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Generation of Identities and Space: A Quantitative Approach to Ancient Settlements with Avaris – Tell el-Dab'a as a Case Study

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When discussing the presence of a Near Eastern component in the Egyptian Nile Delta, a simple description of the archaeological material will not provide the necessary answers. Traditional culture-historical approaches have occupied a considerable amount of the bibliography dedicated to ancient population studies. Cultural, social, and economic traits have been derived from studies of pottery, sculpture, and personal objects, as well as funerary practices and domestic structures; such characteristics were made to relate with specific population groups and geographical areas. The inclusion of quantitative procedures to analyse space is conceived here as a heuristic tool. It allows for a surpassing of formalistic approaches to settlement patterns, incorporating an evaluation of the strategies in the use of space. The inclusion of a "spatial turn" in the form of Geographic Information Systems (GIS), and Urban Syntax can help in the identification of patterns of use and social clustering in space. Daily interaction occurs in public and private spaces, and it is at this level that some of the forces that drive ethnogenesis–and myriad identities–might be located.

La generación de identidades y el espacio. Una aproximación cuantitativa a los asentamientos antiguos con Avaris – Tell el-Dab'a como caso de estudio
Cuando se discute una presencia de origen próximo oriental en el Egipto del Delta del Nilo, una simple descripción del material arqueológico no está en condiciones de aportar las respuestas necesarias. Las aproximaciones más tradicionales, que se basan en la tradición histórico-cultural, han ocupado gran parte de la bibliografía dedicada a los estudios de las poblaciones antiguas, y la Egiptología no ha sido una excepción. Rasgos culturales, sociales y económicos han sido deducidos de estudios de cerámica, escultura y objetos personales, así como de prácticas funerarias y estructuras domésticas, siendo relacionados después con grupos concretos de población ("asiáticos") o áreas geográficas específicas. Como novedad, la incorporación de procedimientos cuantitativos al análisis del espacio se concibe en las siguientes páginas como un elemento heurístico, que permita la superación de aproximaciones puramente formales a los patrones de asentamiento antiguo, mediante una evaluación del estudio de las estrategias utilizadas en el uso de ese espacio en la Antigüedad. La incorporación del "giro espacial" mediante los Sistemas de Información Geográfica (SIG) y la Sintaxis Urbana pueden ayudar a identificar cómo patrones de uso y agrupamiento social pueden verse reflejados en el espacio. La interacción ocurre tanto en espacios privados como públicos, y es a este nivel en el que pueden localizarse algunas de las fuerzas originarias del fenómeno conocido como "etnogénesis" o generación de identidades.

Keywords: Egypt, Urban Syntax, Depthmap, architecture, domestic occupation.
Palabras clave: Egipto, Sintaxis Urbana, Depthmap, arquitectura, ocupación doméstica.

1 | Egypt and the Levant. The question of the arrival of "the Hyksos"

The cultural traits that characterized ancient Egyptian civilization developed in a privileged landscape that facilitated the contact of groups and the movement of people into and through different areas. Egypt had frequent interaction very early on with its more immediate neighbours, such as the territory of present Libya, the Levant, Nubia, or the Sinai Peninsula, but also with other geographical areas farther away. In many of these cases, the exchange of very diverse objects such as cedar wood, different types of oil, or raw material such

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as lapis lazuli, acted as catalyst and holder of these interactions; frequent contacts were already in place much before the rise of a unified power who would control a considerable area of the Nile Valley. Amidst such interactions, the area of the Levant seemed to have had a prevailing role already from the Chalcolithic period; early contacts are reflected in the north by the so-called Buto-Maadi culture.[1] During the First Dynasty (c. 3000–2890 BC), dozens of vases uncovered at Abydos cemetery in Middle Egypt were traced back to a production place around Tell Beth-Yerah, in the Southern Levant.[2] The Eastern Nile Delta, as a crucial point of encounter both for terrestrial and maritime routes, has provided numerous examples of material of Near Eastern origin for all periods of Egyptian history [3] (for an overview of the area surrounding Avaris, see fig. 1).

While interaction occurred between the Nile valley and the Near East, these contacts seem to intensify or decrease much in consonance with the political situation in both areas. Thus, during the Egyptian late Middle Kingdom a reduction in Levantine imports in Lower Egypt is detected, until they stop being documented altogether after the Thirteenth Dynasty (c. 1770 BC)[4] also in southern Egypt, probably because of the political crisis that divided the Egyptian statehood before the advent of the Second Intermediate Period (c. 1650–1550 BC). This crisis undoubtedly played a role in the slight decline of contacts of Egypt with its neighbours: at the end of the Thirteenth Dynasty the central government had lost control of the easternmost part of the Delta and the mining exploitations in the Sinai.[5] With the advent of the Fifteenth Dynasty,[6] the dynasty of the "Hyksos", Levantine imports around the area of Memphis came to represent less than one per cent of the recovered material.[7]

Is this presence and rise to power of the Hyksos Dynasty what has been frequently heralded as unassailable proof of the migration of some population groups from the Levant to Egypt during this period The arrival of this "contingent" of people has been regarded as an event that would have profoundly altered the Egyptian substratum, loading it with Asiatic characteristics before the actual migrants would finally become "Egyptianized". However, the so-called "Asiatic" presence in Egypt was not only common and continuous much before, but was also characterized by the presence of very diverse groups.

1 Bader 2015: 8. The sites identified as such include a cemetery and settlement complex at Maadi, Midant-Reynes 2000: 57. Levantine influence is discernible in worked flints, and the appearance of the so-called "Canaanite blades", Midant-Reynes 2000: 58.

2 Greenberg *et alii* 2012: 95–96. Egyptian material dated to the First Dynasty has also been found in Beth Yerah. For an overview of the excavations at Abydos see Amélineau 1899–1905; Petrie 1900, 1901, 1902, 1903; Peet 1914.

3 The literature in this regard is very extensive. A good introduction can be found at: Bietak 1991a; Sowada 2009; Bader 2011; Mourad 2015; Kopetzky 2016. For a recent overview of the *longue durée* maritime relations between Egypt and the Levant, see Marcus 2019: 150–160.

4 This suggests that Memphis was not subjected to the influx of the Hyksos, as the ceramic corpus at Kom Rabia developed from a later Middle Kingdom corpus and does not contain traces of Middle Bronze Age Levantine culture as the ceramic recovered at Tell el-Dabʿa, Bader 2009: 518–601.

5 Bard 2015: 188.

6 There is still dissent in defining the political map after the crisis that followed the Thirteenth Dynasty. The more widespread theory relates that at least three dynasties shared the power during this period: Thirteenth Dynasty in the north, governing from the capital Itj-tawy, the—still contested—Fourteenth Dynasty, that is said to have occupied the Eastern Nile Delta or even Avaris, and the Fifteenth Dynasty that presumably followed the Fourteenth and also reigned from Avaris. In the south, the Sixteenth and Seventeenth Dynasties reigned from its stronghold at Thebes. For more, see: Ryholt 1997; Schneider 1998; Bietak 2010; Bourriau 2010; Wegner 2015; Ilin-Tomich 2016; Wegner and Cahail 2021.

7 Bader 2009: 653–660, 2015: 18.

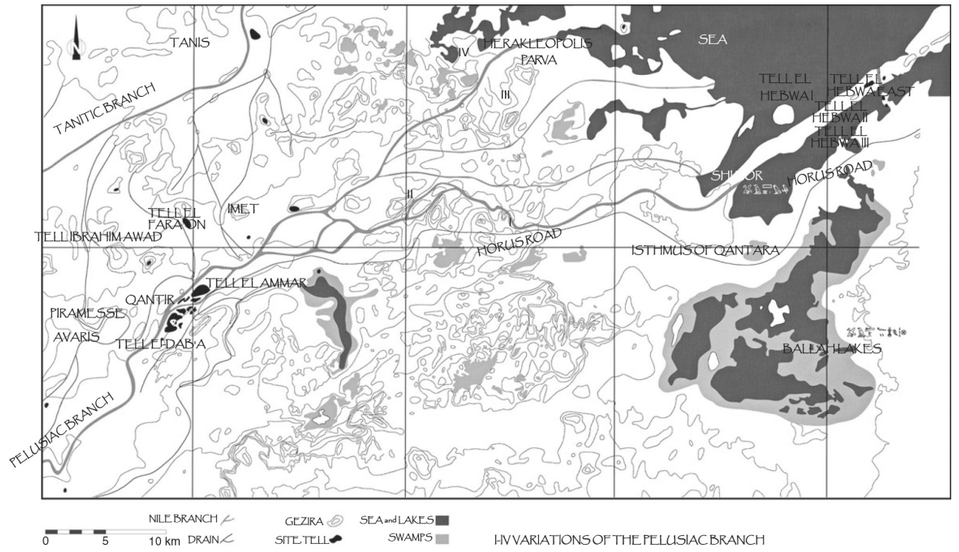


Figure 1. Avaris – Tell el-Dabʿa location in the Eastern Nile Delta (Bietak 2010: 27, fig. 1) © M. Bietak.

In the following pages, I present a few aspects of my ongoing PhD research to illustrate how the inclusion of spatiality in ancient studies can help to deconstruct the dominant historicism and help the identification of social practices in antiquity. I aim to introduce the subject from the perspective of the social significance of space and the generative capacity of the built and non-built environment.

2 | Settlements in Egypt. The special case of Avaris and its "Asiatic" component

Some of the most well-known examples of excavated ancient settlements in Egypt, such as Lahun,[8] Deir el-Medina[9] or Amarna[10] were conceived according to a fixed scheme that reflected more of an official conception of the built space

8 Petrie, Brunton and Murray 1923. El-Lahun first emerged as a royal dominium created to agriculturally control and exploit the region. It seems that it never lost its original function as administrative head in the Fayum area, Moeller 2016: 249, 2018: 203. See also Luft 2003, Mazzone 2017.

9 Deir el-Medina features a characteristic grid-type settlement and a typology of house alike to those at Amarna, but individual alterations are more obvious, Koltsida 2007: 121. The bibliography of Deir el-Medina is very extensive, <https://www.ifao.egnet.net/recherche/archeologie/deir-el-medina/> (accessed November 2021). Bruyère's archives are digitized at <https://www.ifao.egnet.net/bases/archives/bruyere/about#tdm> (accessed November 2021).

10 Petrie 1894; Kemp and Garfi 1993; Murnane and Van Siclen 1993. The city of Amarna is divided into various neighbourhoods and does not have a rigid grid pattern, but nonetheless maintains a regularity of structure. "High-end" houses are very similar and share orientation and shape. The so-called "workmen village", with more modest and smaller houses, follows the typology of a grid-type structure, Kemp 1977: 127, 1987: 43.

than a spontaneous one; this conceptualization of space has been termed as "arising from top to bottom". Notwithstanding the presence of these "official" places and the seeming rigidity they show in construction and organization, a few examples of dwellings and structures that do not fit within this norm have come to light in recent years.[11] This should not come as a surprise: it is expected that even in the case of the setting up of "official settlements" the agency of individuals must have played a part, and its manifested materialities subsequently made evident.[12]

Acknowledging the existence of such particularities, it is true that Avaris represents a unique type in many respects, and not only in that it presents areas where a more spontaneous growth or approach "from bottom to top" is visible. The excavated domestic areas at Avaris do not follow a grid-scheme,[13] and throughout its phases different house types can be identified. Thus, aside from the typical "Egyptian snail-house",[14] there are variations of examples such as the central courtyard / room[15] or the so-called *Mittelsaalhaus,*[16] types not documented in Egypt before but amply used in northern Mesopotamia already from the end of the fourth millennium BC.

The Second Intermediate Period phases at Avaris are characterized by the admixture of Egyptian customs next to the presence of certain elements of non-Egyptian origin such as intramural burials of adults,[17] accompanied by "attendants",[18] equids, toggle pins, and weapons,[19] although such practices are not exclusive to Avaris as they have also been documented in various places of the Eastern Nile Delta.[20] Such materialities have sometimes been instrumentalised as cultural markers, to the point of being related to the movement and settlement of a group with uniform characteristics that would have settled in Egypt from the Levant, only to become Egyptianised after a suitable stay. This theory is nowadays being disputed

11 For instance, Elephantine. It presents characteristics more alike to a pattern of spontaneous growth, although the number of excavated houses is low: Von Pilgrim 1996: 196–205; Bietak 2006: 18; Bardoňová 2015: 202. An excellent compilation of urbanism in Ancient Egypt until the Middle Kingdom can be found in Moeller 2016.

12 The term "materialities" is not used here to signify only pure material culture but, in the sense highlighted by Meskell, "studies of materiality cannot simply focus upon the characteristics of objects but must engage in the dialectic of people and things", pursuing studies that also engage with social relations that go around but also beyond the object, Meskell 2005: 2.

13 The only exception is the planned settlement at ʿEzbet Rushdi, probably from the reign of Amenemhat II, Bardoňová 2015: 202. For a monograph of Rushdi, see Czerny 2010. Remains of a Middle Kingdom planned settlement were unearthed also in Area F/I, Czerny 1999; Bietak 2016a: 264; Bader 2021: 45.

14 Bietak 2006: 18.

15 In Area A/II: Bietak 2010: fig. 14; Bader 2018. Also, in Area A/V during the Hyksos period: Bietak 2010: 19; Forstner-Müller *et alii* 2015: 26; Michel 2016: 153.

16 In Area F/I: Bietak 1996: 10; Schneider 2010: 157. Examples of *Mittelsaalhaus* in Mesopotamia can be found for example at Khafadje (at Mound A, Delougaz, Hill and Lloyd 1967: fig. 14), Haradum, identified by Chavalas as a *Mittelsaalhaus* http://users.stlcc.edu/mfuller/aia/papers/chavalas/chavalas.html#D.%20Haradum:%20The%20Domestic%20Units <accessed October 2021>) or at Munbaqa (Machule and Blocher 2010: 1; Margueron 2013: 218).

17 In this regard caution is required: although not commonly found, adults are sometimes buried intra-settlement in Egypt, as is the case in Elephantine, Von Pilgrim 1996: 81–82. Schiestl (2002: 329) already suggested that the picture of the funerary culture in Egypt is somehow incomplete, as even in Upper Egypt some cases of proximity of tombs and towns can be found, as conveniently suggested by Kemp (1968: 30–33).

18 Bietak 1989; Burke 2019: 82.

19 Bietak 2010: 159, 2018: 76–80; Forstner-Müller 2010: 129.

20 For example, at Tell el-Maskhuta, Tell el-Yehudiyeh, Tell Hebua or Kom Rabia: Holladay 1982: 44–50; Paice, Holladay and Brock 1996: 163; Redmount 1995: 184; Rzepka *et alii* 2013: 273; Rzepka *et alii* 2014: 89; Ksiezak 2019.

by a hypothesis that explains that probably already during the Middle Kingdom a few factors were at play that could have facilitated the passing and / or settlement of different groups of western Asiatic origin in Egypt, and Avaris would not be an exception.[21] The urban background that resulted from this would represent the basis for the kingdom of the Fifteenth Dynasty.[22]

It is not the purpose of these paper to go into detail with this subject, as it has been sufficiently dealt with by other researchers. Here, I would like to explore what spatially oriented research could bring to the debate of population dynamics at Avaris.

3 | Ethnogenesis in ancient Egypt. Is space relevant?

A quick glance at inscriptions and representations of people in ancient Egyptian monuments or a detailed analysis of textual references concedes that the Egyptians featured diverse imagery to represent different kinds of population groups with whom they lived and whom they encountered. Although gradation in skin colour or the attribution of different dresses, attires and accessories comes to mind easily when thinking, for example, about the representation of the "Nine Bows", recent scholarship has highlighted that while the Egyptians would employ distinct language as well as varied artistic standards to represent differences they perceived in people, such conventions were fluid and were far from fixed.[23] Egyptian language possessed a rich vocabulary used to refer to population groups from neighbouring regions whose culture was apparently diverse enough to be named differently and considered as foreign. However, the inclusion of certain groups under the category of foreigner would enormously fluctuate through time, much dependent on the variations in political alliances or wars that the Egyptians would sustain with their neighbours.[24]

However, for most part of the history of Egyptology, representations of difference in ancient Egypt were equated with concepts such as "race" or "ethnos", very much influenced by the "racial anthropology" of the nineteenth century.[25] Such terms are in fact derived from colonial perspectives in the classification of human groups. In the early twentieth century, anthropology already exposed that, contrary to common opinion, ethnic identity is in fact a complex concept which is part of an even more complex process that is neither static nor fixed.[26]

Commonly described as an expressed feeling of belonging by groups that share physical similarities, language, religion, or said to have originated from a common ancestry,[27] the dynamics and complexities of human groupings led researchers to see the concept of "ethnicity" as fluid, mostly representing self-ascribed constructions that fluctuate in time and are dependent on social or political aspects.[28] They can be either emphasized or supressed depending on the context—what has been called situational ethnicity.[29]

21 Bietak 2018: 75; Schneider 2010: 158. For an introduction to the history of the settlement, see Bietak 1996, 2006.

22 Schneider 2010: 158.

23 Schneider 2010: 154; Moreno García 2018: 2; Matić 2020: 12.

24 See, for example, Chantrain 2019; Matić 2020: 11.

25 Matić 2018: 33, 38; Bader 2021: 9–14.

26 Shennan 1994: 13–14; Jones 1997: 64; Candelora 2018: 47.

27 Shennan 1994: 15; Jones 1997: 62.

28 Jones 1997: 13.

29 Okamura 1981: 452; Shennan 1994: 16, 31.

Though material culture can sometimes be employed to reify a shared identity,[30] this does not necessarily have to be ethnic.

It is not the intention here to discuss the evolution of the concept of "ethnicity" or its uses in Egyptology, as there are already outstanding studies that occupy themselves with this subject.[31] However, it is necessary to emphasise how a narrow conceptualization of "ethnicity" and the creation of identities (termed "ethnogenesis") influenced the historical discourse created around the Hyksos and the elements of Near Eastern origin in Egypt during the past century. From this derived a common practice of classifying pottery, sculpture, personal objects or funerary customs and domestic areas as representative of a "Hyksos identity", and the elimination of the "identity" veil has proven to be tough.[32] The creation of a complete historical discourse must necessarily get rid of such culture historical views and contemplate interdisciplinary approaches. The goal is not to look for common associations of objects, but rather to underline how social dynamics were expressed or suppressed in the realm of materialities.

Given the lack of correlation between ethnicity and architectural style,[33] formal studies are not suitable for analyses where social processes constitute the main subject of research, but an approach to space can be relevant. Space is not simply the static scenario where events take place, but is an active part of the social context in which such relations occur. It can help the identification of social dynamics in the same way as other materialities. Daily interaction occurs in public and private spaces, and it is at this level that some of the forces that drive ethnogenesis might be located.[34]

While a geographical determinism should be avoided at all costs, the presence of space in the creation and, especially, the maintenance of coeval social dynamics merits a deeper study. Space can get us closer to the construction of social group dynamics.

4 | Can spatiality help to detect population dynamics?

Analyses based in the application of tools from spatial analysis are a suitable medium to overcome the overreliance on comparative studies when studying ancient settlements.[35] The relevance of a Space Syntax approach is well established since the twentieth century. Researchers were able to determine that artificially generated cells in a computer made myriad spatial structures that, however vast, comprised a finite number of combinations.[36] That means that space has actually a "limit" in what combinations can be formed,[37] pointing out why groups and cultures separated in time and place may end up creating similar types of structures. This experiment led the authors to propose the existence of a

30 However, group bonds can also be expressed by recourse to symbolic and/or non-material aspects.

31 Assmann 1996; Schneider 1998; Diego Espinel 2006; Candelora 2018; Moreno García 2018; Matić 2020; for a more general approach to ethnicity in archaeology see also Jones 1997.

32 Candelora (2017) has recently dealt with this concept of "Hyksos identity".

33 Emberling 1997: 317.

34 Bawden 2005: 13.

35 Spatial analysis encompasses a huge field of applications. In particular, Space Syntax has already been explored in Mesoamerican archaeology (Parmington 2011; Morton 2012) and in classical archaeology of ancient Greece and Rome (Stöger 2015).

36 Hillier and Hanson 1984: 54.

37 It is important to stress here that urban syntax is not movement modelling. Urban syntax aims to understand and explain aspects of human behaviour in relation to the built environment.

"subjacent logic of space": space possesses a very extensive, but finite capacity of combination.[38]

A lot has changed since this method came about, and subsequent upgrades and derived applications have been conceived, although the appeal of spatial syntax is still growing. The study of space as social catalyst has been limited for a long time to studies coming from disciplines such as human geography or, more recently, social theory.[39] The introduction of the "spatial turn" in archaeology offers the advantage of replacing formalistic approaches by analyses that concentrate instead on the processes that can generate space. While two built spaces can look identical, the underlying processes that set them up vary, and are the product of different dialectics. These processes are not immediately evident by looking at a two-dimensional representation like an excavation plan, so spatial software can be used as a supporting tool for researchers interested in social change.

These pages show an attempt to use such analysis (figs. 2–5) based on the application of *Depthmap,* a versatile software developed within the Space Syntax School.[40] The selection of this software, whose value I already noted elsewhere,[41] arises from the utility it lends to the study of topology, the relations existent in space such as visibility or adjacency. *Depthmap* works by calculating values such as segments (streets) and angular change (turns) between them, and several variables can be measured.[42] Here I display only two, expressed respectively by global integration and connectivity.

The first shows how accessible a street is in relation to the entire network, or the potential a point has for being selected as a destination, the "to-movement". The second value measures the number of lines that directly intersect a given axial line: the possibilities that a segment has of being frequented.[43]

An example may be needed to clarify these concepts. Suburban zones in modern European cities conform to desirable housing areas, as they provide a quiet location at a sensible distance from busy city centres. This distance increases the sense of security and intimacy of the residents because the influx of unexpected pedestrian flow is very low. In many cases, the accessibility to these suburbs is severely reduced if the person does not own a car. If it does, the suburbs can easily connect with the centres of cities while at the same time avoiding the constant noise of areas like high streets. In urban syntax models, suburban zones are characterized by a decent level of integration but moderate connectivity. This model serves to illustrate that every purposeful structuration of space is based in the connection and integration of areas. This combination can be conscious, as public and private spaces shaped by people, or unconscious, because peoples' behaviour is also subconsciously affected by space. Ancient spaces were not an exception.

38 Hiller and Hanson 1984: 12, 80.

39 Both fields also had their share of contradictory theories as per the utility of space as an object of study and the importance of space as a variable in social processes. An excellent compilation can be found in Soja 1989.

40 DepthmapX (Version 0.6.0) [Computer software], https://github.com/SpaceGroupUCL/depthmapX/, last accessed 01/08/2021.

41 A complete analysis of the entire Area A/II at Avaris and an example of Byblos during the *Sableaux* period (c. 3000–2800 BC) can be found at Gómez Senovilla 2019.

42 See more at Jiang and Claramunt 2002.

43 There are more variables that can be calculated using *Depthmap*, as Choice. This value is related to integration but measures the quantity of movement that passes through each element on shortest trips, the "through movement", Hillier, Yang and Turner 2012: 2.

Some have questioned what utility these tools may offer in cases where the height of the walls and the location of doors are not known. While this is a valid point, these two constraints would not change the values. The reason is that *Depthmap* is not applied here to internal spaces, for which the location of the door and the height of walls would be needed. Software to calculate the amount of light that a street or building get do exist, but the visibility in *Depthmap* is not related to light. On the contrary, it derives from the range of vision dependent on the axiality of a straight line, and not on the amount of light a street can get. It can be applied if the purpose is directed to explain the connection of a segment or area.

On the other hand, the shape of the building would have had an influence on the degree of immediate privacy. But if this shape does not reduce or enlarge the axial line—for example, when the façade protrudes onto the street—the values remain unchanged. The application of such methods in cities with very narrow lanes and high buildings, such as Venice, has not changed the applicability of these values.[44]

5 | Study case. Results of Depthmap applied to Area A/II of Avaris-Tell el-Dabʿa

As already mentioned, Avaris-Tell el-Dabʿa, notwithstanding an initial planned occupation at ʻEzbet Rushdi and in area F/I,[45] seems to present a spontaneous growth pattern in Area A/II[46] that did not follow a programmed arrangement. The change of uses by period, the gradual erection of temples and palaces,[47] and a subsequent shaping into a more strict planning order, bear witness to an increasingly narrow relationship with the structures of power, foreshadowing the capital status the town would achieve during the Fifteenth Dynasty.

The displayed exercise with *Depthmap* focuses on showing the corresponding values of connectivity and integration for the phases G (c. 1770–1710 BC) and E (c. 1680–1590 BC),[48] respectively. Higher values are shown in a colour gradient from red to yellow, while lower ones use undertones between green and blue. It is important to note here that the final values in *Depthmap* are much dependent on the expanse of the surface analysed. While this particularity of the software underscores its versatility to be applied both at a macro and a micro-scale, changing scales when necessary, the lack of excavated surface at ancient settlements inevitably acts as a constraint to a multi-scalar approach, shading the results. This drawback must be considered in order to not jump into impromptu conclusions that may only be the result of insufficient data. Unexcavated areas in A/II are interpreted by the software as a vacuum or as a non-analysable space. Future excavations and additional data could significantly change the model presented here.

Going back to the analysis, during the first documented occupational phase or Stratum G there is a significant number of domestic areas compared to subsequent periods. The values for connectivity during Stratum G are higher over the main street (fig. 2) although the presence of a median wall (identified as MW) deviates the steadiness of the axial line, reducing the connectivity in its southern sector. These lower values probably derive from the connection with the southeast—unexcavated—

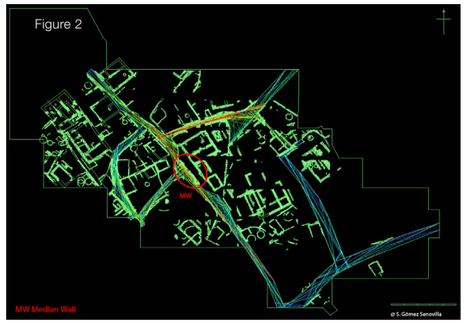
44 While axial lines work the same, the only variation found in Venice with respect to other modern cities is that there are variations in the local-to-global or global-to-local interaction. In Venice, local planning is influential at the level of the streets but lacks global structure (Hillier, Yang and Turner 2012: 179). The latter is, however, dominant at the level of the canals, see also Crompton and Brown 2007. This subject would occupy another paper.

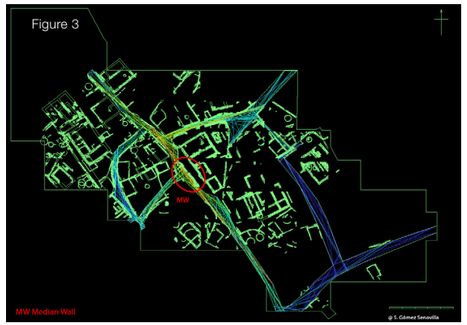
45 See note 13.

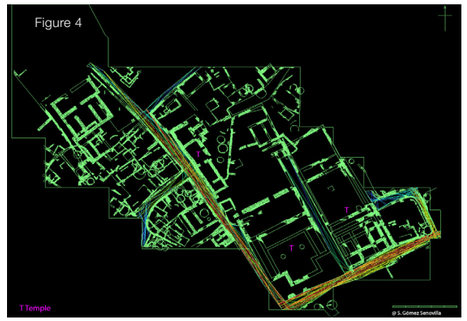
46 For a general introduction to the area, see: Bietak 1968, 1970, 1991b, 1994; Förstern-Müller 2001; Bader 2020.

47 Bietak 2003, 2016: 223–227, 2019: 47–49.

48 For the chronological outline of Avaris, see fig. 6.







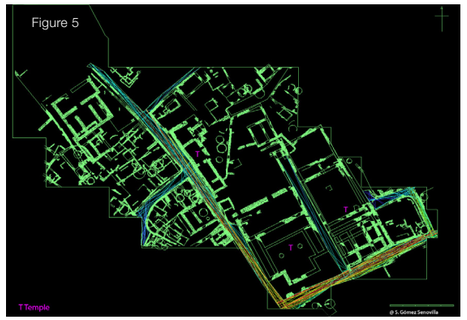


Figure 2. Connectivity, Area A/II, Stratum G © S. Gómez-Senovilla. Figure 3. Integration. Area A/II, Stratum G © S. Gómez-Senovilla. Figure 4. Connectivity, Area A/II, Stratum E © S. Gómez-Senovilla. Figure 5. Integration. Area A/II, Stratum E © S. Gómez-Senovilla.

area, which is interpreted by the software as a *cul-de-sac* and consequently with no connection whatsoever to any other lane. The values shown for integration in Stratum G are very similar to those of connectivity (see fig. 3) except in the southeast, where the blue is much more intense.

During the next phase, (Stratum F, c. 1710–1680 BC, not shown here) the area was mostly employed as a necropolis,[49] and already during phase E/1 (c. 1620–1590 BC), the area does not appear as exclusively domestic,[50] but will progressively achieve a cultic character with the erection of four temples.[51] Connectivity values in this phase (fig. 4) are high and constant along the N – S street, also in the southeast. Integration values (fig. 5) are also even, contrary to what was shown in the previous phase. Now the colour lines are very uniform and subtly merge into each other. Despite the lack of excavated surface that resulted in low values for the previous phases, the area on the southeast is shown now as a highly integrated part. This opens an interesting debate.

49 Bietak 1991b: 39–75, 1996: 36–48. For an Amorite hypothesis, see Burke 2019: 82.

50 Although domestic structures are present, such as the so-called "priest house" in Stratum E/3, Bader 2018: 121.

51 Bietak 2003: 13–16, 2006: 23, fig. 34, 2010: 154–156, 2019: 47–49. The area will be again of domestic character after phase E/1, during the Hyksos period (Bietak 1991b: 19–26).

6 | Discussion. Implications for the study of population dynamics in Avaris

As has already been mentioned, the initial habitation of Avaris seems to have taken place in areas R/I[52] and F/I[53]. Subsequent occupation was documented in areas A/IV[54] and A/II[55] (fig. 6).

Domestic settlement in A/II during Stratum G presents crammed houses that abut on winding lanes,[56] giving the impression that the occupation of the usable surface and the population density was in all probability high. The existence and location of this packed habitational quarter in this area of the site could have been related to accessibility to the harbour, which was situated towards the east (fig. 7).[57] The houses in Stratum G do not follow an ordered pattern, neither in disposition nor in shape, and the occupation in Area A/II seems to have been mostly determined by the availability of space (fig. 8).

At the beginning of Stratum F and after an abandonment period[58] the area starts to be used as a necropolis, as evidenced by the location of burials in what seems to be a relatively short period of time.[59] This fact was interpreted as an indication of the actuality of an epidemic.[60] Although this hypothesis has not been yet demonstrated, the fact that Avaris was a harbour town does not make this idea illogical. The epidemiological profile of harbour towns and cities points to the fact that infection and the transmission of illnesses were a common trait of such locations until modern times.[61]

It is in the following phase, Stratum E, when a change of use is bestowed onto Area A/II[62] (fig. 9). The space is progressively occupied with the completion of four temples, from which a Near Eastern *Breitraum* type stands out.[63] The restructuring that takes place in these strata involves the erasure of some lanes that abutted onto the main street from the northeast and northwest in the preceding period (compare fig. 2 and 4). There is also a new lane that joins the previously disconnected street to the southeast, where an access to the internal precincts of the temples is provided. Epidemic or not, it seems clear, however, that this area was given up for domestic purposes and the population might have been accommodated from

52 Bietak 2006: 15–16, fig. 11.

53 Bietak 2006: 16, 18.

54 The oldest stratum documented in Area A/IV has been dated towards the end of the Twelfth Dynasty. The following documented period already belongs to phases G and F, which coincide with the end of the Thirteenth Dynasty, Kopetzky 2010. Also, Forstern-Müller 2007: 83.

55 Bietak 2006: 18–19; Forstern-Müller 2007: 83, 92; Bader 2011: 45–56, 2018.

56 Bietak 1996: 31; Bader 2011: 45, 56–58, 2012: 220, 2018; Burke 2019: 82.

57 Bietak 2006: 16, fig. 3.

58 Schneider 2010: 158.

59 Also in Area F/I, Bader 2018: 109.

60 Bietak 1996: 7, 35, 2006: 16; Schneider 2010: 158.

61 Modern measures of protection such as quarantine were not in place until the modern age, a fact that would have boosted the infection rate at such places, Gensini, Yacoub and Conti 2004: 258. However, in the case of Avaris, this fact has not yet been proven so caution is advised.

62 Bietak 2006: 18. Fig. 9 here shows the final plan of the area during its final phase, so the image should be interpreted with caution.

63 Bietak 2003, 2006: 23, fig. 34, 2010: 154–156, 2019: 48–50. Another early *Breitraum* example has been identified within a necropolis precinct of the late Twelfth Dynasty in Area F/I at Tell el-Dabᶜa (as yet unpublished), Bietak 2019: 48. One example of this type of temple documented previously in Egypt dates from the Old Kingdom and was excavated at Tell Ibrahim Awad, in the eastern Nile Delta, Eigner 2000; Bietak 2010: 142–145, fig. 3.

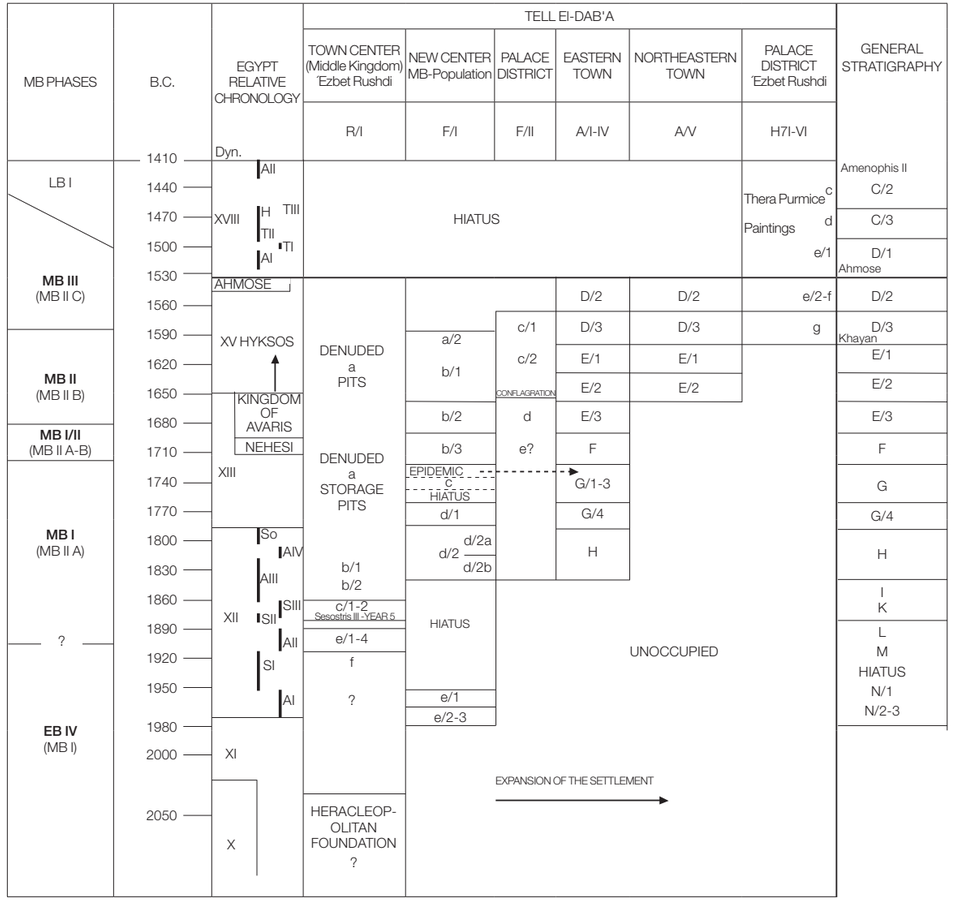


Figure 6. Chronology at Avaris – Tell el-Dab'a © M. Bietak.

now on in a different, more advantageous area of the harbour. The area A/II remains as a mostly cultic zone during the subsequent period.[64]

The main street values remain stable in all occupational phases of Area A/II. The construction of the four temples[65] appears as the only significant

64 Bietak 2003: 13. Domestic occupation during this period is documented in Area A/V, Hein and Jánosi 2004: 183–186; Bietak 2006: 19, 2010: 164.

65 Two of them were identified by Manfred Bietak (2016b:225) as chapels related to the nearby cemeteries.

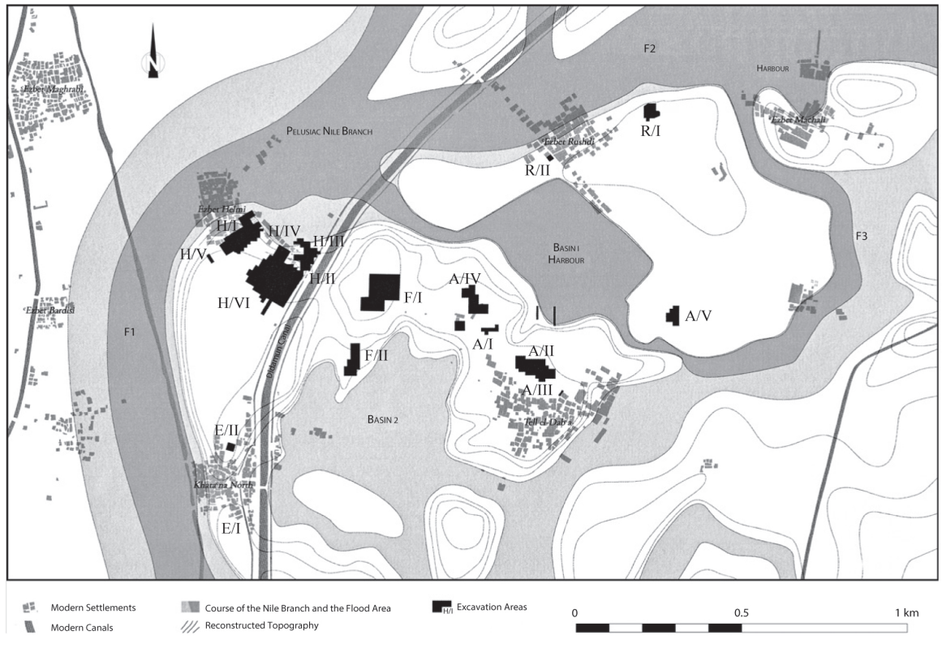


Figure 7. Occupational areas at Avaris – Tell el-Dab'a in relation to the harbour (Bietak 2010: 32, fig. 6) © M. Bietak.

Figure 8. Area A/II of Avaris – Tell el-Dab'a, Stratum G 1/3 (Bietak 2010: 40, fig. 14) © M. Bietak.

change affecting the area, implying more a variation of character and use. However, the application of *Depthmap* shows that more than the construction of new buildings is the restructuration of lanes and alleys, the closing of accesses, and the opening of some other spaces, not always in immediate association to the new buildings, that have the power to radically alter the connectivity and choice of an entire area. While built space affects movement patterns and inhabitant behaviour, and is for this reason an element frequently used as way of control by political powers—also in antiquity—, we must not forget that space is too a reflection of social dynamics. Changes in population habits, activities and attitudes can have immediate consequences in the landscape.

The novelty brought by *Depthmap* resides here in the different results given for the period when the temples were constructed, especially on the southeast edge. Although this could seem tautological, as we already know that the temples were in place and therefore the area must have suffered a change of use, it must be added that the software "does not know" this fact, and still brought back similar results to those emphasized by the excavators. The extension of the software used here does not rely on the presence of bigger buildings to gain results. Although the software offers the function of assigning a different value, according to their relevance, to every closed polygon (buildings) —for example, if the researcher wishes to signal landmarks such as churches or memorials—in this case I chose to assign to each building the common value 0. The results still show a significant change in this phase, revealing that the street configuration must not be seen simply as a passive reflection of the construction of the temples, but as an active agent in the configuration of space. After seeing the results brought back by *Depthmap*, I argue that a progressive change of use in the area, following a period of high mortality and / or waste of the land, catalysed the transformation of space that we see here. It is not bold to hypothesise that a change of habits and everyday practices following phase F would be leveraged by the official power by the subsequent development of a cultic area, creating the perfect arena for the advancement of official Syro-Palestinian–type religious practices. With this interpretation I give precedence to the use of space by people instead of it being official buildings that shape the rhythm of the place. Of course, this is only a supposition that needs to be studied in comparison with other areas of Avaris, but that I find necessary to mention here to encourage the challenging of initial assumptions about population dynamics.

7 | Conclusion and final remarks

I aimed here to highlight how the inclusion of quantitative methods can help in developing new hypotheses to analyse social processes from a new lens. Space can be made a fundamental part of the explanatory chain without falling into a determinist trap, and quantitative methods that derive from that can actually enrich ancient population studies. Modern approaches to the configuration of space have shown that it is frequent for the ethnic and social division in cities to become spatially apparent.[66] Immigrants, if possible, tend to follow similar paths when appropriating space, as this sometimes serves to protect them from rejection at the new place while emphasizing a sense of community and belonging.[67] On one hand, modern examples are influenced by different variables, not

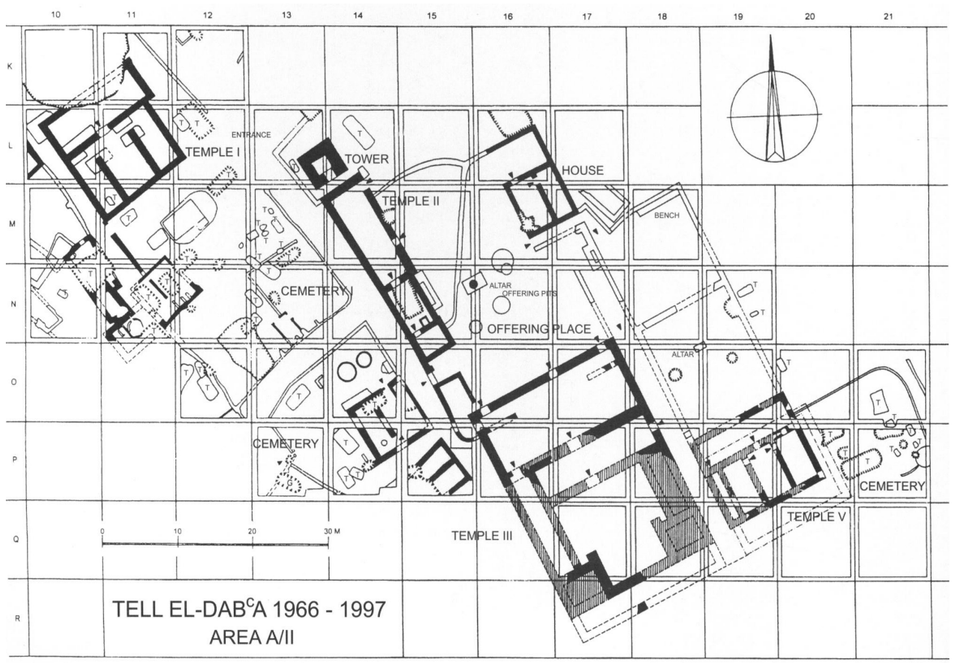


Figure 9. Area A/II of Avaris – Tell el-Dab'a, Stratum E, final phase (Bietak 1996, fig. 30) © M. Bietak.

all of them relatable to ancient population dynamics. On the other hand, it is true that there are social spaces that almost invariably acquire and maintain ethnic connotations much more easily, as settings like food stalls, kitchens, markets or squares show.[68] These usually take precedence over "official" uses of space.

Is it then possible to trace "ethnogenesis" in space? This is a very special question in the case of ancient settlements. Because identities in general, and ethnic identity in particular, are fluid and will become more or less salient depending on the geographical scale—house, public areas, region—it might be safer instead to attempt, first, a study of the evolution of social relations—in this case, I argue, using space as an alternative. The focus should be on which social relations are outlined, and what they seem to emphasize, instead

66 Thus, the division in Turkish and Greek neighbourhoods in Limassol, each with its own unique spatial configuration and a different use of the space, Charalambous and Geddes 2015: 82.

67 Piragauta 2015: 265.

68 Palaiologou 2015: 197.

of looking for "archetypal customs" pertaining to "one ethnicity". Without being too optimistic, once these social relations are highlighted, a detailed study of the space and context of other materialities such as those related to the preparation of food, religion, or the division of private spaces might help to define what kind of identity was emphasised—or averted. The exercise shown in these pages is not enough to conclude what type of population inhabited Avaris, as a broader study considering other areas as well as chronological implications must be included. However, some conclusions can be drawn.

In the case of Avaris, different traditions were specified at various levels at the same time. At a more official level, area A/II slowly acquires a cultic varnish that was probably a reflection of power relations that start to get mirrored in space. However, such relations must not be seen as just the imposition of an official rituality. The admixture of spiritual practices with very specific cultural contours determined by the erection of Syro-Palestinian types of temples, as well as Egyptian types, speaks of a phenomenon that goes much further than who was in charge. The potential of everyday practices to influence the development of space has been shown in the preceding pages, and it may be time to consider instead that an amalgamation of religious practices consequent of the wide variety of the population of Avaris would have influenced the later development of the area by the official rule. The analysis with *Depthmap* has shown that the power of changing connections is made in this area via the configuration of the street pattern and the opening and closure of alleys; modern scholarship has stated—see above—that this is often a product of social interaction and pedestrian use, and not necessarily a result of an imposition from above. High-streets in modern cities do not emerge from a "top-down" decision, but arise naturally where pedestrian flow is traditionally higher. I argue here that archaeologists should consider first the social uses of settlements, surpassing traditional interpretations that consider big symbols—temples, for example—as the only catalysts of change.

Still, an analysis at this scale is not enough to convey the entire identity of the population groups at Avaris, and different location as well as temporal variation must be considered. The premise that the population substratum of Avaris was entirely connected either to the Syro-Palestinian religious context or to the Egyptian ones in A/II does not consider how ancient cities and settlements were configured. The gathering of *locales* in current modern cities, with places of work, obtention of resources, religion, leisure, or living concentrated in the same place has influenced how researchers view the realities of ancient settlements. The truth is that before industrialization, most settlements were characterized by a separation and layering of such *locales*[69] that could be constituted by various nodes and were multi-layered. Area A/II would be but one sample of *locale* with some specific contours (official temples) that have left traces in the archaeological record, but by no means would correspond to the only religious practices of the entire population.[70] As stated by Bader "any differences *per se* should not be connected to ethnic identity but to varieties in practice carried out by various groups […] fulfilling their social and economic fates".[71]

69 Soja 1989: 152

70 I attempt a more comprehensive study in my ongoing PhD research, where I consider the distribution of *locales* in space of various contemporary settlements of Egypt and the Near East during the Bronze Age.

71 Bader 2021: 96.

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