tree-like patterns that indicate spatial segregation, and are similar to the graph for Clan House 1. Two of these structures exceed the spatial depth of the Casa Grande, yet all exhibit a sense of architectural enclosure and containment that is lacking in the big house. Inasmuch as most rooms can only be entered by one route, access is relatively easy to control. It also means that there are very few alternative routes by which one could gain entry to the deepest elements within each of these subcompounds. As in the case of Clan House 1, a spatial hierarchy is evident. To be sure, not every built space has been as well preserved as those within the Casa Grande, and there may be questions concerning some assumptions about access openings. On the other hand, experience has shown that the integration formula is sufficiently robust so that the presence or absence of a few connections will not fundamentally alter the value of a system (Shapiro, 1997). That factor, together with the persistence of the discovered patterns, supports the view that these patterns are genuine and are not merely an artifact of the analysis.

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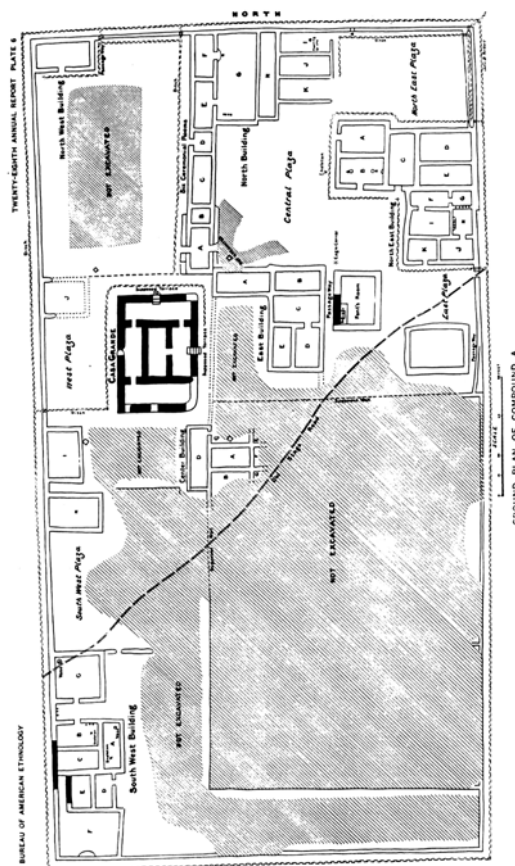


Figure 5. Map of Compound A (from Fewkes 1912)

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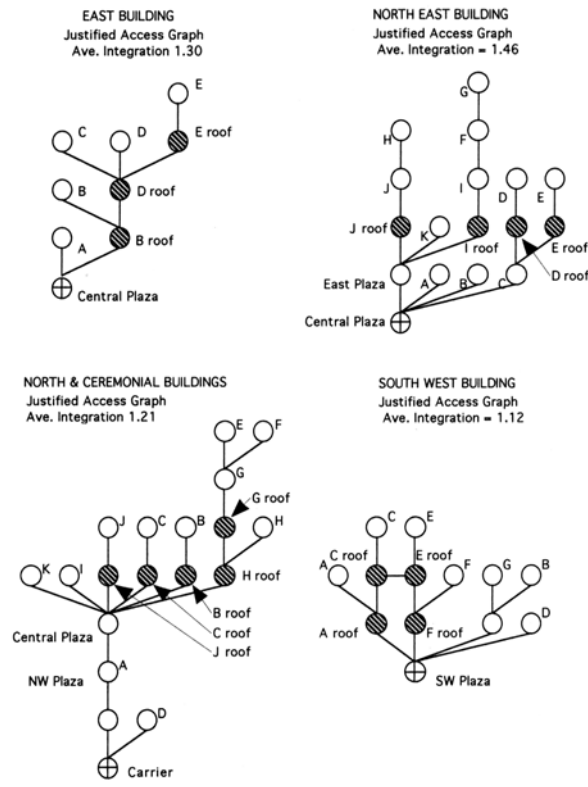


Figure 6. Comparative View of Justified Access Graphs

Table 1

Building	Ave. Integrat	High Integrat	Low Integrat	No. Spaces <sup>°</sup>	Doorways to Rooms Ratio
Casa Grande	0.69	1.10	0.44	13	18/11, or 1.63:1
NE Building	1.46	2.02	0.68	17	7/11, or .63:1
East Building	1.30	2.03	0.68	9	2/5, or .40:1
Ceremonial & North	1.21	1.75	0.74	19	5/9, or .55:1
SW Building	1.12	1.54	0.55	13	4/7, or .57:1
Clan House 1	1.19	1.87	0.47	17	6/13, or .46:1

<sup>°</sup> includes rooftop spaces

Table 1. Summary of Integration Values

The only individual integration values that approach those of the Casa Grande are associated with the plazas within Compound A. In particular, the Central Plaza has the lowest value in the entire compound, a not unsurprising finding given its proximate relationship to the majority of structures within the compound. While function cannot be inferred from integration values standing alone, if the majority of structures within Classic Hohokam walled compounds demonstrate similar patterns of restricted spatial access, then one may presume that they had similar functions. Buildings with few interconnecting doorways would have provided both privacy and a sense of “defensible space” (Merry, 1987), whereas the plazas and the Casa Grande were more open, accessible, and integrating “public-encounter spaces.” If increased privacy was a significant domestic concern among Classic Hohokam groups (Crown and Fish, 1996), it is clearly manifested in the architectural arrangements within Clan House 1 and Compound A. Previous research has suggested that walled compound enclosures probably represent a fundamental form of residential grouping (Crown, 1991; Gregory, 1991; Wilcox and Shenk, 1977; Wilcox and Sternberg, 1981), in which case, most of the built elements within Compound A appear were probably residential. Precisely who lived in these structures is an open question, and it is one for which space syntax analysis has no immediate answer.



## 6    Discussion

This article strengthens some long-held assumptions: namely, that the Casa Grande was designed around a number of well-integrated spaces and that the single fourth-floor space was a unique space in a unique building. Although space syntax analysis cannot shine any unequivocal light on specific room functions, it reveals how much redundant accessibility was planned into the Casa Grande. Several functional explanations have been suggested for the Casa Grande, but the weight of space syntax analysis, when combined with the building's unique design, construction, and astronomical associations, tips the scale in favor of religious or ceremonial power. The relatively low integration values associated with the Casa Grande, when compared with the higher values for Clan House 1 and the Compound A buildings, suggest a spatial format for the management of special knowledge. In other words, an overt ideological framework was explicitly incorporated into the architecture of the Casa Grande (Markus, 1993:208).

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In a recent article, Crown and Fish (1996:806), argue persuasively that the transition from the Preclassic to the Hohokam Classic period was characterized by increasing architectural segregation coupled with increased social complexity. Compound enclosures could certainly provide a degree of privacy during a period in which residential populations were more ethnically diverse and living in larger aggregates (Crown and Fish, 1996:806). Although Crown and Fish have focused upon the spatial manifestations of gender segregation, their observations are supported by the integration values derived from the spatially segregated structures of Clan House 1 and Compound A. The relative paucity of internal doorways within those buildings limits the potential options for movement and communication, and even the presence of additional rooftop hatchways would not seriously disrupt the sense of privacy associated with most rooms. If gender segregation was a goal of Classic Hohokam society, their architectural arrangements certainly provided a means to that end.

Crown and Fish (1996:807), also challenge the notion that Classic period mound compounds were primarily ceremonial rather than residential. In some ways, religious and ceremonial architecture can provide more, not less, accessibility than domestic architecture, as such structures often include undifferentiated open spaces in which the populace can see or participate in a variety of activities (Hillier and Hanson, 1984:182; Oliver, 1997:720). Many ceremonial buildings, such as Pueblo kivas, have social restrictions regarding use and entry that are not always architecturally evident, but the internal arrangements of these special places are typically not as segregated as the architectural patterns that characterize Classic compound enclosures (Foster et al., 1996). In light of previous research revealing that Classic Hohokam walled compounds contained domestic structures (Gregory, 1991:167), the assignment of domestic functions to the majority of built units, including Clan House 1 and those within Compound A, is both logical and justifiable. Unfortunately, the relationship of the presumed domestic, residential buildings to the Casa Grande is not known, and remains an area for additional investigation.

Recent research in connection with the Pueblo Grande community may help to resolve lingering questions about the overall place of the big house within the Casa Grande community. In discussing the sociopolitical orientation of Pueblo Grande, it

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has been surmised that the community was based upon two power centers - a platform mound area and a big house (Foster et al., 1996:42). This view challenges previous views that stressed the concentric orientation of Classic Hohokam communities around platform mounds.

The Casa Grande community may have had a similar dual orientation, with the Casa Grande serving as the focal point within Compound A and the platform mounds doing the same in Compound B. Although the major community-scale architectural elements (compounds, ballcourt, individual buildings, etc.) appear to surround a central plaza-type area, the community is architecturally defined by the dominant structures within Compounds A and B. If the platform mounds were occupied by power-holding elites living in walled compounds, and the Casa Grande was a premier example of religious architecture, then at least some Classic Hohokam communities may have been structured around the dichotomy of secular versus clerical authority, or between different realms of power, such as the celestial (the Casa Grande) and the terrestrial (platform mounds) (Zhu, 1994). One intriguing possibility is that power was shared in some undetermined manner between those responsible for predicting and providing water, in the form of rain, and those responsible for managing and allocating it among irrigation canal users (Wilcox and Sternberg, 1981:37).

### 7 Conclusion

In spite of all that has been written, archaeologists still know very little about the ideas held by the people who designed, built, and used the Casa Grande. The specific cultural exigencies served by the arrangement of walls and openings remain tantalizingly out of reach. Space syntax analysis puts a number on the “uniqueness” of the Casa Grande, and offers potential explanations as to how it might have functioned within a cultural system that was well along the road to social inequality. Standing alone, space syntax analysis will not answer every question about social and spatial relationships, but if used in conjunction with traditional archaeological techniques, it can help to develop, test, and in some cases, revise, existing hypotheses. To paraphrase a comment made by Moore in his recent book, *Architecture and Power in the Ancient Andes*, in the absence of informants to tell us the meaning of prehistoric architecture, we can still examine how buildings can create meaning, even if we do not know the precise meanings.

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