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Architecture in Archaeology: An Examination of Domestic Space in Bronze Age Mesopotamia

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1. Introduction

Built structures have always attracted interest, but just as the study of archaeology has changed drastically over its history, so has the study of architecture within the field. The first surveys of architecture focused on the monumental building achievements of cultures such as the ancient Maya and Egyptians. Concentrating on remarkable features along the lines of V. Gordon Childe's characteristics of civilizations, large structural works were specifically sought after. Many archaeological expeditions over the centuries have focused on these large structures. Yet, as archaeology has developed, interest has shifted in many areas from the extraordinary to the everyday (Steadman 1996: 53). Recent studies in architecture have begun to focus on domestic settings in order to better understand the day to day lives of the common citizen (Sanders 1990, Fisher 2009). The 'built environment,' or the way humans manipulate their surroundings and create structures, concerns both of these domains. The examination and study of private household buildings, when combined with established knowledge of elite, political, and religious spheres of society, supplies archaeologists with a more versatile, well-rounded perspective.

Architecture is often a canvas for changes with a society or culture. Social, economic, or political shifts within populations materialize as modifications in the built environment. As Hiller and Hanson (1984: 27) assert:

> The most far-reaching changes in the evolution of societies have usually involved or led to profound shifts in spatial form and in the relation of society to its spatial milieu; these shifts appear to be not so much a by-product of the social changes, but an intrinsic part of them and even to some extent causative of them.

The frequent correlation between major changes in society and those found in architecture demonstrate that these links are not merely coincidences. One example is the shift from round to rectilinear homes, which is connected to changes in intensification and family dynamic. As production was controlled increasingly by families, the household became the main economic

unit of a village. Storage became personal and selective, as seen in rectilinear houses. This indicated a major change from more egalitarian villages where resources were shared, to a hierarchical society were social stratification was prevalent (Flannery 1972: 48–9).

Research of architecture in archaeology has not had a direct, well-defined history nor a singular academic pursuit (Vila, Rotea and Borrazás 2003: 2, 10). In fact, it could be argued that the discipline has only recently begun to take shape. Architecture has always had its place in archaeological studies of the past. Archaeologists and historians in the early 1900s knew that architecture was an important part of culture, but did not attempt to speculate on the relationship between the two (Saile 197: 157). Now in the past few decades, the 'built environment' is being examined on its own. Instead of being listed and categorized as an artifact, perhaps useful for dating or as artwork, structures are inspiring new theory and methodology with which to study them. Authors such as Sharon Steadman (1996) and Susan Kent (1990a) have sought to organize the tangled past and theory of architecture.

The study of architecture within Mesopotamian archaeology focused on monumental, elite structures of urban centers for 150 years. Only recently have studies of domestic buildings begun to be carried out and new methods of analysis are continuously being applied to sites previously excavated (Steadman 1996: 53). This study will focus on spatial methods, such as access analysis and visibility patterns. Using these techniques and data collected from the Early and Middle Bronze Age, the following questions will be addressed:

1. Does the spatial patterning of Mesopotamia support the theory of extended families living in the same household? And, do the spatial relationships between rooms suggest a hierarchical multifamily structure? In order to accommodate several families, a house would have to be a significant size and contain several living

quarters. Living rooms may be determined by their position located off of main hubs, such as courtyards, and by a reasonable amount of privacy. Stratification of family authority is also anticipated to be reflected through placement and privacy. Noticeable differences livings rooms' in size, control on other spaces, and amount of isolation could indicate that a family hierarchy was present and replicated within these structures.

2. What does the structure of the household relate about privacy beliefs within Bronze Age Mesopotamia? Privacy will appear in architectural structure as a variation of depth and the amount of access to a space. Deeper systems require moving further into a house in order to reach certain rooms. Privacy may also be shadowed in the amount of integration into the household a visitor would have experienced. It is expected that examining the distance of the front doorway from the main center of the house will offer insight, as well as studying the amount of space that is visible to a guest.
3. What changes in structure can be witnessed in homes through the Early and Middle Bronze Age?

2. Background

Mesopotamian Archaeology

One of the defining shifts studied in Mesopotamian archaeology is the development of cities. In southern Mesopotamia, cities developed and were controlling social and economic organization by 3500 BCE (Stone 1995: 236). The creation of these large centers is attributed to the rise of temples as sources of religious and administrative power. They controlled all aspects

of society: “writing, government, judicial system, fine art and architecture” (Stone 1995: 236). As these cities grew, so did their trading networks, which allowed for an increasing variety of imported goods and wealth, and also facilitated the spread of Mesopotamian culture.

Around 2800 BCE, cities began to compete as they started encroaching on one another’s territory. Struggles in the hinterland of these centers incited many rural inhabitants to move into the continuously growing cities, causing significant increases in their populations. Disputes also caused cities to increase fortifications; therefore around this time period, large construction projects such as fortifying walls were undertaken. Stone (1995: 236) also attributes the appearance of war to the development of the palace and a new domain of leadership. The palace, and the group of elites that controlled it, became the administrators of the political and military spheres, though the temple continued to exert control over religion, economy, and the palace as well.

Both archaeological research and records show that elites and ‘commoners’ lived next to one another in residential areas of the cities, however the stratification between to the two groups is obvious. The hierarchy created by the temple and palace systems was pervasive and structured. Citizens connected to the political or religious spheres were considered superior; their homes and institutions, like the palace itself, demonstrated their wealth and prominence (Stone 1995: 241). Among the residential structures were workshops, demonstrating the variation of occupations, such as working with ceramics, metal, or stone (Stone 1995: 242).

By the Old Babylonian Period, around 1900 BCE, the nature and amount of control the temple wielded began to change. Though temples appeared to continue growing in size, the palace seemed to grow as an authority (Robertson 1995: 451). Both powers maintained the

possession of large areas of property, which were often worked on by citizens on behalf of the authority. Land was also loaned to those in need or to private businesses (Robertson 1995: 452).

As cities became more integrated and stratified, ties of blood and clan became less influential than ties to the community. Since inhabitants considered themselves first as residents of these urban centers, political and social loyalty was important (Greengus 1995: 469). The new development of laws, as early as 2100 BCE, was a major factor in allegiance to these authorities (Greengus 1995: 471). However, immediate family and extended-family links remained significant, especially in regard to property and intra-family authority (Greengus 1995: 469, 478).

Unsurprisingly, Mesopotamian archaeology over the past century has focused on the monumental structures attributed to the elite palace and temple population. The draw of these artifacts is understandable; the capacity of influence these authorities possessed and the vestiges of it left behind in the form of substantial works of architecture, art, and organization are impressive. The development of the temple and palace are also responsible for the restructuring of Mesopotamian society into an urban and strictly stratified population. However, study of this group provided a one-sided depiction of Mesopotamian life. Only within the past few years have archaeologists and researchers begun to study non-monumental, domestic buildings and artifacts (Steadman 1996: 53).

Architecture in Archaeology

The study of architecture evolved from earlier studies of settlement archaeology (Steadman 1996: 52). Settlement archaeology investigates communities on a landscape-wide scale and places emphasis on spatial patterns and symbolic arrangement of settlements (Ellis

2000: 551, 554). This broad view and the focus on space and symbolism both found their place later in the study of architecture. Amos Rapoport (1990), writing from an architectural background, has been analyzing connections between the built environment and human behavior for over 25 years. His research has culminated in 'environment-behavior studies' (EBS) which is now a leading feature of archaeological architectural thought (Steadman 1996: 52). Though starting from two different foci, the theories of settlement archaeology and human behavior both have basis in a New Archaeology functionalist approach which concentrates on purpose rather than descriptive characteristics. For some areas, such as settlement archaeology, this involved newer processual practices that used scientific methods, instead of historical ones (Vila, Rotea and Borrazás 2003: 3). For others, like EBS, cues were taken from the post-processional movement and they began to involve social and cultural ideas as well (Vila, Rotea and Borrazás 2003: 4).

The first manifestation of architecture taking a role in archaeology was the development of 'household archaeology,' the merging of settlement archaeology and 'activity area research' (Steadman 1996: 54). This discipline treated the household as the basic socioeconomic unit and focused on the house, and the artifacts found within it, as a reflection of the social and economic structure of the culture or community. Spatial analyses used in settlement archaeology were adopted for more microscale examination of material remains (Steadman 1996: 54). Archaeologists began to use material remains, their spacing, and knowledge of the culture to determine what activities were being performed, where, and by whom. Ethnoarchaeology had been utilizing similar methods to find "the nature of social relations within the domestic unit and other hidden symbolic elements" (Steadman 1996: 55).

Household archaeology's economic focus led to the next advancement in studying structures. Archaeologists looked at how these economic factors shaped the house, the activities that took place there, and changes over time. These ideas were developed in works by Richard Wilk and also Richard Blanton (Steadman 1996: 55, 57). Eventually, other social and symbolic aspects of culture were taken into account as forces influencing the set up of domestic situations, and more specifically the space bounded by them (Vila, Rotea and Borrazás 2003: 4). In the 1980s, Hillier and Hanson (1984) were refining forms of spatial analysis tailored specifically for architecture on a settlement and individually-based level; delving into inter- and intra-structure relationships of space. Finally, structures themselves had become the focus of research, instead of simply the remains found inside of them.

Current discussion within the field concentrates on several new themes and continues to builds on foundational ones. For example, the relationship between human behavior and the built environment, such as Rapoport reasoned, is a popular topic. Semiotics, or how a building nonverbally communicates behavioral cues, is part of such work (Steadman 1996: 66). Other developments question the meaning of space, as demonstrated by Hiller and Hanson's 'space syntax analysis' which examines the relationship of space within a building and other authors' search for characteristics that may be culturally universal (Steadman 1996: 66, 67).

Like any new subject area, investigation in domestic architecture from an archaeological perspective has become increasingly focused and specialized. Due to the integration of method and theory from several fields, it has attracted the attention of many academics from varied disciplines and has an incredibly vast range of applicability and flexibility (Vila, Rotea and Borrazás 2003: 10).

Branches of Investigation

There are several interests that result from approaching architecture from an archaeological viewpoint: 1) the object itself; the structure as an artifact, 2) activity areas within a structure, 3) the specific way in which a building confines space, and 4) the relationship between human behavior and architecture. These are simplified divisions that help to understand the relationship between architecture and archaeology. However, on their own, they do not demonstrate the complexity of this synthesis. In many cases, the boundaries between these interests blend together. Often they complement one another in ways that make it difficult to separate them as separate aims.

Structures as Artifacts

The first category regards a house as an artifact and, as with any other artifact, it can be described and classified in order to understand typology, patterns, and sequence. Detail and decoration are also taken into account to trace trends and motifs in artwork. Vila, Rotea and Borrazás (2003: 2) describe this as a 'historical-cultural' archaeological approach, with its roots in spheres of study such as history and art history. These disciplines focus on identification and systemization of features and variations, in addition to how these aspects change throughout time. The authors remark with regret that this method continues to be widely used in archaeological contexts, through it ignores additional information that may be gained from studying architecture (Vila, Rotea and Borrazás 2003: 3). It is obvious that categorization is a common method in this approach. A more recent method utilized in this ideology is stratigraphic analysis. First used on historical buildings, stratigraphic analysis attempts to chronologically order stages of the building process (Vila, Rotea and Borrazás 2003: 7). A subsidiary theory that

is often found along with more socially-based ideas is 'geographic determinism' which contributes architectural forms to environmental conditions like available materials, landscape, and climate (Vila, Rotea and Borrazás 2003: 2).

Semiotics, or the study of non-verbal symbols, can also be classified within this group as it involves the investigation of surface features. These symbols can express social meaning through elements added to surface, rather than the structures actual form, and is therefore treated the same any other artifact. This is specifically called artifact semiotics and can inform meaning such as status or power by outward appearances (Hillier and Hanson 1984: 8).

Activity Areas

The second element that can be interpreted through architecture is the examination of activity areas or accumulations of material (Kooyman 2006: 424). Using architecture and artifacts found within buildings, household archaeologists investigate who used certain buildings and rooms, for what purpose, and at what time. The main focus of such research is production within the household; a pattern that archaeologists believe can convey a great deal about a settlement's economy as a whole (Steadman 1996: 55). However, several other themes have permeated into household archaeology, such as gender studies, class segregation, and ethnicity (Steadman 1996).

Spatial analyses are an incredibly significant facet of this type of research. Recording the accumulation and spacing of artifacts, such as potsherds, tools, or food remains, provides much of the data for current study. Ethnoarchaeology, which involves studying artifacts and culture of current societies to make parallels with past ones, also provides pertinent background information in many cases (Smith and Schreiber 2005: 201).

Activity areas are also useful for studying boundaries, especially those that are not physically visible. This includes physical boundaries that have not survived into archaeological record, such as screens or curtains which may be more easily moved or more likely to deteriorate, and also, as Kooyman studies, social boundaries which are nonphysical. The flexibility and permeability of boundaries demonstrates the way human activities were structured and can be telling of social rules and classifications that underlie this structure (Kooyman 2006: 425).

Understanding Space

The third understanding of the built environment is to consider it as an entity that binds space. Space has been studied within archaeology separately from the subject of architecture in fields such as settlement and landscape archaeology, but there is much more to space than the simple three dimensional concept (Vila, Rotea and Borrazás 2003: 1). It is also resolutely tied to structure and the designer's environment. As Vila, Rotea and Borrazás (2003: 1) write, a study of architectural space is not complete without taking into account the 'rationality' of the entity that built it. Even the most basic of human interaction has a spatial component as seen through commonly used dichotomies such as inside/outside and near/far (Rotea, Borrazás and Vila 2003: 18).

Recent studies, which have embraced notions of cultural and symbolic anthropology, seek to find the factors that dictate the way space becomes organized. At this time in architectural research, a prevalent approach is that, as built environment is constructed by humans, it is inherently instilled, consciously or unconsciously, with physical representations or manifestations of culture and behavior (Vila, Rotea and Borrazás 2003: 1, 4). However, the part

of culture which is responsible for the formation of architecture and reactions to space is heavily debated (Kent 1990a: 2). As Wilk points out, it seems there are limitless possibilities. Some of the various ideas that have been proposed are: form 1) reflects the psychology of the builder, 2) shows world view, 3) demonstrates status, 4) imitates kin interaction, 5) is based off ideas of privacy or territory, or 6) is a reflection of social relationships (Wilk 1990: 34). It is difficult to find an overarching theory that encompasses all of these thoughts. Wilk (1990: 34) suggests ranking these influences by the amount of affect they have on form, however this requires a subjective judgment. Others, such as Bawden (1990: 153), believe that such universality is not possible and that each culture must be separately studied in its own context. In this case, the most influential factor would, again, be culturally determined; so a hierarchy of stimuli would not have the capacity to contribute to a universal theory. Roderick Lawrence is of the opinion that time must be taken into consideration, as even within one society, influences and behavior can drastically change over time. In this way, attempting to find one factor, or the most significant, is not only futile, but also impossible (Lawrence 1990).

Nevertheless, understanding spatial organization and its use remains one of the most popular developments of archaeological architecture. As Susan Kent notes, one of the first distinctions of space recognized by archaeologists was that of opposites: inner/outer, public/private, and sacred/profane. These classifications are applied to space within homes as cultures assign boundaries to previously unorganized space (Kent 1990a: 2). Lawrence describes these as ‘binary oppositions’ which shadow already existent tensions in activities and culture. They are important and prevalent because they simultaneously maintain spatial, functional, social, and psychological roles. The model of opposites seem only to juxtapose the two entities, but in actuality they also help transition between to the two (Lawrence 1990: 76). The example

Lawrence provides is the western foyer or entrance hall, which provides a conversion space from outdoors to indoors. A different type of spatial identification is found in Betsileo homes of Madagascar where spatial dimensions indicate status. Whether determining the meaning of a room, object, or activity by its placement in a household, these dimensions are: height, such as a second floor, signifies social value, north indicates nobility and seniority, the south is humble and lowly, east is sacred, and west is profane (Kus and Raharijoana 1990: 23). Similar dimensions were found in Swahili coral houses by Donley-Reid (1990: 120).

However, the belief that culture shapes the built environment is not shared by all in the field. Donald Sanders (1990), for instance, believes that seven factors contribute to the form of built environment and culture accounts for only two of them. These factors are grouped into three categories. The first, which includes climate and topography, are fixed natural conditions that can have an incredible influence. Available building materials, economic resources, and the level of technology are grouped into what Sanders labels 'flexible determining factors' because their affect can be varied. The culturally fixed factors, function and cultural practices, are set before construction takes place (Sanders 1990: 44). Sanders (1990: 45) also calls attention to the fact that the culturally fixed factors tend to overpower the influence of the others, but that they are also the hardest to recover from the archaeological record, creating a difficult problem for archaeologists.

Archaeologists attempt to find answers using a variety of methods. Straight-forward analytical methods of mapping plans and looking at the relationships between rooms of a building are common systematic tools. Again we see that, because it is an environment constructed by humans, there is also a perceptual aspect that must be analyzed. The access to the structure and the movement of space within it are features that exist at a visceral level in the

human mind, but which are just as important when studying the experience of space (Rotea, Borrazás and Vila 2003: 23). Placement and visibility at thresholds within in a building communicate cultural and social cues, as do the placement of objects such as stairs or furniture, an area of research which Rapoport discusses extensively (Rotea, Borrazás and Vila 2003: 23). Sanders (1990: 47) focuses on the elements of personal space, territoriality, privacy, and boundaries to begin to understand what cultural conventions are present. Boundaries appear many times in research as important indicators. For instance, Kent (1990b) connects the amount of space segregation with the degree of sociopolitical differentiation.

Proxemics is another important method of interpreting space. The term proxemics was coined by Edward Hall who studied the behaviors and 'distances' of personal space (Sanders 1990: 48). He believed that there are four personal space zones, each with a 'near' and 'far' phase: intimate, personal, social, and public distances (Hall 1966: 109–10). The existence of these zones is culturally universal trait, but the acceptable behavior assigned to each is culturally determined. Though Hall's view of strict zones is often criticized, the idea that proxemic behavior is subconscious and culturally defined is acknowledged. T. Matthew Ciolek synthesized numerous proxemic studies and condensed them into a system of zones, or 'co-presence spaces,' generally assigned to each of the five senses (Sanders 1990: 48). Decreasing in size, these concentric spaces are areas of vision, hearing, smell, reach-with-a-tool, and contact. Though they would take on the appearance of concentric rings in an open area, within the confines of a building, the zones often get controlled and restricted. Ciolek agrees that behavior within these rings is dictated by culture, but also believes that the distances themselves are culturally mediated (Sanders 1990: 48). Interesting dimensions are those of reach-with-a-tool, which is

about 2.7 meters, and the interpersonal zone of 0.9 meters, which indicates the amount of space a person would need to maneuver in a room (Sanders 1990: 59).

Architecture and Behavior

The last category is centered on human behavior in conjunction with architecture and the built environment more generally. Because buildings are constructed by humans and are embedded with social and cultural meaning, the space within them is given a 'new reality' where it plays an active part. Due to this relationship, architecture can also uphold social order and, to some extent, dictate behavior and activity (Vila, Rotea and Borrazás 2003: 4). It is important to note that most in the field no longer accept the theory that architecture and use of space are fully reflexive. Most believe that structures do not create behavior but can suggest, impede, or facilitate certain behaviors (Kent 1990a: 2). Others, such as Linda Donley-Reid (1990), disagree. She finds that the house plays the role of a 'structuring structure;' a building that both depends on social rules for its form and imposes them. She argues that those in power often use house form and the objects within them to compel attitudes and behaviors that are beneficial for them, that keep them in power, and remind others that they are superior (Donley-Reid 1990: 115).

Rapoport's studies have made some of the foremost advancements in the subject (e.g. 1990). He believes architecture is ideally built to support, or encourage, certain behavior. In turn, the form of buildings is a reaction to desirable activities. The degree to which structure is affected by the activity corresponds to how 'tightly' the architecture surrounds it. The more tightly enclosed, the more the activity influences the built environment (Rapoport 1990: 11). When referring to 'activities' in this relationship, Rapoport is really referring to a complex much broader than the activity itself which includes the actual activity, how the activity is performed,

its relationship with other activities (activity systems), and its meaning (Rapoport 1990: 11). For one activity, the other three characteristics can be incredibly varied and therefore account for the large variety of places that exist to facilitate one activity. He also stresses that activity systems are more useful to study than single activities because they provide more information. They also take place in a ‘system of settings,’ or multiple spaces and buildings which cue behavior (Rapoport 1990:12).

There are several ways architecture can prompt certain activity. Rapoport divides these into fixed, semi-fixed, and non-fixed feature elements. Fixed featured elements are those permanently found, such as the building itself, walls, and doorways. Semi-fixed feature elements are movable items, for instance furniture. And, non-fixed elements are other people present and their behavior (Rapoport 1990:13). By moving elements, spaces may become new settings and acquire new sets of behavioral rules. These cues are culturally defined, as are the activities they suggest, so we often do not formally notice but nevertheless know how to follow the signals (Rapoport 1990: 12). Repetition of cues is also highly important as it makes it more likely for inhabitants and visitors to notice and follow them; they ‘routinize’ behavior (Fisher 2009: 443). By our surroundings we know what is appropriate to wear, if we should be quiet, or where to stand. The study of these signals is semiotics, as explained previously, which regards them as a type of non-verbal communication (Sanders 1990: 46–7). As demonstrated, semiotics may not only explain external features, but may also interactively prompt behavior.

Though some of these aims may seem far from the idea of architecture, in reality they are all closely tied both to the built environment, and to one another. Each branch relies on structure as the basis of its investigation and, in several cases, the division between branches becomes blurred. For example, semiotics can be used when trying to understand activity areas or the

connection between behavior and the built environment. A home fulfills several types of needs; it provides physical protection, it allows one to participate in culture, and it satisfies a psychological need, whether it be flaunting social status or feeling safe (Wilk 1990: 34). To understand these necessities, how they change between cultures, and how they are fulfilled one must utilize the branches of architectural archeological study. Each of these four branches of must be employed to bring about the most thorough understanding.

3. Methods

Data Collection

Many excavations in Mesopotamia, especially Southern Mesopotamia, were completed in the early 1900s and often did not pay much attention to areas with domestic structures. This bias narrowed down the number and potentially useable sites significantly. The major excavations of the urban centers Tell Asmar, Nippur, and Ur proved to provide substantial amount of information about domestic sectors (Fig. 1). Within these specific sites, floor plans were examined for how complete they were, how confident the excavators were with the form, and how well the plan seemed to represent the most popular or prevalent structural form. Only site levels from the Early and Middle Bronze Age were considered to limit the range of time period.

Tell Asmar, also known as Eshnunna, is found in the Diyala River basin in modern day Iraq (Fig. 1) (Meyers 1997a: 261). The site was excavated in the 1930s by the Iraq Expedition of the Oriental Institute of the University of Chicago under Henri Frankfort and later in the 1950s by Thorkild Jacobsen with the Diyala Basin Archaeological Project (Meyers 1997a: 262). Research indicates that Tell Asmar experienced a great deal of expansion during the Early Dynastic period (ca. 3000–2350 BCE) and was a main administrative center; the city was

abandoned during the Old Babylonian period (ca. 2000–1595 BCE) (Meyers 1997a: 262). Much of the archaeological surveys focus on the large temples and palaces, however the northwest section of the site was a sizable residential area (Meyers 1997a: 264).Two houses from this area were chosen and are examined over three phases comprised of Early Dynastic II and III using site reports from Delougaz et al. (1967).

Fig. 1. Map of Mesopotamia highlighting the location of Tell Asmar, Nippur, and Ur (adapted from Matthews, April 12 2010).

Nippur, also located in modern day Iraq, was a major urban and religious center well-known for being the location of the temple of Enlil (Fig. 1). Occupation of the area began in the sixth millennium and continued through 800 CE on the main mound (Meyers 199b: 148). By the

end of the Early Bronze Age, the city had grown to 135–150 ha and boasted many large construction projects. Briefly excavated in 1851, excavations resumed under Donald E. McCown in 1948 with the University Museum of the University of Pennsylvania and the Oriental Institute of Chicago (Meyers 1997b:149). Excavations have continued through 1990 with sporadic breaks. In addition to the discovery of impressive temples and a large number of tablets and documents, areas TA and TB of the site were private housing sections (Meyers 1997b: 150). House C, used in this study, is from area TB and dated to the Old Babylonian Period (McCown and Haines 1967).

Ur, or Tell el-Muqayyar, is in southern Mesopotamia and was positioned on a branch of the Euphrates River that no longer exists (Fig. 1). Major excavation began with C. Leonard Woolley, who worked on the site from 1922–1934 with the University Museum of the University of Pennsylvania and the British Museum. The city began in the fifth millennium BCE and had ended by the first (Meyers 1997c: 288). Ur was the capital of the empire Ur III from 2100–2000 BCE, the height of its expansion (Meyers 1997c: 289). Woolley had a preference for focusing on larger, more elaborate structures, however tightly packed residential areas were found in the EM and AH area of the site (Meyers 1997c: 290). The house chosen from this region is House 14 from Isin-Larsa period area AH (ca. 2000–1800 BCE) as described by Woolley and Mallowan (1976).

Analyzing Data: models for interpreting architecture

The study of space, and the way it is organized within domestic sites, is one of the newest subdivisions of architectural research within archaeology. Although the investigation of social and economic organization was first applied to more general, non-domestic settings, it has

slowly been introduced into questions regarding ancient households. These new studies have been conducted around the world, in Africa, the Near East, and Europe (Steadman 1996: 67-8). As these approaches are implemented in more contemporary studies, they become increasingly adapted and reliable, widening their applicability. In many ways, they also fill in gaps in research that other techniques are not able to answer. For instance, one of the most common problems archaeologists face is fragmented material remains, and studying the built environment is no exception. It is not unusual to come across only structural foundations, with little of the building remaining (Fisher 2009: 439). Also, as archaeologists are often studying ancient sites, in many cases historical documentation detailing architecture is nonexistent. In order to analyze these incomplete remains, diagnostic tools that allow the relationship between humans and their architecture to be examined needed to be generated. Studying spatial relationships is one of these methods.

Structures communicate meaning; though the way in which it is conveyed is debated, this basic fact is agreed upon (Kent 1990b). Therefore, even without knowledge of the builder, one can use the built environment to study cultural conventions or behavior (Sanders 1990: 47). The actual structure may be constructed through the work of the builder, but the form is the work of spatial laws that exist beyond the decisions of a single person. So, even without substantial knowledge of a society, one could establish certain properties of the culture through architecture. Hillier and Hanson (1984: 36) thought these laws seemed similar to natural laws, not results of human decision. Hillier and Hanson's work, *The Social Logic of Space* (1984), was one of the first to not only discuss spatial logic, but to develop methods to systematically examine it: "The ordering of space in buildings is really about the ordering of relations between people" (Hillier and Hanson 1984: 2). Built space is not just a 'backdrop' for this interaction, but rather an

important element in the development of behavior (Fisher 2009: 440). However, the philosophy of space that they discuss in their book touches upon much more complex theories and causations. The argument of *The Social Logic of Space* largely centers on Hillier and Hanson's idea of space syntax. This research has been the basis for many other developed techniques as well. The models and methods listed below are those that will be used to examine the data collected.

Space Syntax

In their investigation of space, Hiller and Hanson, in the most general sense, wanted to study what caused variation and similarity in architectural structure. They wanted to account for the fact that within a small region, one with little deviation in climate, topography and technology, great variations could be found in architectural and spatial forms. And, conversely, they wanted to know why analogous forms could be found across large expanses of time and space (Hillier and Hanson 1984: 4). Prior to their work, the best attempt to explain this phenomenon focused on human treatment of territory; the idea that all humans need to claim a certain area as their own or through extension, that groups need to claim territory. This supports the idea that space only has 'social significance' if it is connected to a certain group (Hillier and Hanson 1984: 6). However, they concluded that differences in form could not be explained by a 'constant rule' of territory behavior (Hillier and Hanson 1984: 6). They concluded that in order to achieve a theory of space, it must be explained in its own terms, what they call 'descriptive autonomy.' They further reasoned that architecture can not be explained as merely the result of an outside cause (Hillier and Hanson 1984: 5). The ordering of space by humans is social

behavior, “a form of order…which is created for social purposes” (Hillier and Hanson 1984: 9). All of these ideas and directives needed to fit into their model of space.

Hillier and Hanson proposed a syntax model in order to achieve these goals. Syntaxes, as they describe, are “combinatorial structures which, starting from ideas that may be mathematical, unfold into families of pattern types that provide the artificial world of the discrete system with its internal order as knowables, and the brain with its means of retrieving descriptions of them” (Hillier and Hanson 1984: 48). Two examples are the game of hide and seek and the set up of an army camp. In the hide and seek example, everyone playing knows the rules of the game and understands the qualities to look for in a hiding space. In a way, the model that players hold within their mind is like a genotype; the set rules that define possible outcomes. However, the game looks unique, or is carried out differently, every time it is played in a new location (Hillier and Hanson 1984: 38). Each specific game would parallel the concept of a phenotype. Even though the games all look different, the rules, or genotype, stay the same. The army camp example demonstrates the same idea, except it includes the naming of different entities. Each time an army sets up camp, the exact formation of the tents and structures changes with the landscape. Yet, the relationships between specifically identified entities stays the same because these are spatial connections that must be acknowledged and adhered to whenever the camp is established (Hillier and Hanson 1984: 39). The plan or model mapped in the brain is knowable, as described by the syntax model. Describing the model through language or mathematics gets you to the syntax and the underlying principles that dictate spatial life.

The army camp example introduces the idea of the universal term, category, and ‘transpatiality.’ The ‘specific identities’ in the army camp example can also be understood as a universal term, because they are a class of objects that are identified as being similar to one

another disregarding their location. For instance, in any camp, one could locate and identify the general's tent by its placement in regard to other entities. This identification is a category, which is made possible by transpatial integration, "the summation of objects into composite entities without regard for spatio-temporal indicability or location" (Hillier and Hanson 40).

As Hillier and Hanson outline, a syntax model must achieve four things: 1) find the objects that can not be further reduced, the 'elementary structures', 2) represent these in a type of notation to avoid wordy verbal explanations, 3) demonstrate how the structures relate to one another to make a system, and 4) illustrate how they are combined to create complex structures (Hillier and Hanson 1984: 52). The authors first work this system out for the broader context of settlement space, then move on to the question of interior space. It is wrong to assume that interior space is simply settlement space scaled down. The difference between the two contexts is that of boundary. Whereas settlement space is dictated by spatial relationships outside of boundaries, interior space is cut up by them. It is characterized by discontinuous space, plots that must be encounter individually. This quality, however, makes it a transpatial system (Hillier and Hanson 1984:144). Boundary also presents the notion of inside versus outside, dominated by either social or spatial solidarity. Social solidarity refers to the local reproduction of a global structure. It is marked by 'analogy and isolation' because it is emphasizes the similarities in objects that are located separate from one another. The more complex the structure is, the more it will be followed and the stronger the solidarity. On the other hand, spatial solidarity stresses continuity and movement across boundaries. Therefore, one theory upholds boundaries, while the other undermines them (Hiller and Hanson 1984: 145). Nevertheless, both are required to explain the nature of boundary and how it affects those who encounter it, both inhabitants and visitors (Hillier and Hanson 1984: 146).

Access Analysis

To illustrate these theories in notated way, as a syntax is intended to provide, Hillier and Hanson translated them into more mathematical and abstract logic, commonly known as access analysis (Fisher 2009: 440). Manipulating their method 'alpha-analysis' created for the larger context of settlement space, they came up with a mapping system and equations that demonstrate the permeability and control of interior space, called gamma-analysis. The foundation of this analysis is the basic cell which represents a bounded space and which is accessed from outside. The cells often denote rooms of a building, although Fisher (1990) prefers to attribute them to 'convex' spaces, or the fewest and squarest areas. He believes these most realistically represent the movement between spaces, especially complex ones (Fisher 2009:440). A closed cell is a room with only one access point (Fig. 2a) and an open cell has more than one (Fig. 2c). These can also be represented by a circle with access indicated by a line connecting it (Fig. 2 b and d). Space outside the building, also referred to as the 'carrier,' is represented by a circle with a cross (Hillier and Hanson 1984: 147–8). It is always treated as a single point even though it represents the entirety of the exterior environment (Fisher 2009: 440).

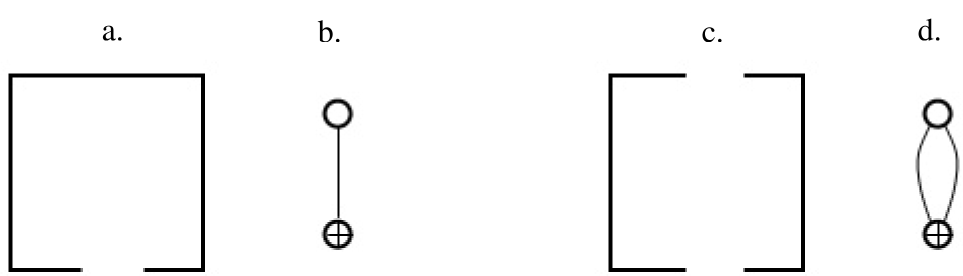

Fig. 2. a) and b) representations of a closed cell, c) and d) representations of an open cell (Hillier and Hanson 1984: 147).

Two dominant characteristics are represented by and investigated through the linking of these cells: symmetry and distributedness. Symmetric cells follow the pattern of 'A is to B' as 'B is to A' with respect to space C (Fig. 3a), so that neither cell controls permeability to the other. In an asymmetric design, one cell controls access to another from space C (Fig. 3b). Distributedness involves the amount of movement through a cell. A distributed system features more than one route from A to B, including going through space C (Fig. 3a), while in a nondistributed system any route from A to B must go through C (Fig. 3b) (Hillier and Hanson 1984: 148).

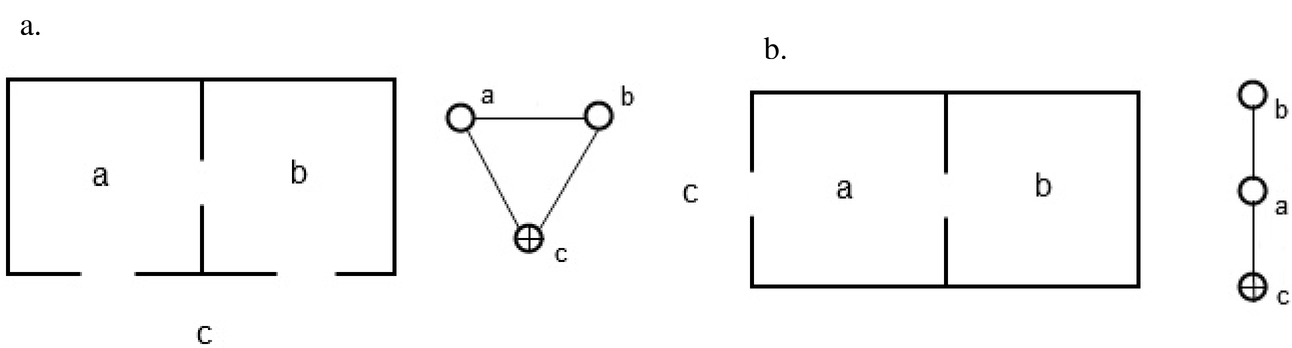

Fig. 3. a) symmetric and distributed system with respect to space C, b) asymmetric and nondistributed system with respect to space C (Hillier and Hanson 1984: 148).

Justified gamma maps plot the relationships of bounded rooms using the point-line system discussed above to represent spaces and permeabilities. Spaces that have the same depth value, or that take the same number of boundary crossings to arrive at, are lined up horizontally above the carrier with access routes drawn in. These maps have the ability to show variations of symmetry and distribution within a system very quickly (Hillier and Hanson 1984: 149). For example, maps that are 'deep' or extended are indicative of an organization that is asymmetric, while a 'shallow' plot portrays the opposite (Hillier and Hanson 1984: 149). Changing the placement of access points or doorways between rooms, without altering the position of the

spaces themselves, greatly modifies the symmetrical and distributedness properties of the entire structural complex. These characteristics are entirely reliant upon the permeability of the interior space (Hillier and Hanson 1984: 150).

Relative Asymmetry

A mathematical approach to examining permeability or integration is Hillier and Hanson's 'relative asymmetry' (RA) value (Hillier and Hanson 1984: 153). The degree to which any point or room is integrated into the rest of a building can be calculated by the following equation:

$$RA = \frac{2(MD-1)}{k-2}$$

'MD' stands for mean depth which is computed by adding the depth values, or number of spaces away from the original point, and dividing that by the number of spaces, not including the original point. The variable 'k' is the number of spaces in a structure, including the carrier (Hillier and Hanson 1984: 108). This equation provides a number between 0 and 1. Values closer to 0 denote a space from which the rest of the structure is shallow, meaning it is well integrated. Higher values signify that the space or room is more segregated from the rest (Hillier and Hanson 1984: 109). As Fisher (2009: 442) points out, as systems gain spaces their relative asymmetry values get lower. In order to compare houses of different sizes, one can calculate real relative asymmetry (RRA) by dividing the RA by its D-value, a previously computed number (Hillier and Hanson 1984: 112, Table 3). RRA values have a greater range; therefore values around 0.4–0.6 are integrated, while those around 1 and above are segregated (Hillier and

Hanson 1984: 113). Fig. 4a shows a justified gamma map for House X; Fig. 4b displays the map manipulated to show relationships from the point of view of space Z. To find the relative asymmetry value for space z, one adds the depth values (1+2+3+3) and divides by the number of spaces (4) to get a mean depth of 2.25. The value of k for this system is 5. Substituting these numbers into the equation gives a relative asymmetry value of 0.8333.

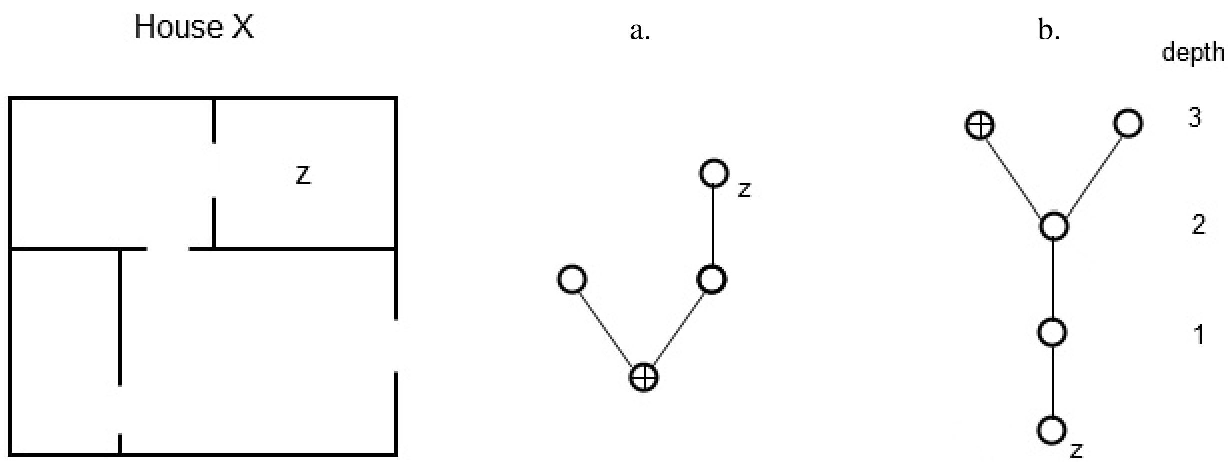

Fig. 4. House X. a) justified gamma map of House X, b) justified gamma map of House X with respect to space Z, demonstrating depth of each room.

Control Values

Fisher also implements Hillier and Hanson's measure of control for settlement movement, but modifies in specifically for interior space. The control value (CV) of a space is the amount of influence it has over neighboring spaces (Fisher 2009: 441). While RA or RRA demonstrate patterns of accessibility or interaction, the control value indicates which space may be the centers of such interaction (Fisher 2009: 446). Measure of control is calculated in the following way: each space is allocated a value of one which is divided between the neighboring spaces with which it is directly linked. These received quantities are added up for each space;

this constitutes its control value (Hillier and Hanson 1984: 109). Hillier and Hanson break up these values into two categories, above or below 1, but Fisher finds it more useful to sort them into three. Values of 1 or less he classifies as 'low,' meaning the spaces are subject to neighboring control more than influencing others themselves. Numerals between 1 and 2 are 'medium' and greater than 2 are 'high' (Fisher 2009: 446).

Using control and relative asymmetry values, Fisher also catalogs different types of contact spaces: gatherings, public-inclusive occasions, and private-exclusive occasions (Fisher 2009: 447). Gatherings are informal, transient interactions which syntactically manifest in spaces that have low RRA values and a medium to high control value because these characteristics promote accessibility and movement. They are also called 'movement spaces' as they transfer people to different parts of a structure and can take on the form of narrow hallways. Occasions are more official, prolonged events that take place around a 'node,' which is the center of activity. Public-inclusive occasions are larger assemblies that visitors are invited to join. These spaces tend to have a medium to high control value and low RRA, but are also expected to be larger cells that are shallowly-placed in the system with regard to the carrier (Fisher 2009: 447). Private-exclusive occasions are those which are more secluded and selective, and therefore have a low control value and medium to high RRA (Fisher 2009: 448).

It is somewhat apparent through the brief mention of Fisher's use of room size, that access analysis can be combined with other types of examination to provide greater detail. Fisher calls his method an integrative approach that includes techniques from access analysis, but also the examination of function and symbolic meaning. He studies these by looking at physical characteristics such as the size and shape of spaces, the construction of walls and details of doorways. Nonverbal communication methods such as attempting to understand the purpose of

fixed feature and semi-fixed feature elements are employed. Fisher (2009) also integrates visibility techniques and proxemics.

Relative Ringiness

'Relative ringiness' (RR) is the corresponding method for observing distrutedness-nondistributedness (Hillier and Hanson 1984:153). The more ringiness a complex has, the more the spaces within it can influence one another; it sets up a system of control (Hillier and Hanson 1984: 162). The least number of lines needed to connect x points of a system is x – 1. This set up would also provide a linear system, one without rings (Hillier and Hanson 1984: 153). Therefore, as the number of lines in system grows, so do the number of rings that can be found. Since rings imply an increased number of points with multiple accesses, increasing the ringiness of a complex adds to the distributedness of the entire system and also to the specific points included in the rings (Hillier and Hanson 1984: 154). Although there is a mathematical equation for investigating ringiness, this study will just investigate it graphically using the justified gamma maps. Observing the ringiness through illustration can illustrate pathways of movement. The number of rings and the number of rooms included on each can provide another way of comparing structures. If the functions of spaces are known, observing where or which functions are placed on a ring can impart information, as well.

How Space Syntax is Used

The 'syntactic dimensions' symmetry/asymmetry and distributedness/nondistributedness are much like genotypic building blocks for mapping relationships within a structure. Different combinations and patterns of these characteristics can reveal interaction between the inhabitants

of the building and between inhabitants and visitors. Changes in these relationships result in changes in structural form (Hillier and Hanson 1984: 155). A noticeable example of such a shift can be found in English domestic space as the front parlor became less popular. In many ways, the parlor was the best room of the house, with superior location, furniture, and decoration. However, it was only used during special occasions or when receiving a visitor (Hillier and Hanson 1984: 158). From a syntactic point of view, the room had high asymmetry and was the only important room that was not on a ring, so that even examining the space mathematically showed its segregation from the rest of the house. These properties indicate that it is a transpatial space; one meant to "articulate relations across greater distances, both spatial and social" (Hillier and Hanson 1984: 159). The parlor was a transitional space as well; a buffer between the outside world and that of the interior space. On the other hand, the living room of a modern home is a hub of interaction. It often has the lowest asymmetry value, signifying that it is highly integrated, and it can frequently be found on the center of a ring with relation to the carrier. Many of the routes through the building will go through the living room. It is clear that it is an important center in the household. It enforces spatial solidarity or, as discussed above, movement through spaces, making it the space where interaction between residents and between residents and their guests takes place (Hillier and Hanson 1984: 159). The contact patterns between inhabitants and guests that are associated with the front parlor and the living room are unmistakably different. The spatial changes reflect a modification in acceptable forms of interaction. The boundary between everyday life and visiting became much more flexible. Daily activities extended into previously 'best' space and guests were accepted into more personal space of the household. This 'merging of use' is shadowed in the overall lowering of asymmetry values for the complex (Hillier and Hanson 1984: 160).

The general principles that Hillier and Hanson follow, that of a genotype-phenotype theory based on abstract rules, loosely resemble the standards of the structuralist method. This method aims to demonstrate that foundations of social behavior are not found in the individual, but in society and its forms. The syntax model parallels this idea by insisting that social organization has its own laws outside of human agency which can impact society; meaning it is not simply based on the way humans choose to compose themselves (Hillier and Hanson 1984: 199). However, structuralism fails because the nature of a 'rule' says that it dictates an outcome or comes before the 'event' it governs. This implies that rules of social behavior come before the event of societal organization, when structuralism has already asserted that these rules come from society itself. Hillier and Hanson (1984: 205) seek to fix this problem through the idea of reproduction: "For syntax to appear requires not that the rule precedes the event, but that an initial description is retrieved from spatio-temporal reality and then applied consistently in the succeeding events in the process."

In the 1990s, a large number of studies worldwide applied the theories and methods of spatial syntax. The results from these examinations demonstrated that looking at movement and control through access analysis could be a successful tool, and also showed that influences of social organization, such as power or class, could have an effect on structural design (Fisher 2009: 442). However, there are also several criticisms of spatial syntax; most prevalently that it fails to account for the symbolic or representative details imparted in the built environment (Fisher 2009: 442).

Visibility

Boundaries within a building not only control space but also determine what is visible from different points within the structure. Manipulating access points and organization of space can provide views of open, inviting pathways, or only glimpses of more secluded and private sections of a building. In many ways, constricted visibility can be as restraining as the physical boundaries themselves (Fisher 2009: 448). Sight perception is researched by investigating isovists: "Isovists are defined as the set of all points visible from a particular vantage point in space" (Fisher 2009: 449). Replicating 'isovists' or sightlines two-dimensionally within a structure can suggest what may have been visible from points with a building (Fig. 5a). Expanding upon this idea, archaeologists also look at 'isovist fields,' which are the points viewable from an entire space (Fig. 5b). Lastly, researchers look at 'viewsheds' which are the points that would be viewable to a person facing or traveling in a certain direction within a structure (Fig. 5c) (Fisher 2009: 450).

Viewsheds may be the most applicable as they approach the situation from the mind of those who would be interacting in the built environment under question. They are implemented by representing the sightlines as a polygon overlaid on the structure's floor plan. To account for 'human binocular vision,' an angle of 100˚ is positioned on either side of the axis directly forward from the viewer, to create a 200˚ polygon. To illustrate more detailed vision, 5˚ is added to either side of the axis to make a polygon of 10˚ (Fig. 5c) (Fisher 2009: 450).

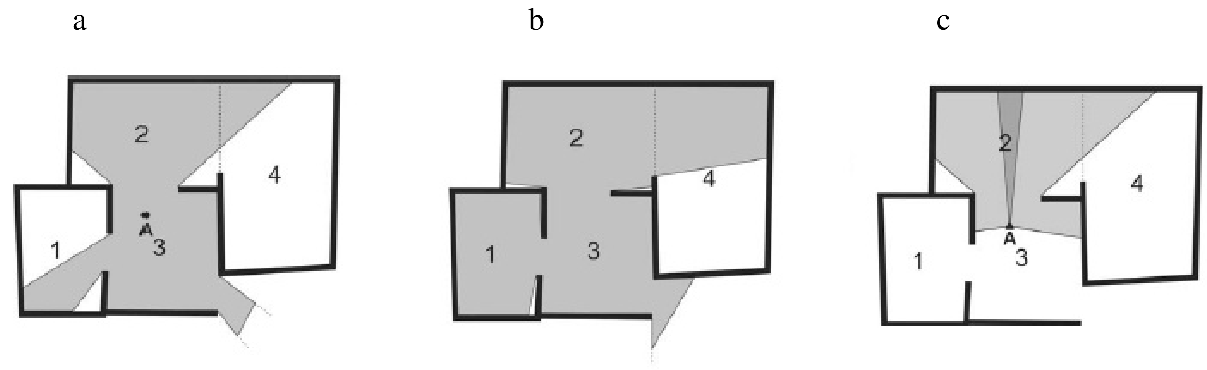

Fig. 5. a) isovist, b) isovists field, c) viewshed (taken from Fisher 2009: 445).

The techniques that will be used in this study are the syntax techniques of access analysis, real relative asymmetry, control values, and ringiness, as well as visibility viewsheds.

4. Results

The following section investigates floor plans from the sites Tell Asmar, Nippur, and Ur. Results of each analysis are featured first, succeeded by the interpretation of the findings. Results are discussed in the context of southern Mesopotamia and of the discipline of architecture in archaeology as a whole.

Tell Asmar: House I and II

House I

The structural changes made to House I at Tell Asmar between Strata Vc and Va are slight, but generate interesting transforms in the spatial relationships of the building (Fig. 6). Stratum Vc is correlated with the Early Dynastic III of the Early Bronze Age (ca. 2600–2350 BCE) and Stratum Vb and Va are attributed to Early Dynastic II (2800–2600 BCE). The real relative asymmetry of the complex slowly lowered over the three phases, though the conversion

was not drastic (Table 1). House I of Stratum Vc had a RRA of 1.31 which drops to 1.14 in Stratum Vb, and down to 0.88 in Stratum Va. This marks a general trend of the rooms within House A becoming more integrated. The decrease in the mean depth from 3.3 in Stratum Vc eventually to 2.45 in Stratum Va shadows this pattern, as well. The boundary between inside and outside the structure also lessens from 2.18 to 1.28, demonstrating that the external world also became more included because the separation between them became less distinct. Stratum Vc had slight ringiness due to the multiple doorways of room G. When one of these was closed in Stratum Vb, the building became completely linear and access to most rooms was controlled by the main room C (Fig. 7). This is mathematically displayed by its low RRA value and high control value. However, in Stratum Va the addition of many new entryways resulted in a highly ringy structure, which is seen in its gamma map (Fig. 7a). Though room C remained a hub, spaces were accessible through other routes.

In Stratum Vc, the view from the front doorway of House I included both the first room, room A, and also some of the succeeding room B, but did not give a glimpse of the main part of the house (Fig. 7a). By Stratum Vb, front access was moved to room D, which moved the visitor, and the outside world, closer to the center of the house. As demonstrated by the justified gamma map of Stratum Vb, the path to enter the actual house shortened (Fig. 7b). By Strata Vb and Va, a person standing at the doorway would have even had slight view of the courtyard, room C (Fig. 7b).

According to Delougaz et al. (1967: 166), room I had a small altar and a storage jar, insinuating that it may have been a domestic temple which would account for its somewhat remote position in the household (Fig. 7). Additionally, a bread oven was found in the vestibule of Stratum Va, room D (Delougaz et al. 1967).

Fig. 6. Tell Asmar. House I and II in a) stratum Vc, b) stratum Vb, c) stratum Va (taken from Henrickson 1982; Fig. 7-9).

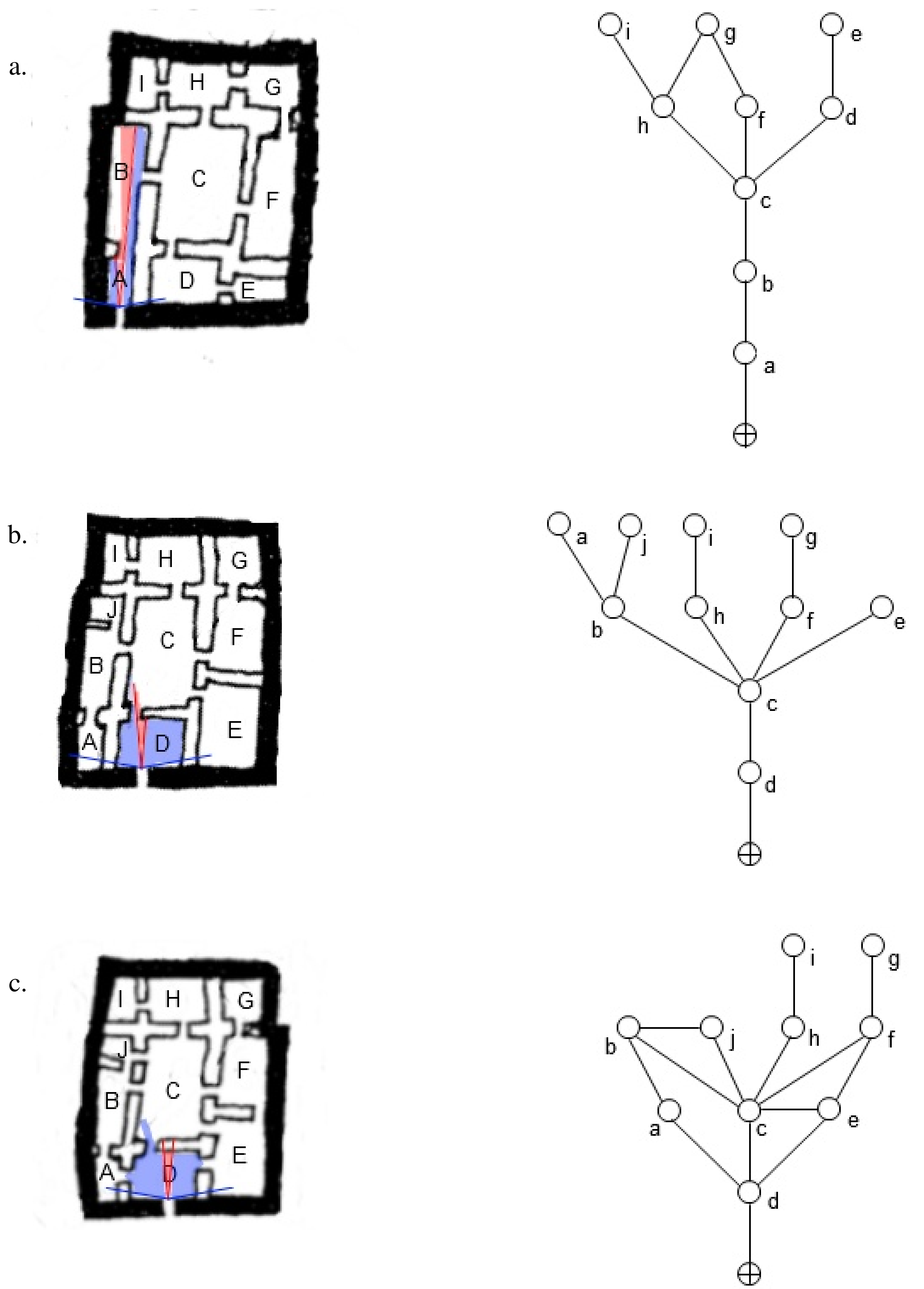

Fig. 7. Tell Asmar. House I. a) Floor map with viewsheds and justified gamma map of stratum Vc, b) Floor map with viewsheds and justified gamma map of stratum Vb, c) Floor map with viewsheds and justified gamma map of stratum Va (floor maps adapted from Henrickson 1981, Fig. 7-9).

Table 1. Mean Depth (MD), Relative Asymmetry (RA), Real Relative Asymmetry (RRA), Control Value (CV) and depth for House I, Tell Asmar.

Stratum Vc

	MD	RA	RRA	CV	depth
◎	33	0.67	2.18	0.5	0
A	25	0.44	1.45	1.5	1
B	19	0.28	0.91	0.75	2
C	15	0.17	0.54	1.83	3
D	21	0.33	1.09	1.25	4
E	29	0.56	1.82	0.5	5
F	21	0.33	1.09	0.75	4
G	25	0.44	1.45	0.83	5
H	19	0.28	0.91	1.75	4
I	27	0.5	1.63	0.33	5
mean	23.4	0.4	1.31	0.99	3.3

Stratrum Vb

	MD	RA	RRA	CV	depth
◎	31	0.47	1.58	0.5	0
A	29	0.42	1.43	0.33	4
B	20	0.22	0.75	2.2	3
C	15	0.11	0.38	2.83	2
D	22	0.27	0.91	1.2	1
E	24	0.31	1.05	0.2	3
F	22	0.27	0.90	1.2	3
G	31	0.47	1.58	0.5	4
H	22	0.27	0.90	1.2	3
I	31	0.47	1.58	0.5	4
J	29	0.42	1.43	0.33	4
mean	25.09	0.34	1.14	0.99	2.82

Stratrum Va

	MD	RA	RRA	CV	depth
◎	27	0.378	1.28	0.25	0
A	20	0.22	0.75	0.58	2
B	20	0.22	0.75	1.17	3
C	14	0.09	0.3	2.32	2
D	18	0.18	0.6	2	1
E	18	0.18	0.6	0.83	2
F	20	0.22	0.75	1.5	3
G	29	0.42	1.43	0.33	4
H	21	0.24	0.83	1.17	3
I	30	0.44	1.51	0.5	4
J	21	0.24	0.83	0.5	3
mean	21.64	0.26	0.88	1.01	2.45

House II

Like House I, House II at Tell Asmar experienced small changes throughout the three stages over a couple centuries (Fig. 6). The real relative asymmetry jumped from 1.10 to 1.39 between Stratum Vc and Vb, indicating that the spatial relationships became more a little more segregated (Table 2). The houses mean depth got notably deeper as well, changing from 2.67 to 3.58. This was due to the creation of new rooms acquired from the absorption of a neighboring structure (Fig. 6). However, by the period of Stratum Va, the RRA had dropped back down to 1.22, and the mean depth to 2.75; both similar to the values of the first phase. The outside became only slightly more segregated in Vb, as compared to Stratum Vc (Table 2). And, by Stratum Va, RRA of the carrier had dropped to 1.45, signifying that the house became more accessible to outsiders. It is also notable that the doorway was moved from room A to room B between Stratum Vc and Vb (Fig. 8). Fig. 8a shows that only the first room of the house was viewable in Strarum Vc. Although the doorway moved, nothing more was visible. Nevertheless, the entryway was moved closer to the courtyard and also had to access points other than the front door, adding to the general integration of the structure.

Similar to the findings from House I, the courtyard of House II, room D, controlled much of the movement within the household, as observed in the justified gamma maps (Fig. 8) and the high control value, ranging from 2.58 to 3.83 (Table 2). The control values of room D are significantly higher than all other rooms, regardless of which stratum is observed. The plans of Stratum Vc and Vb are mostly linear, through by Stratum Va, a main ring had been formed through the rooms A, B, D, G, and H, implying this may have been an important route through the house, especially since it includes the courtyard and entryway (Fig. 8c). Several rooms

remained fairly isolated such as room I and J, but by Stratum Va, admission to these was no longer controlled by room G.

During Stratum Vc, room C was used as kitchen, as marked by a large oven that occupied most of the room, and the vestibule had ovens as well (Delougaz 1967: 155). When the front entrance was moved, room B and C were combined into one space and the kitchen was probably moved to room E, where another oven was found. Delougaz et al. (1967: 159) believe rooms G and K may have been storage rooms and that H, I, and J were living areas.

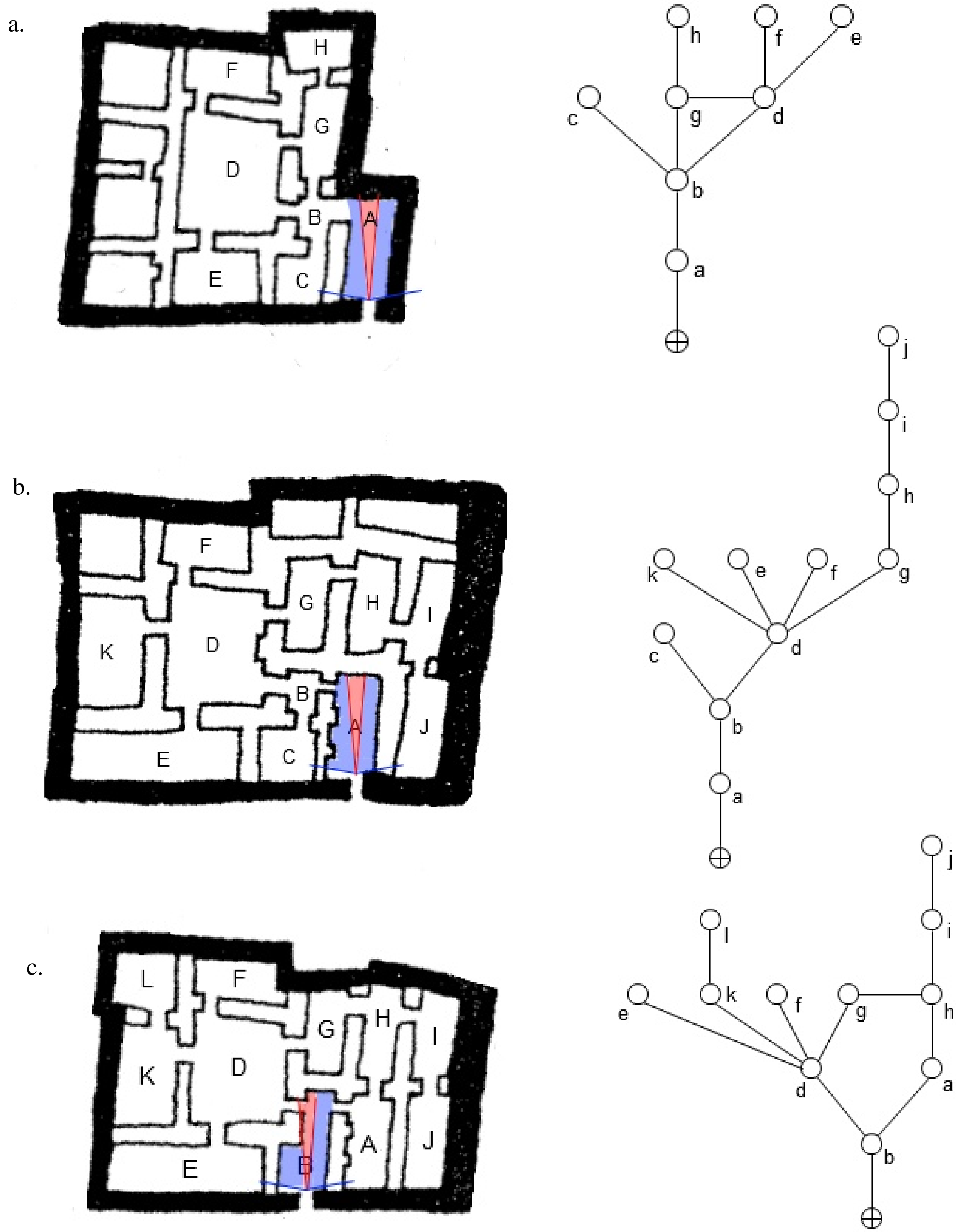

Fig. 8. Tell Asmar. House II. a) Floor map with viewsheds and justified gamma map of stratum Vc, b) Floor map with viewsheds and justified gamma map of stratum Vb, c) Floor map with viewsheds and justified gamma map of stratum Va (floor maps adapted from Henrickson 1981, Fig. 7-9).

Table 2. Mean Depth (MD), Relative Asymmetry (RA), Real Relative Asymmetry (RRA), Control Value (CV) and depth for House II, Tell Asmar.

Stratum Vc

	MD	RA	RRA	CV	depth
◎	24	0.57	1.8	0.5	0
A	17	0.32	1.01	1.3	1
B	12	0.14	0.45	2.08	2
C	19	0.39	1.24	0.25	3
D	13	0.18	0.56	2.58	3
E	20	0.43	1.35	0.25	4
F	20	0.43	1.35	0.25	4
G	14	0.21	0.68	1.5	3
H	21	0.46	1.46	0.33	4
mean	17.78	0.35	1.1	1	2.67

Stratum Vb

	MD	RA	RRA	CV	depth
◎	43	0.58	2.04	0.5	0
A	33	0.4	1.4	1.33	1
B	25	0.25	0.89	1.7	2
C	35	0.44	1.53	0.33	3
D	21	0.18	0.64	3.83	3
E	31	0.36	1.28	0.2	4
F	31	0.36	1.28	0.3	4
G	25	0.25	0.89	0.7	4
H	31	0.36	1.28	1	5
I	39	0.51	1.79	1.5	6
J	49	0.69	2.42	0.5	7
K	31	0.36	1.28	0.2	4
mean	32.83	0.4	1.39	1.01	3.58

Stratum Va

	MD	RA	RRA	CV	depth
◎	33	0.4	1.45	0.33	0
A	26	0.27	0.99	0.66	2
B	23	0.22	0.79	1.7	1
D	20	0.16	0.59	3.3	2
E	30	0.35	1.25	0.2	3
F	30	0.35	1.26	0.2	3
G	23	0.22	0.79	0.5	3
H	25	0.25	0.92	1.5	3
I	33	0.4	1.45	1.33	4
J	43	0.58	2.11	0.5	5
K	30	0.35	1.25	1.2	3
L	38	0.49	1.78	0.5	4
mean	29.5	0.34	1.22	0.99	2.75

Nippur: House C

House C Nippur, dated to the Old Babylonian Period (ca. 2000–1595 BCE), is an interesting model in that it has two courtyards, rooms C and G (Fig. 9). The real relative asymmetry of the system is 1.27, showing that the pattern was not particularly integrated or segregated (Table 3). The structure was evenly integrated as well, as demonstrated by the small range of RRA values for individual rooms. The exception to this precedent is the carrier, which has a RRA value of 1.9. This is notable characteristic considering the front doorway is positioned relatively close to the front courtyard, room C (Fig. 10). However, the appearance of the second courtyard towards the back of the house, room G, reduces the importance and influence of room C. Mathematically, this relationship is reflected in the control values of the respective rooms. Though the real relative asymmetry values are the same, room C has a control value of 0.99 whereas room G is 2.83 (Table 3). This affects the significance of the viewshed when standing at the front access, as well (Fig. 10). A visitor at the door would be able to see into the front courtyard partially, but room C is not the core of the household as seen in other models.

The mean depth of the building is significantly high at 3.93 (Table 3). The ringiness of the spatial pattern accounts for this high value. There is only one ring found in the system, but it dominates the overall pattern (Fig. 10). Though this means that most of the spaces in the structure are connected, it also means that there is a strict pathway through the house which one must conform to. Reaching the back courtyard, room G, can only be achieved by passing through a series of other rooms (Fig. 10).

It is worth noting the Elizabeth Stone (1981: 27) found area TB to be dominated by square houses like House C, or those with rooms surrounding a courtyard, whereas area TA mostly had linear house or structures with fewer spaces set in row-like pattern. Therefore both

styles were found in Old Babylonian Nippur. Stone (1981: 29) also predicted that four rooms of House C may have been living rooms: rooms D, I, F, and M (Fig. 10).

Fig. 9. Nippur, area TB. Field level II. House C denoted (taken from McCown and Haines 1967, Plate 61).

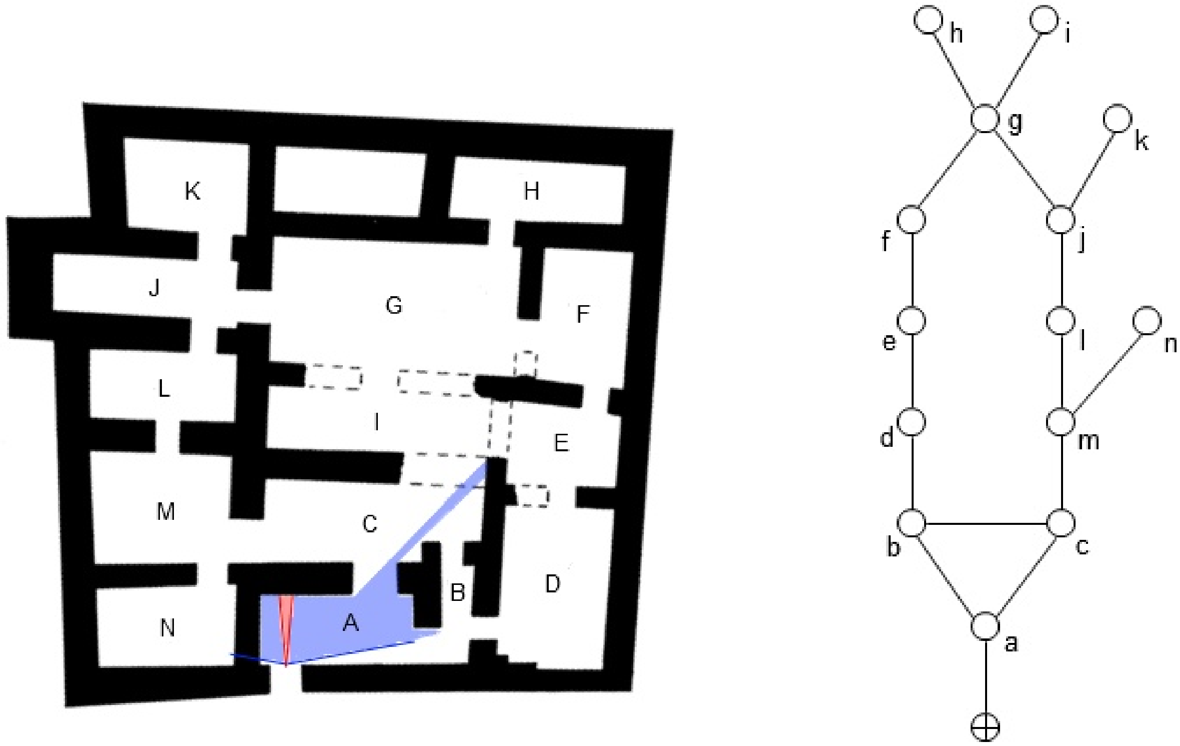

Fig. 10. Nippur, area TA. House C, level II. Floor map with viewsheds and justified gamma map (floor map adapted from Stone 1981: 28).

Table 3. Mean Depth (MD), Relative Asymmetry (RA), Real Relative Asymmetry (RRA), Control Value (CV) and depth for House C, Nippur.

	MD	RA	RRA	CV	depth
◎	59	0.49	1.91	0.33	0
A	46	0.35	1.36	1.66	1
B	41	0. 3	1.15	1.16	2
C	39	0.27	1.06	0.99	2
D	44	0.33	1.27	0.83	3
E	43	0.32	1.23	1	4
F	41	0.3	1.15	0.75	5
G	39	0.27	1.06	2.83	6
H	43	0.32	1.23	0.25	7
I	52	0.42	1.61	0.25	7
J	37	0.25	0.98	1.75	5
K	50	0.4	1.53	0.33	6
L	37	0.25	0.98	0.66	4
M	37	0.25	0.98	1.83	3
N	50	0.4	1.53	0.33	4
mean	43.87	0.33	1.27	0.99	3.93

Ur: #13 Church Lane

House 13 on Church Lane in the AH section of Ur had two courtyards as well (Fig. 11). This structure dated to the Isin-Larsa period (ca. 2000–1800). Prior to this period, part of the house had been removed to make room for a chapel directly to the south (Woolley and Mallowan 1976: 133). The mean real relative asymmetry value was 1.56, which implies segregated organization. The mean depth of the house was also deep, with a value of 3.87. These two characteristics were influenced by the linear branch of rooms K, L, M, N in the northwest corner which consequently had RRA values around 2 (Table 4).

Again, the carrier was fairly segregated, with a RRA of 1.87. As demonstrated by the viewshed, guests could see partially into the front courtyard, room B (Fig. 12). However, unlike House C from Nippur, House 13's front courtyard was integrated, with an RRA of 0.85, and controlled much of the movement through the house as demonstrated by the high control value of 3.33 (Table 4). On the other hand, the second courtyard, room K, was fairly segregated and had a control value of just 0.83. Nevertheless, access to the branch of rooms L, M, N mentioned previously meant passage through room K. The feature can be found through out much of the structure, which has a linear configuration and no ringiness (Fig. 12).

Woolley and Mallowan (1976: 134) postulate that room H was a kitchen. They also interpreted rooms E and F as guest rooms and believed that G and M may have both been chapels.

Fig. 11. Ur, northern section of AH site. House XIII denoted (adapted from Woolley and Mallowan 1976, Plate 124).

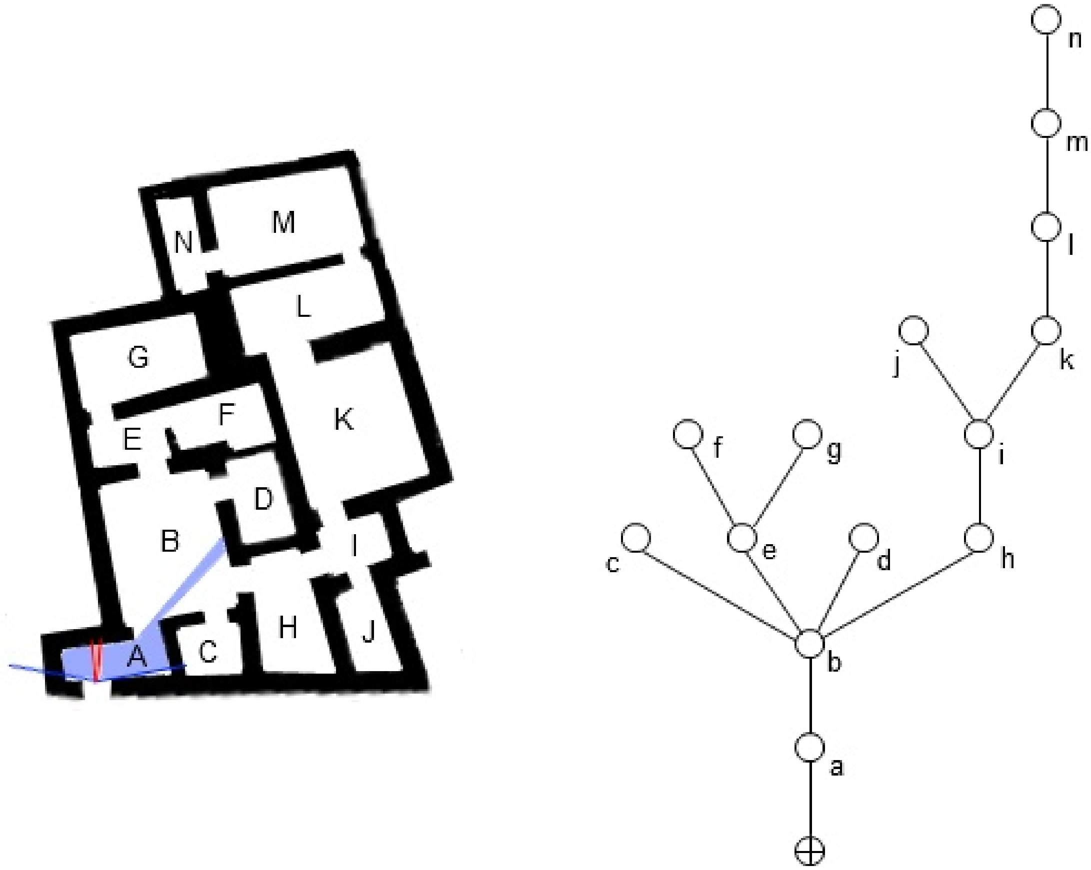

Fig. 12. Ur, AH site. House XIII. Floor map with viewsheds and justified gamma map (adapted from Woolley and Mallowan 1976, Plate 124).

Table 4. Mean Depth (MD), Relative Asymmetry (RA), Real Relative Asymmetry (RRA), Control Value (CV) and depth for House XIII, Ur.

	MD	RA	RRA	CV	depth
⊚	58	0.48	1.87	0.5	0
A	45	0.34	1.32	1.2	1
B	34	0.22	0.85	3.33	2
C	47	0.36	1.4	0.2	3
D	47	0.36	1.4	0.2	3
E	43	0.32	1.23	2.2	3
F	60	0.51	1.95	0.33	4
G	60	0.51	1.95	0.33	4
H	35	0.23	0.89	0.53	3
I	38	0.26	1.02	2	4
J	51	0.41	1.57	0.33	5
K	45	0.34	1.32	0.83	5
L	54	0.44	1.7	1	6
M	65	0.56	2.16	1.5	7
N	78	0.7	2.72	0.5	8
mean	50.67	0.4	1.56	0.99	3.87

5. Interpretation

The preceding data provides examples of architectural and spatial organization that one may expect to find in southern Mesopotamia. Though commonalities of Mesopotamian architecture are understood, such as the presence of a centrally located courtyard and walls shared with neighboring buildings, using the methods outlined above, more in-depth information can be garnered (Brusasco 2004: 143). Questions can be addressed from a new direction and with new analytical tools. As listed in the introduction, several questions may be investigated with these methods in mind: do the results support the idea of extended family households and do they demonstrate any inequality, what do the findings tell us about the treatment of privacy, and what changes can be found over time?

Due to the size and complexity of these houses, it is likely that many of them housed several families. The presence of 'linear' houses of three or four rooms at all three of these sites shows that some nuclear families were living in smaller, more contained structures (Fig. 6, 9, and 11). This supports the theory that a structure with numerous rooms would be linked to more than one family. This is formed under the assumption that each family occupies around two for personal use. The existence of courtyards with many rooms surrounding suggests a high number of occupants as it creates a shared space, but also provides a considerable amount of privacy or possession for singular rooms and those living in them. It is conceivable that any room located off the courtyard of a considerable size could have been used as a living room. Suites of rooms may indicate a series of rooms that were used by a single family within the larger household (Brusasco 2004: 143). Living room, in this context, refers to a 'living space' used by the family for any needs that would call for space and privacy. As a result, a living room may have been used for sleeping, storage, working, or variety of other daily activities. Spaces allocated for

kitchen and storage use must be taken into consideration, as well as the possibility of houses reserving rooms for domestic chapels. Nevertheless, using the analyzed structures, it appears that there are enough rooms to provide these services and support the existence of several living rooms. For instance, Tell Asmar House II, rooms H, I, J stand out as a possible living area, as do many of the rooms surrounding the courtyards of House C from Nippur (Fig. 8 and 10). From the data, it seems that the location of these living rooms does not have to be separated from the rest of house, but can be positioned on a direct route through the building. Though this increases the number of possible living spaces within a household, it also makes it difficult to determine specific features or values that could signify a family living room. The size of the room may be an important indicator, as it is clear a space would have to be a certain scale to serve the purpose of a living quarter. Stone (1981: 29), for example, chose 7.25 m^2 as the minimum area of a living room.

In Bronze Age Mesopotamia, written evidence shows that inheritance included the division of a family's home among heirs, with the eldest son receiving preference (Stone 1981: 24). A certain room, or set of rooms, was allocated to each inheritor and his individual family. Though Stone's studies (1981) demonstrate that a great deal of transactions and trading of rooms occurred between family members, and possibly even outsiders, it is plausible that the structure and organization of the home would shadow the hierarchy of inheritance and age. Tell Asmar House I is not a great example, although room H's higher control value may account for a living room with more control (Table 1), however House II from the same town could demonstrate this inequality. Rooms E, F, and K of House II at Stratum Vb are all in a similar position off the main courtyard D (Fig. 8b). This is suggested in similar values as well; all three rooms have a real relative asymmetry of 1.28 and control values around 0.2 (Table 2). As living rooms, these

would be fairly equal positions, though K is at a slight visual advantage in its placement across the courtyard from the entrance vestibule. In more control is room G, which controls access to H, I, and J. Even if an owner did not posses the entire branch of rooms, the control of room G would mark a level of importance, especially if rooms H and J were significant, like a domestic chapel. By Stratum Va, House II goes through some changes making room G no longer powerful, but switching the control to room H (Fig. 8c). However, the same ideas apply to the new floor plan. The theory of room K housing a senior family is also supported in Stratum Va, by the attaching of room L.

The two houses of the Old Babylonian period from Nippur and Ur illustrate similar designs. House C from Ur had ten rooms that were not part of the courtyard or the entrance rooms. Stone (1981: 29) predicted that four of these were living rooms, though more of them may have been. No matter the number, spaces that were closer to the front of the house, like rooms D and M, exhibited a certain amount of control over the entire building because inhabitants would have had to pass through these rooms, and others along the sides, to reach more spaces in the back of the house (Fig. 10). However, the rooms in the back have the advantage of being more secluded. Room I, one of the largest in House C, is segregated with a RRA of 1.61 and also a depth of 7 (Table 3). These values, along with its position off of the back courtyard and location in the center of the house probably signify it as a superior living quarter.

House 13 from Ur is also a complex building with two courtyards. Woolley and Mallowan (1976: 26) insist that many of the buildings would have had at least two floors. It is unlikely for second stories to survive in the archaeological record of this region and period, however even if House 13 had a second floor, the existing plan from the first floor shows some impression of inequality. Woolley and Mallowan (1976) believed that room E and F were a guest

room suite, though they could have easily been a living room suite as well (Fig. 12). If room G was a chapel as they maintain, then control of rooms E and F would have been significant. Rooms D, C, and J may have been living rooms as well do to their size and position. They all have real relative asymmetry values around 1.4 and control values around 0.2, very similar to the values from House II (Table 4). Room L regulates passage to M and N, which may have been another chapel (Fig. 12). This characteristic, in addition to its size, location off the second courtyard, and depth in the house, are good indicators of seniority.

Privacy was an important quality in Mesopotamia culture and it connects highly with inequality as more senior families are associated with rooms more segregated and deeper in the house. It is hypothesized that the courtyard house of Mesopotamia was specifically planned to provide seclusion. Guinan (1996: 61) describes the arrangement as 'turned inward' because the courtyard is set away and not visible from the street, but is the center of activity in the household with sections branching off of it. This separation between inside and outside the home is obvious by the high real relative asymmetry values of the carrier for all the structures used; ranging from 1.28 to 2.17 and always higher than the mean RRA for the building.

Many others features of the courtyard house add to the rejection or separation of outside life. For example, the existence of the entryway clearly separates visitors from the rest of the house; especially since it stops them before even reaching the courtyard. In some cases, such as Tell Asmar House I at Stratum Vc and House II of Stratum Vb, there are two entry rooms, segregating enterers even further (Fig. 7a and 8b). The RRA values of the vestibules are generally high, around 1.4, with the exception of Tell Asmar House I in Stratum Vc and Vb, whose entryway is closely positioned to the courtyard (Table 1). These rooms also generally exhibit a fairly high control value, around 1.2 to 1.7, because they control entry into the rooms

that constitute the actual house. The viewsheds from the entryways also suggest that privacy was valued. Houses such as House I of Stratum Vc at Tell Asmar and House II are structured so that an individual standing at the front door can not see any of the building except for the front hall (Fig. 7a and 8). The most that a guest might see is a peripheral glimpse of the courtyard, as in the case of House 13 at Ur or House C at Nippur (Fig. 10 and 12). It is clear that Mesopotamia society felt privacy in the home was an important feature.

Many of the changes in these houses over time have already been discussed, but fundamentally the patterns of the buildings are analogous. The site of Tell Asmar allows us to see changes made over a relatively small period of time of up to several hundred years. A large number of small changes are made in both houses over the three phases (Fig. 6, 7, 8). House I's RRA value becomes increasing lower through the stratum, whereas House II's becomes higher and then lower again in Stratum Va (Table 1 and 2). Both of these trends can be traced to new doorways that where built during different periods. However, the difference between the real relative asymmetry values of the two buildings does not vary by much; which remained just above 1 for the most part. Other small alterations can found in the Tell Asmar buildings. In House I, room E was expanded and connected to the courtyard instead of room D, possibly because room D became the entryway (Fig. 7). Many of the changes may indicate the possibility of House I becoming a single family home, especially the appearance of many new doorways which significantly lowered the mean RRA for the building. The frequency of these modifications seems to insinuate that minor changes, such as new doorways and additions of rooms, are common; perhaps corresponding to changes in owners or family dynamics, but not major shifts in societal organization or customs.

The houses from Nippur and Ur are both from the Old Babylonian period of the Middle Bronze Age. Many of the attributes found in House C and House 13 are similar to the houses from the earlier Tell Asmar period, despite the fact that is nearly 1,000 years difference between the sites. The courtyard was still a prevalent feature of the house, though the presence of two courtyards appears to be a new trend. The existence of 'branches,' or series of rooms accessed through one another in row, is also found in houses from both times periods. House C stands out for the large ring that dictates the building's structure (Fig. 10). Yet, House 13's spatial pattern is linear, with no form of ringiness (Fig. 12). Therefore, it is difficult to say which, if either, was a more popular pattern during the period or if it was regionally determined. The mean real relative asymmetry values for these two structures were not incredibly different from those of Tell Asmar's. House C had a RRA value of 1.27 (Table 3) and House 3 a value of 1.56 (Table 4). The depth, however, was considerably different from the earlier data; both had mean depths just under 4.0. This change might point to an attempt to increase privacy within the domestic sphere or indicate the more frequent use of secluded rooms to indicate superior rank. Interestingly, though the spaces become deeper, the front entrance seems to become more included. Even in Tell Asmar, doorways were moved closer to the courtyard and were somewhat more included in the house. Both houses from this later period strictly had one entrance room that allowed a slight view of the front courtyard.

6. Discussion and Conclusions

Though these three sites were excavated in the early 1900s, the methods used in this analysis allow us to reexamine the findings for new information. The purpose of this study was to examine spatial and structural relationships in order to answer questions concerning multiple family residency, importance of privacy, and architectural changes over time. These new

analytical techniques revealed evidence that supports many previous ideas concerning Mesopotamian life and culture.

The size and number of rooms featured in the houses from Tell Asmar, Nippur, and Ur insinuate that multiple families may have lived in the same domestic structure. This approach is not the most consistent or reliable way to determine whether the homes were extended-family structures, however the existence of seemingly excessive rooms is a necessary attribute for a building that would house several families. Records of land sales from this time period support the theory of extended-family homes, increasing the reliability of the theory (Stone 1981). The houses used in this study also illustrate that the positions of different room results in greatly varied properties of privacy, integration, and control over other spaces within the structure. Using the model of multi-family households, these attributes imply that there would have been a hierarchy reflected in the form of the house. Certain spaces within the structures seem to be situated in positions of authority. This is indicated by rooms which control access to important spaces, like the chapel, or by spaces that are located off a courtyard but that still retain a great deal of privacy. This evidence suggests that these spaces would have been owned or occupied by a higher or 'superior' family.

Privacy is major aspect of family dominance, but is also clearly an important feature of all Mesopotamian domestic architecture. The careful positioning of doorways, specifically access ways from the street, hides most of the home from the view of visitors. Vestibules were visibly segregated from the rest of the household and always opened into the courtyard. Occasionally, there were two entryways, or in some cases a 'guest room,' as Woolley and Mallowan (1976: 134) refer to then, where visitors were separately entertained. This meant the spaces used daily

by the residents were set deeply away from the few rooms that had contact with the outside world.

Changes in the overall architectural structure of the sites were slight enough that they are not representative of major shifts in Mesopotamian society. It is more likely that changes such as the creation of new doorways or modifying the dimensions of a room were results of owners' preferences. These small alterations are easily viewed over several centuries by the three phases of Tell Asmar. Skipping approximately 1,000 years to the sites of Ur and Nippur, one finds that changes are still small, but may represent larger trends. The boundary between the outside world and domestic life appears to have relaxed slightly over this time period, while the inequality of spatial relationships and the value of privacy remained, or perhaps became even more, important in daily life.

The spatial methods applied in this investigation are encouraging because they can be applied to both past and future excavations relatively easily. Using a two dimensional floor plan, a great deal of information can be gathered. Results from this type of analysis can easily be compared with previous conclusions; generating support of past findings or offering new alternatives. These methods also provide a universal foundation by which different societies may be compared. By condensing architectural properties down to specific characteristics and values, structures from different cultures, locations, or time periods can be evaluated without involving specific characteristics or traditions. For example, methods or theories that rely too heavily on culturally defined qualities make it difficult to compare architecture cross-culturally. In contrast, techniques such as access analysis depend on basic descriptive and numerical features which can be used universally.

Researchers such as Sanders (1990) and Fisher (2009) include these spatial methods in a broader collection of techniques. For example, Sanders also uses examinations of building material, climate, technology, nonverbal communication, and artifact analysis. Studies like these demonstrate that more comprehensive approaches to research in architecture are becoming more commonly employed within archaeology. Utilizing spatial investigations with other types of analysis provides a greater range of information with which to answer questions. Understanding what a space may have been used for by studying artifacts found within it, or learning what behavior certain objects incite through ethnoarcheaeology, is information that would significantly strengthen the conclusions of spatial analysis. As demonstrated by the sites from Mesopotamia, spatial analyses can provide much insight on their own. Larger and more integrative studies of architecture would surely supply even greater understanding of past cultures.

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