The Domestication of Vertical Space: The Case of Steep-Slope LPPNB Architecture in Southern Jordan

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In the LPPNB of southern Jordan, intrasite social and spatial pressure forced the use of vertical space. As domestic space became more and more restricted through progressive community or family growth, two storey domestic structures developed in steeply sloped sites. In settlements like Ba'ja, natural boundaries gave birth to use of vertical space.

Developments in the Early Near Eastern Neolithic are dominated by a range of agglomeration processes, leading to the domestication of beings, abiotic resources, material and immaterial spaces and spheres. These rapid initial agglomeration processes appear to have progressed in geographically varied and polycentric ways, determined by regional environmental conditions, and by the increasing role of interaction between regions. One must state that these early sedentary agglomeration processes also established the socio-spatial ethology of our modern life, or formed the sedentary ethology of human space (Gebel 2002).

The groundplans of buildings and settlements indicate that the "Mega-Site" Late PPNB (hereafter LPPNB, Fig.1; Gebel 2004) of the Jordanian Highlands consisted of corporate family and community structures. In these LPPNB milieus, social and spatial agglomeration continuously triggered cooperative structures, and cooperative structures in turn triggered more agglomeration processes. It appears impossible to separate either element in these developments.

This contribution presents the material evidence of one type of early spatial agglomeration, that of two-storey or multi-storey housing, which developed in southern Jordan during the 8th millennium cal BC. Rarely are all elements of real two-storey architecture preserved together on LPPNB sites. Before we discuss this evidence, we must consider the agglomeration and territoriality of space under early sedentary conditions.

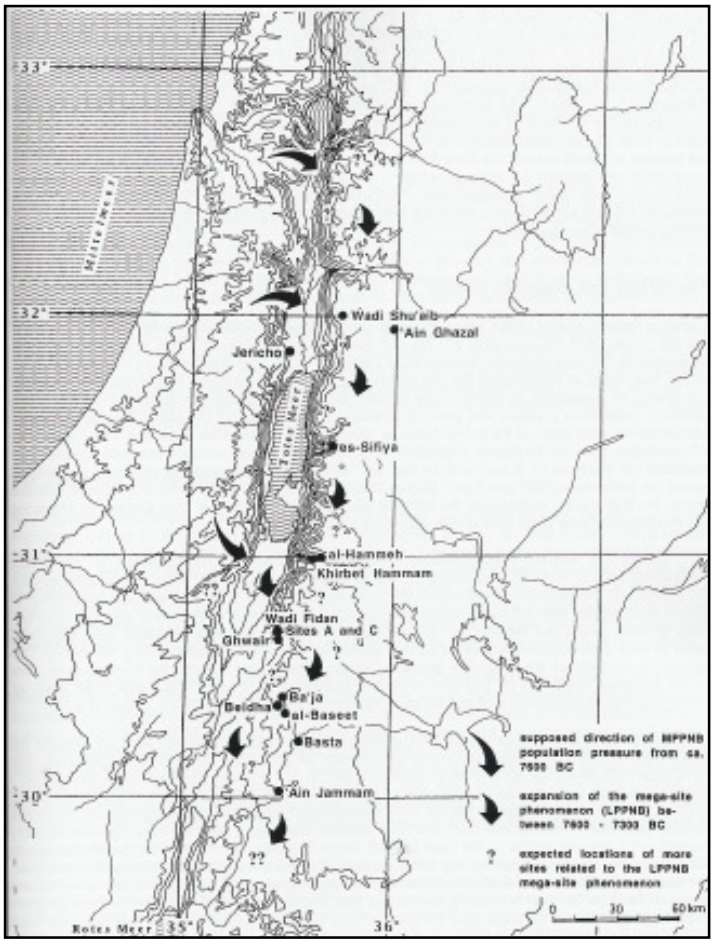


Figure 1: LPPNB sites in discussion for the use of two-storey architecture, with information on the mega-site expansion (from Gebel 2004)

Sedentary Space

Settled life demanded a fundamentally different human territoriality than did mobile, foraging life. This different understanding of space resulted from a growing territorial inflexibility, determined by the new sedentary spatial orientation, progressive population dynamics and new socio-economic production modes and structures.

Habitational and natural spaces were reconceived and redefined in all aspects of life and human expression. This resulted in hitherto unknown and increasingly complex types and levels of conflict, countered by adaptations to more complex social and socio-economic structures that helped balance interests. Warfare over habitats or aggression over

Figure 2: Panoramic view of a LPPNB mega-site on a shallow terrace, reconstructed as a two-storey settlement. (reconstruction by M. Kinzel)

Discussion of LPPNB architecture demands clear definitions of the specific terms in use, without which mutual understanding would fail. The following list of definitions must be considered preliminary and incomplete, but may serve as a start for a common LPPNB architectural terminology for storeyed architecture. Terraced architecture requires different definitions of "basement", "groundfloor", and "storey" than those used in common understanding. Here, for clarity, a storey above a basement is addressed as a second storey.

Basement: A storey below an upper storey. In Ba'ja, basements were created from upper storeys by building a new storey on top of them. Basements can have a cellar-like appearance. Substructures are not basements, although they can be used (e.g., as a burial ground, as at Basta).

Building terraces: Building lots created by terraces dug or built into slopes, extending their space by off-slope substructures, or both.

Floor: This term should be reserved for an actual floor (and not used as "storey").

Ground floor: A neutral term for the lowermost storey, whether it carries an upper floor or not. Some ground floors can be basements.

Level: An ambiguous term to be avoided in the discussion of storeyed buildings (but see "split-level" below).

Rising-floor structures: An architecture in which storeys "move" upwards by the vertical extension of walls and by raising the floors with room fill, often related to split-level architecture (cf. evidence from pueblos in the American Southwest, e.g., Cameron 1996a: 199; 1996b: 79-80; Kidder 1958: 122-124).

Raised floors: Floors on substructures that do not form a storey (e.g., substructures to create an even building ground or to provide ventilation or insulation).

Pillars: Posts serving to support main beams of ceilings, (e.g., 'Ain Jammam, Ba'ja, as-Sifiya).

Roof: The unsheltered open-air space on top of any storey that does not have one above it. It should not be considered as a "storey" itself. Several connected roofs (as in pueblo-like LPPNB architecture) can form a communal space or roof "landscape" for intra-settlement traffic.

Roofment: A new term for a partially sheltered, open-air space on top of a building. Roofments can be any unroofed structures on a roof, e.g., parapet walls or any physical, spatial division on a roof. Isolated room-like structures that were roofed (penthouses), however, should be considered a storey, even when built on a roof.

Split-level structures: Architecture in which neighbouring rooms with floors at different heights share walls. Split-level rooms are connected by passages.

Storey: A closed room or group of (interconnected) rooms with ceilings built above them.

Strengthening buttress: Attached (abutting) or originally built (bonded) to strengthen a (long) wall and possibly to support a main ceiling beam.

Substructures: Various types of sub-floor structures below a basement or groundfloor (e.g., the LPPNB channel-like or grill-type network of dry-stone masonry that created an even building lot on a slope, and vertical stones supporting floors as at Dhra', Finlayson et al. 2003: 18-19; Kuijt and Finlayson 2002). Substructures support raised floors.

Subterranean: Sometimes an archaeologically ambiguous term, this should be reserved for buildings dug into the natural or cultural sediments and be distinguished from buildings with outside levels that rose through sediment accumulation.

Support gap: A gap in a masonry wall to support beams (e.g., for lintels, staircases, ceilings, or roofs).

Support wall: Any wall built to support beams, including wall ledges.

Twin buttresses: Buttresses located in opposed position to support a main beam in the ceiling and possibly to strengthen walls. Attached (abutting) twin buttresses indicate a secondary need to carry extra weight.

Two-storeyed: A building with two ceilings and one roof, located directly above one another.

Wall sharing: Where two neighbouring rooms or buildings, usually at two different levels, share the same wall without an interconnecting passage. An example: Two-storey housing in Ba'ja, Area B-North

the territorial neighbourhood of settlements were new sorts of conflicts.

The changing understanding of space included not only the material space; immaterial spaces — social spaces defined by new forms of conflict management or production hierarchies, new values in property definition and prestige goods, and ritual and symbolic spaces, like the intramural "domestication" of otherworldly powers or of the dead — became subjects of a hitherto unknown agglomeration. There are indications that the ritual and material space were not as differentiated in the early Neolithic as they are in modern times.

Sedentary space is limited by immediate neighbourhoods. Social space is restricted by both physical and social boundaries, and stress is therefore created when there is a need for growth and expansion. The resulting spatial pressures can be managed for a while by the adoption of new corporate structures and by adding to the horizontal space through the use of the third dimension. The use of vertical space again increased spatial pressure by allowing a higher population density within LPPNB settlements.

Space is both a material and an immaterial subject of domestication. The domestication of space resulted in agglomeration, and spatial agglomeration intensified the further domestication of space. The use of vertical space is an expression of this intensified domestication.

Vertical Space and Regional Architectural Development

The beginnings of multi-room LPPNB architecture of southern Jordan[1] extend to an architectural history of just half a millennium in the region. The round houses of the Middle PPNB seem to have been the first solid architecture in the southern Jordanian Highlands. Earlier solid architecture should be expected along the rift's fringes and its major eastern confluents. New evidence from the round-house MPPNB at Shaqarat Mazyad[2] demonstrates at least the use of roofs and thus the beginning of exploiting the vertical space. Staircases leading up in the interior of a MPPNB round house must not have led to a second storey, but at least can be

Figure 3: Basta, Area B, Square 84; View of the NE Wall of Room 2 of Building Unit B VIII (photo: Basta J.A.P., Y. Zu'bi)

The use of right angles in LPPNB architecture seems to have triggered the introduction of substructures, artificial terracing, or platforms without substructures.

1. According to Gary Rollefson (pers. comm.), 'Ain Ghazal provides clear indications of both two-storey and split-level LPPNB structures. The best evidence is from a single building that shows both aspects: "The building was a large residential building in the North Field. The reasons for claiming that at least the western part of the building had two storeys is that the fill of the ground floor included thick red-painted plaster flooring that could only have come from an upper storey; the western wall of the structure shows clearly that there was no split-level part of the building farther up the hill."

2. In the course of our architectural investigations at Ba'ja and Basta, as well as exploring the recent traditional terraced housing in southern Jordan, it became obvious that identification of a real second storey (closed rooms with two ceilings built above each other) is not as easy as we anticipated and that the evidence sometimes is difficult to distinguish from other sorts of shared-wall architecture (e.g. split-level structures or rising-floor structures). The investment of the Ba'ja team in discussing the architectural and stratigraphic morphodynamics of storeys has been considerable, and we now feel able to identify archaeologically what is coming mostly as a statement from other (mega-) sites: that second storeys did exist. This discussion might soon require expansion : Recent discovery of staircases leading up in a MPPNB round house at Shakarat Mazyad (north of Ba'ja), together with staircases leading down into the same building, may indicate an earlier use of the vertical space in the MPPNB, whatever this space may have looked like (Hermansen et al. n.d.). So far, this isolated discovery does not conclusively expand the second-storey discussion to the round houses of the MPPNB.

We are conservative in our view that secure evidence for second storeys so far comes only from the LPPNB. The suggested examples of second storeys from the MPPNB (the pier-houses from Beidha: Byrd 2005; Byrd and Banning 1988; the architectuure of Ghwair I: Simmons and Najjar 1998, 1999, 2000) still appear doubtful. Despite its MPPNB radiocarbon dates, the Ghwair findings fully correspond to the character of a LPPNB culture and little is said about its MPPNB cultural affinities; if Ghwair is MPPNB, it should be explained why or how its LPPNB features came to exist isolated in an MPPNB context. For the pier-houses of Beidha: even Byrd (2005) notes that the question wasn't solved how they relate to similar PPNC groundplans known from 'Ain Ghazal; it also appears archaeologically insufficient to argue that thick walls must have carried a another storey. However, the pier-houses of Beidha might become a potential candidate for discussing second-storey buildings already in the MPPNB.

Figure 4: Ba'ja 2003; Aerial view of excavation areas, from SW. (photo: Ba'ja N.P., K. Traulsen).

evidence for use of the roof. Staircases may have existed in places were the dense honeycombed arrangement of the round houses did not have space for installations that allowed inhabitants to reach the roof from outside. However, new evidence for PPNB architecture continuously surprises us, and it would not be unlikely to find evidence of early MPPNB round "towers" with second storeys and flat roofs.

It is not clear at all if southern Jordan witnessed an indigenous development from round to rectangular groundplans. It could well be that such a stage of development does not exist but that rectangular architecture was introduced from the north with the new social paradigm that accompanied the mega-site expansion (Fig. 1; Gebel 2004).[3] The LPPNB mega-site architecture strongly hints at the existence of social units larger than nuclear families (possibly kin groups or lineages) as the standard social unit (cf. Garfinkel, this volume). Given the limited resources of the PPNB environment in southern Jordan, corporate exploitation and consumption would have offered advantages over smaller MPPNB (nuclear) family units. The large, corporate family structures that followed allowed their members to reduce competion and, thus, conflict levels. They started to use rectangular, multi-roomed groundplans and, after a while, houses expanded vertically (Figs. 2, 5).

It is worthwhile to consider the possibility of a developmental relation between round houses and right-angled groundplans on slopes with substructures. The use of right angles in LPPNB architecture seems to have triggered the introduction of substructures, artificial terracing, or platforms without substructures. The introduction of right-angled groundplans could have facilitated second storeys, since they provided more solid structural support.

Basta seems to indicate that regional architectural variability was substantial in the LPPNB of southern Jordan. There is little secure evidence for two-storey structures in Basta, although some evidence clearly hints at split-level architecture (Kinzel 2003; 2004). One may speak of an optional second-storey architecture in Basta (cf. below). Kuijt's (2000) reconstruction of the Basta House might be correct in principle, but we cannot be at all sure that the houses of the LPPNB Basta village were two-storeyed throughout. Rising-floor structures (see below) are virtually absent in Basta but seem to be characteristic of steep-sloped Ba'ja, where vertical rock formations and gorges limited horizontal settlement growth. The LPPNB occupation of Basta, mainly resting on fairly slight slopes, shows architecture built on artificial terraces of dry-stone masonry with grill-type substructures. The height differences among the various terraces is not very significant (Nissen, forthcoming), and the buildings in Areas A and B show little maintenance or alteration as compared with the steep-sloped sites ('Ain Jammam, Ghwair I, Ba'ja, al-Basît).

Large, presumably central, rooms surrounded by rows of smaller rooms appear to be characteristic of the LPPNB in southern Jordan. Various publications (e.g., Kuijt 2000; Gebel

3. If the pier houses of Beidha C were two-storey (Byrd 1994; 2005: 132; Byrd and Banning 1988, but questioned by B. Finlayson during experimental reconstruction in 2005, pers. comm.) and are indeed of MPPNB date (see fn 1), they would represent the earliest two-storey architecture of the region. Archaeologically, for now they should be considered as doubtful evidence for two-storey houses

2002) describe this groundplan type as t e "Basta House", since its regular and rectangular layout (which in Basta was not affected by the topographic constraints of a very steep slope and was much helped by building terraces created by substructures) was first identified there (Nissen, Muheisen, and Gebel et al. 1987). The principle of the Basta House groundplan with its central room was further identified in 'Ain Jammam, Ba'ja, as-Sifiya, and Ghwair I (Simmons and Najjar 1998: Fig. 1). In the steep-slope settlements, this ideal groundplan is difficult to recognize because the layout had to be adapted to topographical conditions (e.g., Fig. 6), leading to the use of triangular or polygonal rooms attached to an irregular central space. In these cases, rooms of the same building frequently rest on different levels, especially in sites or at spots where substructures to create an even building lot were not in use.

A very basic, yet unsolved, question is whether the large central room or central space of a Basta House belongs only to the ground floor, with no second storey above it, or if it represents the central room of an upper storey, as outlined below for the recent finding in Ba'ja.[4] The wall thicknesses, other static elements, like inserted buttresses or wall ledges and wall gaps, and the good preservation of walls (resulting from a rapid filling of rooms by material that must have arrived from an upper level) all support the argument that the central space once belonged to a basement or groundfloor. It has been suggested (Gebel and Hermansen 2001; 2004) that in Ba'ja all groundplans represent basements, whose considerable heights were preserved by the mass of material from an upper storey eroding into the rooms,[5] but the evidence does not really contradict the possibility that they belong to groundfloors.

Another concern is that Basta Area B, itself, seems to lack secure and direct evidence for second storeys,[6] except, possibly, in Room 2 of Building Unit B VIII (Fig. 3) and the abutting buttresses found in Building Unit I in Area B. The NE wall of Building Unit I in Area B has a ledge that could have supported a ceiling's beams, a buttress reaching a

Figure 5: LPPNB Ba'ja reconstructed as a two-storeyed settlement, from SW. (reconstruction: M. Kinzel)

4. Our discussions excluded the possibility that the adjusted wall heights in B22 and the ceiling material on Wall 34 represent just a leveled building ground, which cleared the area for just another single-storey building. The position and levels of the beam supports and of the staircase and Threshold 56 argue for a connection between two storeys, and against the idea that the space between the abutting Buttresses 33 and 55 had nothing to do with the altered concept of the lower stratification (Rooms 2, 4, 5, and 6).

5. Of course, rising-floor structures with intentional room fill are another reason for the excellent preseva-tion tion of wall heights.

6. It has to be stressed that the impressive groundplan of a Basta House should not rule our understanding of the LPPNB architecture of southern Jordan. There must have been considerable diversity in domestic building, and even non-domestic structures is as witnessed in the part of the settlement uncovered in Basta Area A (Nissen, forthcoming).

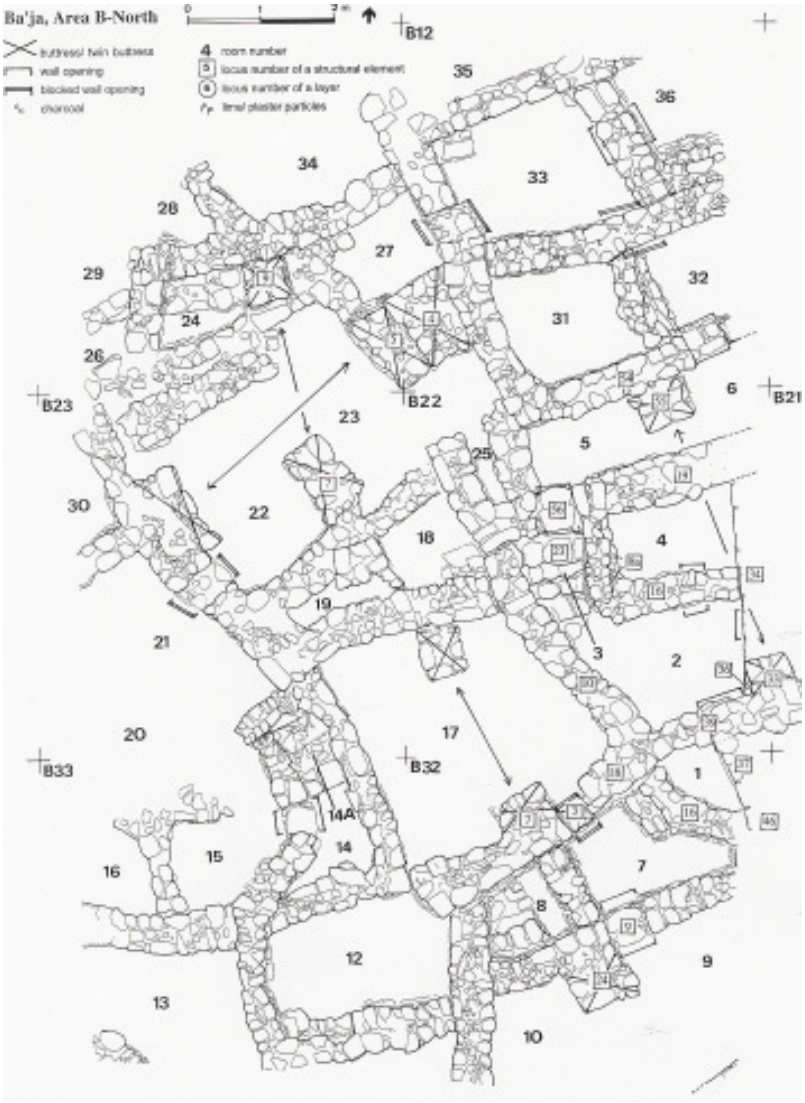
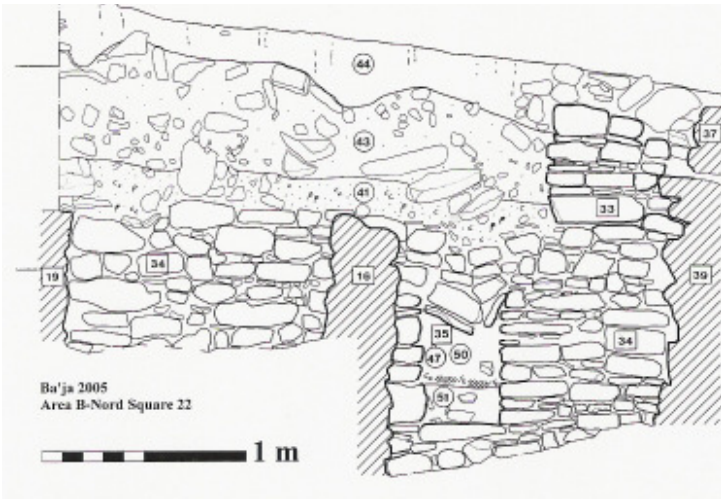


Figure 6 (above): Ba'ja, Area B-North; Groundplan of domestic, steep-slope architecture.
Figure 7 (below): Ba'ja, Area B-North: Part of the eastern sections of B22/32, with evidence for leveled wall heights (Wall 34) and in situ floor/ceiling remains (Layer 41)

similar height, and an intact room height of ca. 2.1 m (Gebel, Muheisen, Nissen, and Qadi et al. 2004: Fig. 4; Nissen, forthcoming: Fig. 22). Decorated plaster at various heights in the room fill indicates that the material originated in an upper storey. It is not easy to understand why Basta would have single-storey houses while closely similar groundplans at other sites provide more direct evidence for second storeys.



Could it be that the generally larger space occupied by a house in Basta made second storeys unnecessary, or is it simply a matter of shorter house lives in Basta's Area B, of wall preservation, or of room-fill observation during excavation?

Architectural and Sedimentary Morphodynamics and Definitions

Discussing the complex structural framework in which second storeys were established requires us to consider the following occupational morphodynamics and characteristics of a southern Jordanian LPPNB settlement. These morphodynamics have been studied in detail in Ba'ja but their features are fully or partly present in all other excavated LPPNB sites in southern Jordan.

a. The level of floors (of a basement or ground floor) rose during habitation and led to a building up of the walls, either for specific rooms or for entire room-groups. This could create different (basement or ground-floor) levels within a single house, with ceilings moving upwards and ceiling materials deposited on floors. The different levels were connected by inserted stairs or stairwells.

b. This process in turn affected existing or newly established upper storeys, for which roofs would have been gradually raised, too.

c. At some locations, complete rooms or parts of basements were filled with rubble (or, in cases of groundplan alterations, with selected material from demolished walls). In such cases, traces can be found indicating that a former upper storey was transformed into a basement (see below). An overall rearrangement of the groundplan, namely the insertion of small rooms, accompanied this shift, and often required the blockage of former doors and wall openings or the insertion of new ones.

d. Intra-and extra-mural spaces may have served as dumping areas for wall rubble from which dressed wall stones had been removed. Raised levels of open spaces in the settlement seem to have resulted in shorter doors or blocked doors.

e. Processes a.-d. are jointly responsible for the excellent preservation of the walls' heights in settlements (up to 4.5 m in Ba'ja).

Figure 8:
Ba'ja, Area B-North, Square B22; Girder grillage of Walls 16 and 19, Buttresses 33 and 55, staircase Room 3, and cut-down Wall 34 with *in situ* ceiling Layer 41, from southwest (photo: M. Kinzel)

Full evidence of true, two-storey LPPNB architecture was recently traced in Ba'ja, Area B-North, Squares B22/32 (Figs. 6-9; Gebel, Hermansen, and Kinzel, in press). Here, a larger, presumably central room[7] of an upper storey was built on top of the leveled room walls of an earlier storey, which itsself appears to have previously been an upper storey that was transformed by this action into a basement. The new, partly eroded, upper room must have rested over Rooms 2, 4, 5, and 6, and unexcavated areas in B21. This storey-shifting shows one of the major building principles attested in Ba'ja (Gebel and Hermansen 2001: 19; see also Cameron 1996a; 1996b; Kidder 1958: 122-124).

The B22/32 finds show that the new upper storey or room was established by cutting back the wall heights underneath the same level, and by inserting or modifying other walls to that level.[4] In the example presented here, the walls were levelled to an altitude of 1167.3 m ASL (Walls 19, 34, and 16 of B22). These walls became load-bearing walls, forming a kind of "girder grillage" for the new floor. Two supports for the new floor's beams could be identified at elevations of 1167.2 m (Locus 8a, running out of Wall 8) and 11167.24 m (Locus 36, below Buttress 33). An additional measure adapting the domestic structure to the new storey was the erection or modification of the stairwell between Walls 8 and 10 (Room 3). Four steps were identified, crossing a height of some 80 cm. The uppermost Step 23 ends at 1166.71 m in front of Wall 19, at a place where Threshold 56 (at 1167,32) occurs. Staircases ending blind in front of a wall are quite common in the terraced steep-slope architecture of the LPPNB, not only in Ba'ja. The evidence we have here suggests that the greater depth of the upper Step 23 helped to create a landing where another small step or ladder would lead up to Threshold 56, crossing the remaining height of some 60 cm.

Thus, the staircases, the supposed small step or ladder of perishable material on Step 23, and Threshold 56 allowed

7. In as-Sifiya, Area C, Squares 9-10, a "central room" surrounded by smaller rooms was discovered in 1997-98. The excavator describes hints of a second storey in a way similar to ours, but seems not to have identified ceiling or roof materials: "There are two small walls projected into the room and intersected with the north wall of this room. Two limestone slabs (two steps) were discovered and located between these two walls, they probably represent part of a stairway leading to the second storey built on top of this central room. Also this central room has a buttress attached to the southern wall and built to support the roof beams." (H. Mahasneh, pers. comm; see also Mahasneh 2003).

Figure 9: Ba'ja, Area B North, Square B22; Staircase in Room 3, from south (photo: M. Kinzel)

access to the floor of the upper new room, located between Walls 39, 10, 8, 7, and 54, or between the twin buttresses, 33 and 55, respectively. Further excavations will hopefully clarify whether the stairwell was built before erecting the new upper storey, and previously led to the roof or a roofment of the building, or was attached west of Wall 8 during erection of the new upper floor.

Room 17 (ca. 8-9 m^2), with its twin buttresses, may well represent the remains of a yet unexcavated larger room of the last storey that existed in this domestic area. Most likely, a "girder grillage" of leveled walls like those mentioned above will show up in its lower stratification. Like the new upper room between buttresses Loci 33 and 55, it had a stairwell to its west (Room 3). Room 17 also had a stairwell (Room 14a) to the west.

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Reconsideration of the architecture in Area B-North proves the existence of at least three such storey transformations in perhaps three buildings. The other example appears to exist in Rooms 22/23, where we find a system of altered twin buttresses (Loci 7 and 9, Loci 4/5, and the opposed one in B23).

Buttresses are a common feature in the LPPNB architecture of southern Jordan, as are walls that extended at right angles into the interior of rooms (e.g., Wall 7 in B23). Buttresses do not necessarily have the function of supporting a ceiling's beams (Kinzel, forthcoming). They could simply represent strengthening of long walls or means for subdividing room space. Such wall strengthenings, especially if not executed in the original building plan ("retrofitted buttresses", as Bill Finlayson calls them), are most likely additions to walls that later had to carry the load of another storey. Wherever they appear in pairs in opposed locations, however, we may expect that they were erected to carry the main or central beam of the beam network of a ceiling or floor. At least four such twin-buttress pairs can be identified in Area B-North (marked by arrows in Fig. 6). Buttress 24 in B32 may have had the function of a strengthening buttress, but it may also have served to reduce the span, for which available beams were not long enough to bridge. There do not appear to be any minimum or maximum standard distances between such main beam supports, since these were influenced by available beam lengths (juniper, stone oak, and pistachio were probably available), room sizes, and other spatial and topographical conditions.

LPPNB buttresses usually abut the walls; rarely are they bonded with them. This must be an indication of their secondary or subsequent structural purpose, caused by later static needs (strengthening buttresses), the need for beam supports when erecting a new storey (support buttresses), or both. Some buttresses extend through the storeys, while others were erected when building a new storey (e.g., abutted Buttresses 33 and 55 were founded on top of leveled Wall 34, witnessing their secondary need as a beam supports for the upper storey, Fig. 7).

The distance between Buttresses 33 and 55 (3.4 m) does not lead us to expect that a single beam spanned the supposed large room of the latest upper storey. Possibly we can expect that a central pillar helped shorter beams to span the distance.

Ceiling Layer 41 (Fig. 7) rests on the leveled Wall 34, and is 20-30 cm thick. The height of its base corresponds to the height of the beam supports Loci 8a and 36, the height of a support gap (Locus 40) in Wall 39, and the leveled tops of Walls 16 and 19. Not only the corresponding heights, but also its material let us interpret this Layer 41 as the *in situ* remains of a floor/ceiling between the upper large room with the

twin Buttresses 55 and 33, and Rooms 2, 4, 5, and 6 underneath. The clayish-silty material is a compact and dense mixture of finer sediment with a high content of lime, recycled plaster, and charcoal.

Summary

If we generalize the evidence from Area B-North in Ba'ja, and consider all information from the other LPPNB sites in southern Jordan, we may hypothesize that the following measures took place whenever a new storey or room association was established in LPPNB steep-slope housing:

1) Cutting back the walls of an existing groundplan (upper storey or ground floor) to a similar height in the area above which the floor(s) of the new storey would be located. The previous groundplan would now represent a basement or groundfloor.

2) Possible insertion of further rooms or walls, creating a cellular layout of this basement that functioned as a girder grillage for the new floor of the new upper storey (or ceiling of the new basement, respectively).

3) Insertion, reuse, or modification of buttresses in the basement or groundfloor to strengthen the walls so that they could support another storey.

4) Building or extension of buttresses in or into the upper storey to support the main beams of the ceiling or strengthen the walls there.

5) Modification of walls in the girder grillage of the ground floor to create beam supports, where necessary (gap supports, wall supports).

6) Insertion or modification of staircases, stairwells, or ladder spaces to provide access between the storeys or to the roof.

7) Reorganization of room connections by blocking (or inserting?) wall openings (passages, window-like openings) in the new basement or groundfloor.

Observations in Ba'ja also hint that LPPNB basements or groundfloors were intentionally filled, and that the former upper storey became a basement by adding a new storey above it. At this time, another episode of groundplan alterations included insertions of stairs, walls, windows, buttresses to support planned upper storey features, and closing of windows and passages. The complexity of architectural events in this process results from the fact that the various building measures could happen in one building at different levels or on terraces. If we assume that the latest upper storey is always eroded away, steep-slope stratigraphies like those in Ba'ja should contain mainly superimposed basements and only rarely fragments of upper storeys.

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