Abstract: A persistent issue with the study of Late Bronze Age (ca. 1600–1100 BCE) chamber tombs in Mainland Greece remains our limited understanding of the factors that governed the choice of location for their construction. Mee and Cavanagh (1990) examined various parameters, such as religious beliefs, distance from settlement, the tombs’ use as territorial markers or relation to roads. They remained, however, inconclusive. The present study revisits this theme, but focuses on one of the factors formerly discussed, that is the relation of the tombs’ locations to roads. As the most extensive record of Mycenaean roads is preserved at the settlement of Mycenae in the Argolid and its hinterland, this site is considered to be the best case-study for analysis. In order to ascertain the significance of roads on the locations chosen for the chamber tombs, this paper builds a methodological approach that makes use of GIS-based mobility analysis and historical cartography. The analysis has shown that, at least at Mycenae, issues of accessibility to the tombs did not play as crucial role as the actual performance of rituals such as the funerary procession. It also sheds light on the form funerary processions probably took at Mycenae and on common notions of wheeled traffic use for the transfer of the dead to their tomb.

Keywords: Mycenaean Death-Scapes; Late Bronze Age Mortuary Practices; GIS and Archaeology of Mobility; Historical Cartography; Mycenaean Road System

1 Introduction

The rock-cut chamber tomb can be considered as the funerary monument par excellence for the Mycenaeans. It appeared in the Argolid during the Late Helladic I period (ca. 1600–1500 BCE) and soon became the main form of mortuary receptacle used by Mycenaean communities in the Argolid until the end of the Late Bronze Age (henceforth LBA) in 1100 BCE.

A persistent issue with the study of the LBA chamber tomb cemeteries in Mainland Greece remains our limited understanding of the factors that governed the choice of location for their construction. As noted by Shelton (2003b), their design and method of construction largely dictated their location: a sloping terrain and a suitable (soft) bedrock. These were the pre-requisites for choosing a location, but beyond that there must have been further parameters factoring in the choice of one sloping location over the next. O.
Exploring the Relation Between the Location of Mycenaean Chamber Tombs and Roads

Dickinson (1977) argued that the location of the chamber tombs depended on a correlation between distance from the palatial acropolis and status. Later, C. Mee and W. Cavanagh (1990) (but see also Cavanagh, 1987; Cavanagh & Mee, 1990) took on the task of systematically discussing the spatial organization of the chamber tomb cemeteries. In their paper, entitled “The spatial distribution on Mycenaean chamber tombs” (Mee & Cavanagh, 1990), they reviewed a variety of potential factors that might have influenced the choice of the tombs’ locations, such as “religious beliefs”, “tradition”, “roads”, the use of tombs as “territorial markers”, the relation to “a dispersed pattern of small settlements”, or “hierarchy, kinship and population”. Their study remained inconclusive, largely because they were trying to identify a standardized set of mortuary practices common to all, or at least to a good number, of Mycenaean communities along the same lines as the notion of the Mycenaean koine evident in the material culture and writing system during of the LH III period (1400–1200 BCE). The latest theory proposed was by E. French and K. Shelton (2005, p. 181), who argued that the distribution of the chamber tombs at Mycenae reflected the “tribal and family divisions of the community and their individual land-holdings”. The two have not disclosed, however, the rationale behind this association.

It is high time now that we revisit this theme, taking into account that new digital approaches and tools have been developed over the last 30 years that may help us re-evaluate the data available.

The present study, however, focuses on only one of the factors formerly discussed, that is the distribution of the tombs relative to settlements' road networks. The question to be explored then is whether the choice of the tombs' locations depended on the existence and suitability of a road network to service the tombs or whether the tombs' locations were chosen so as to increase (by manipulating the route length, duration and energy investment) the performative aspects of the funerary processions. The approach built and followed in this paper is grounded on GIS-based mobility and access analysis. It has to be noted beforehand that, while modelling movement is a recurring theme in archaeological GIS analysis, Mycenaean roads in Mainland Greece have received little scrutiny and never with the use of GIS-based spatial analysis tools, such as measures of terrain slope, elevations, visibility or relation to reconstructed optimal or least-cost paths. Building on previous personal work (Efkleidou, 2017) that explored how Mycenaeans manipulated spatial organisation for the display and negotiation of their social identities, I believe it is very interesting to investigate whether the location of chamber tombs was dependent on measures of distance, visibility or accessibility from respective settlements and their road network and whether this relation had any effect on the social structure of respective communities.

The case study for the present study constitutes the settlement of Mycenae in the Argolid and its hinterland. This is the area with the most extensive and best documented record of surviving Mycenaean road remains (for a list of archaeological sites with road remains see Cavanagh, 2001). The published chamber tombs and road network remains in Mycenae’s hinterland were mapped in a GIS environment and distance and mobility analysis tools were implemented to assess the distance between graves and roads; to reconstruct least-cost and optimal paths leading from the settlement to the graves; and to assess the suitability of the latter to accommodate funerary ritual practices, such as funerary processions. Historical maps illustrating the pre-industrial period at the site have been key tools in the reconstruction of ancient pathways in the present study. This approach allows for assessing the validity of the GIS-based reconstructed road network.

2 The Historical Background

During the Middle Helladic period (henceforth MH, ca. 2000–1600 BCE), burials in the Argolid took place primarily within the confines of the settlement (Milka, 2010; Philippa-Touchais, 2010; Voutsaki, 2010). The practice of distancing the place of burial from the settlement, especially within a tumulus, was the exception and has been securely identified at a handful of MH settlements in the Argolid, such as Asine and Argos (Voutsaki, Ingvarsson-Sundström, & Dietz, 2011; Voutsaki, Sarri, Dickinson, Triantaphyllou, & Milka, 2007). This practice was reserved for a small part of the communities which had the means and the aim to display their differentiation by variegating the location and form of burial, as well as the peri-funeral
practices they followed (Efkleidou, 2017). Distancing the burial location of the dead, for example, must have made it imperative to organize funerary processions to transfer and escort the dead to their place of rest (Efkleidou, forthcoming). From the end of the MH period onwards, the trend of distancing the tombs from the settlement became increasingly popular. Additionally, the number of chamber tombs, which appeared in the Argolid during the LH I period, exploded from the LH II period onwards (Mee & Cavanagh, 1984).

The performative aspects of the funerary processions are not the subject of the present study, but it has to be noted that even today funerary processions constitute a promising stage for display and for both participants and audience to make social statements (Kavoulaki, 2000). Aspects of the processions, such as the provision of a cart for transferring the dead (ox-driven perhaps), the dressing of the dead and the mourners, and the display of the necessary ritual instruments and burial gifts to be placed with the dead during their transportation to the grave, form only part of the qualities that made the procession a ritual increasingly important for the Mycenaeans as the distancing of their graves, especially of the chamber tombs, became the rule (LH II–LH IIIC periods, ca 1500–1100 BCE). It is unfortunate that we only have available a glimpse of these ritual acts painted on clay mortuary larnakes, such as the larnakes of Tanagra with depictions of mourners and funerary processions (Cavanagh & Mee, 1995; Immerwahr, 1995). These can be compared, however, to other ritual processions mentioned in the Linear B tablets (Weilhartner, 2013) and illustrated in Aegean iconography (Blakolmer, 2008; Hägg, 2001; Peterson, 1981; Wedde, 2004).

What is important to this paper is the consideration that various qualities of the increasingly important funerary processions must have been related to the location of the grave. Was the choice of the tombs’ locations dependent on the existence and suitability of a road network to service the tombs or was the tombs’ location chosen so as to increase (by manipulating the route length, duration and energy investment) the performative aspects of the funerary processions? This sounds like the chicken or the egg dilemma, but it is worth exploring it, as such an inquiry may shed light onto more aspects of the mortuary practices and funerary rituals of the Mycenaeans than one might expect.

As mentioned already, this was more or less the question posed by Mee and Cavanagh (1990) in their paper as well. The two largely dismissed the possibility of successfully evaluating the connection between roads and tombs’ locations because of the very partial and limited record of surviving road remains at the sites of Mycenae, Kazarma, and elsewhere that had been published and systematically discussed (Crouwel, 1981) by that time. Since then, new studies of road remains have appeared (Cavanagh, 2001; Hope Simpson, 2002; Jansen, 1994, 2001, 2002; Lavery, 1990, 1995; Wells, 1990). The only exception these studies noted was the site of Nichoria, where the tholos tombs were located beside a major road (Wilkie, 1987). The most recent study (Jansen, 2003) has focused on the site of Mycenae and its hinterland, where the most extensive record of surviving remains of Mycenaean roads has been found to date. This is also the area that will be used as the case study in the present paper.

### 3 The Mycenaean Roads of Mycenae

The first to identify and document remains of ancient roads in the vicinity of Mycenae was Captain B. Steffen, an officer of the Prussian artillery in Cassel-Germany and the cartographer of the first systematic survey and commentary of the antiquities of Mycenae (Steffen, Lolling, Robinson, & Schliemann, 1884). The date of the road remains was securely established by G. Mylonas (1966) based on sherds found in the fill sealed by the surface of the roads. A three-tier hierarchical road network seems to have existed at Mycenae (Jansen, 2003). The first tier involved the “highways”, four roads of monumental construction that had the ability to accommodate wheeled traffic that connected the settlement of Mycenae with other settlements and regions in general to its north, east and south (see Figure 1). The second tier were mostly unpaved local streets or roads that accommodated traffic within the settlement. Finally, the third tier should be classified as the network of tracks that were used only for pedestrian traffic and did not need to be paved or subjected to strict limitations of terrain and slope. No structural remains of these tracts have been identified, as is expected, since trackways are trodden through continuous use and maintained by memory and practice. Nevertheless, these trackways can be reconstructed digitally. The remains of the Mycenaean roads were
digitised from the relevant map produced during the most recent survey conducted in the area of Mycenae by the Archaeological Society at Athens and the British School at Athens and published as part of the Mycenaean Atlas (Andreadi & Braggiotti, 2003).

4 The Chamber Tombs

The rock-cut chamber tombs of Mycenae form perhaps the largest set of tombs in the Argolid. Researchers have mapped 216 tombs that were constructed in different periods (Andreadi & Braggiotti, 2003; Xenaki-Sakellariou, 1985) within an area of 300 hectares (see Figure 1). The tombs are spatially clustered in “cemeteries” dispersed both within and outside the area of the settlement. In total, 27 cemeteries have been defined and named after the area where they have been found (the entire set of the tombs has been revisited recently and mapped in Andreadi & Braggiotti, 2003; and discussed in particular by Shelton, 1993; Shelton, 2000, 2003a, 2003b). The tombs are constructed at slopes varying from 3.94% to 66.68%, with a median of 23.91%, and their orientation always follows the direction of the slope on which they have been constructed.

5 The Terrain

A final note needs to be made regarding the Digital Elevation Model (henceforth DEM) used for the analysis of the terrain. As several scholars (for example Herzog, 2013b) have commented on the effect of the DEM quality (resolution) on the results of various analyses based on it, such as mobility analysis, it was considered necessary to produce a high-resolution DEM of the hinterland of Mycenae. The DEM, with a cell size of 2m, was produced from contours, streams, lakes, and elevation points compiled from the Greek Army Topographical Map series of 1:5,000 scale and the use of the Topo to Raster interpolation method (M. F. Hutchinson, 1989; M. F. Hutchinson & Dowling, 1991). The terrain of Mycenae’s hinterland is best characterized as hilled. This rugged terrain includes only 1.8% of slope grades lower than 4%, that is flat or almost flat, and 95.42% higher than 10%. Significant changes in the landscape took place not only during the Late Bronze Age (1600–1100 B.C.E.), but also later, when a sizeable town was formed during the Classical and Hellenistic period (5th–1st century B.C.E.). Nevertheless, the area that we are most interested in (to the west of the Panaghia ridge and outside the limits of Mycenae’s town at any period of time) seems to have been minimally changed, as only evidence associated with agricultural exploitation has been documented (for example in the area of Pezoulia) (French 2002, p. 141).

6 First Observations

Merely looking at the datasets on the map (Figure 1) produced in ArcGIS, one observes that the sheer majority of the tombs, irrespective of their date of construction or use, has no immediately evident spatial relation to the road network. The greatest concentration of chamber tombs lies west of the settlement, beyond the natural border that the Panaghia ridge forms between the landscape of the living and that of the dead. This area is completely void of any Mycenaean road remains that could have serviced the tombs. Rather, the Mycenaean road remains evidence the connections of the town to areas lying in the North (Corinth), the East (Berbati valley) and the South (eastern parts of the Argolic plain). As a result, it is ineffective to use straight-forward distance tools that would measure Euclidean-distance buffer zones from the roads’ flanks and the distribution of the tombs within these buffer zones.

As a result, two different lines of thought need be explored in order for us to decide whether the tombs’ locations were chosen vis-à-vis a pre-existing road network and to what extent the tombs’ locations had any effect on the performative aspects of the routes necessarily leading to them (by manipulating these routes’ length or level of difficulty to travel). The first line of thought requires us to use the least-cost path (LCP) modelling procedure in order to reconstruct an optimal road network, for which we have absolutely
no indications of its existence, and subsequently examine the tombs’ locations vis-à-vis this “virtual” road
network. The second line of thought makes a combined use of the LCP procedure and historical evidence
for the road network that existed in the 19th century in the area of the tombs as shown on historical maps.

Figure 1. The hinterlands of Mycenae, the chamber tombs and extant Mycenaean road (“highways”) remains.

7 The Least-Cost Path Modelling Procedure

The least-cost path modelling procedure falls within the realm of GIS-based mobility analysis. Over the
last thirty years, mobility analysis (among other GIS-based spatial analysis tools) has become a recurring
theme in archaeology considered to provide an experiential approach to understanding past landscapes
(i.e. Bevan, 2011; Llobera, Fábrega-Álvarez, & Parcero-Obiña, 2011; Lock, Kormann, & Pouncett, 2014;
Murrieta-Flores, 2010; Polla & Verhagen, 2014; Verhagen, Brughmans, Nuninger, & Bertoncello, 2012).
A basic tool of mobility analysis involves the modelling of least-cost paths (henceforth LCP) or corridors
based on a cost surface created with the cost-distance or the path-distance tools in the ArcGIS 10x Distance
toolset of the Spatial Analyst toolbox (Wheatley & Gillings, 2002). The Path-Distance toolset presents most
relevance to this study, as it is anisotropic and allows, furthermore, for more complexity in modelling actual
distance on the terrain’s surface by taking into consideration various horizontal (speed, friction) and/or
vertical (vertical relative moving angle, VRMA) factors (Bevan, 2011, 2013; Herzog, 2013b, 2014a; Herzog &
Posluschny, 2011). As a result, the success of any LCP model depends on the cost function, that is the choice
of the most appropriate algorithm to model movement under the influence of various cost factors and to
create the cost surface.

It should be noted, nevertheless, that intangible or symbolic factors, such as attraction to a monument
or natural feature, and generally the intrinsic will of people as individuals or as members of a group, could
have affected the choice of route followed. However, these factors cannot be successfully modelled into an
algorithm that can be read by GIS software (Herzog, 2013b).
For the needs of the present study two algorithms were tested: the first based on Tobler’s Hiking Function (Tobler, 1993) and the second based on Naismith’s Rule of Thumb (Naismith, 1893) with adjustments by Langmuir (Langmuir, 1984). In both cases, the cost paths’ lengths are expressed in pedestrian travelling time. Comparison of the resulting travelling times of both formulas with empirical hiking times reported for two known routes connecting Mycenae to Mastos in Berbati and to the Argive Heraeum (Prosymna) (E. Milka, personal communication, April 02, 2012) has shown that Naismith’s rule of thumb correlates better than Tobler’s function (Figure 2). A similar conclusion is reached also by Bevan (2013, p. 9) for Crete.

Tobler’s Hiking Function is a well-known algorithm that has been used extensively in archaeological applications of mobility analysis (for a relevant discussion, see Herzog, 2014b). The formula accepts that speed and time necessary to walk a distance are dependent on slope tilt and direction (uphill or downhill). The algorithm modified from White (2015) is the following:

\[ T = \frac{\text{DEM\_resolution}}{1000} / (6 \times \exp(-3.5 \times \text{Abs(Tan(("slope\_raster in degrees" * 3.14159) / 180) + 0.05)))} \]

where \( T \) = time/ 1 meter

Similarly, Naismith’s Rule of Thumb accepts that movement speed is dependent on the steepness of slope. Naismith’s rule accepts that a man walking at a speed of 5km/hour needs 1 hour to traverse 3 miles (5 km) of flat plain and an additional hour for every 2000 feet (610 m.) of uphill walking. Langmuir’s corrections to Naismith’s rule state that 10 minutes need to be subtracted for every 1000 feet (305 m.) of downhill walking on slopes between 5 to 12 degrees and 10 minutes added for every 1000 feet (305 m.) of descent on slopes.
greater than 12 degrees (Carver & Wrightham, 2007).

The formula, as published by Langmuir (1984), calculates time in seconds:

\[ a \Delta_D + b \Delta_{H\_up} + c \Delta_{H\_gd} + d \Delta_{H\_sd} \]

where \( \Delta_D \) is horizontal distance covered, \( \Delta_{H\_up} \) is uphill elevation change, and \( \Delta_{H\_gd} \) and \( \Delta_{H\_sd} \) are gentle and steep downhill differences. All distance measurements are in meters. The default values for the multipliers are: \( a=0.72, b=6.0, c=1.9998, d=-1.9998 \).

The formula is integrated in GRASS GIS’ r.walk module (Fontenari et al., 2004), but in ESRI’s ArcGIS one needs to incorporate into the PathDistance tool the “vertical factor” table that translates the angle of slope (in degrees) between successive cells in the raster into a “vertical factor” showing the time necessary to walk the corresponding distance (Carver & Wrightham, 2007, table 1).

When the two formulas were tested and their results compared (Figure 3), it appeared, on mere visual inspection, that the differences as to the actual paths drawn were insignificant (the discrepancy, nevertheless, in travelling time still remained). It should be noted at this point that both Tobler’s function and Naismith’s rule work well on clear and good footpaths (earthen or paved, such as the Mycenaean roads were), but they will also produce results even in such landscapes where roads did not exist or where roads cannot exist due to very steep slopes. In other words, the formula will always calculate a path between two points by itself, irrespective of how harsh a terrain might be.

Figure 3. The LCPs based on slope costs only and the extant Mycenaean road (“highway”) remains.
8 First Approach: Modelling an Optimal Road Network for Mycenae

In order to explore the spatial relationship between the tombs’ locations with a possible pre-existing road network, it was deemed necessary to model an optimal road network that leads in the best (the fastest and the best-suited to pedestrian, equestrian and wheeled modes of travelling) possible way to the settlement of Mycenae from all directions. Once this optimal road network is modelled, we can explore the distance of the tombs from this road network and determine whether the tombs were constructed near or far from pre-existing roads.

Drawing inspiration from the agent-based approach of modelling dispersal introduced and implemented by Irmela Herzog (2013a, 2016), I attempted to calculate optimal paths leading from the settlement of Mycenae towards various locations on all directions around the settlement and its mortuary landscape. As mentioned already, the paths should be able to accommodate travelling by walking, on horseback, and by wheeled means (chariots and carts drawn by horses or oxen), as these modes are all attested for the Mycenaean period. This condition, however, touches upon the issue of the critical slope when modelling uphill or downhill movement.

9 The Critical Slope Issue

There are several studies to date that have addressed the issue of the critical slope in travelling strategies, that is the critical point of slope when it is more efficient in energy and time cost to shift from direct uphill or downhill to a zigzagging trail so as to maintain a steady critical slope (Bevan, Frederick, & Krahtopoulou, 2003; Herzog, 2013b, 2014a, 2014b; Herzog & Posluschny, 2011; Langmuir, 1984; Llobera & Sluckin, 2007; Minetti, 1995; Minetti, Moia, Roi, Susta, & Ferretti, 2002). While there is no consensus over the ideal critical slope, there is general agreement that the critical slope differs for pedestrians depending on, for example, whether they carry loads or not, as well as between pedestrians and wheeled traffic and between different types of wheeled traffic. This is of interest to the present study as it is envisaged that the paths leading to the tombs should have been suitable for walking as well as for carrying the dead on foot or by wheeled means, such as with the use of bullock carts.

| Study                     | Critical slope for pedestrians | Critical slope for wheeled traffic |
|---------------------------|-------------------------------|-----------------------------------|
| (Herzog & Posluschny, 2011) | 8–12%, mean 10%               |                                   |
| (Posluschny, 2012)        | 12%                           |                                   |
| (Herzog, 2013b)           | 25%, but one can find gradients within the range 15–40% Medieval roads: 13% |                                   |
| (Herzog, 2016)            | 46.6%                         |                                   |
| (Langmuir, 1984)          | 6%–8% for bullock carts, but wind speed or undulation on the off roads makes carts unstable | 26.8%                             |
| (Kankal, 2016)            | 8.3%                          |                                   |
| (Kamiya, 2015)            | 8.3%                          |                                   |

In order to accommodate for different travelling modes, a series of cost rasters was calculated, each with a different critical slope depending on the mode of travelling, based on historical and modern ethnographic data presented in Table 1: for wheeled traffic: 8% and 10%; for pedestrians: 25% and 40%. The procedure
involved adding weight to the standard degrees slope raster by multiplying each time the cells above the critical slope by a factor of 3, so that steep slopes are considered increasingly difficult to impossible to cross as their values get closer to 90°. Cells with weighted values above 90° were then assigned “No Data” value.

10 The Optimal Paths Procedure

The procedure for the optimal paths leading to the settlement of Mycenae involved the setting of a point on the acropolis hill as the point of origin for calculating least-cost paths (LCPs). As the settlement could have been approached from various directions, the cost paths were calculated towards 35 destination points arbitrarily placed around the study area at a distance of 600–1600 m from the acropolis of Mycenae so as to include the site’s entire mortuary landscape inside the imaginary circle formed if one joins the dots (Figure 4). The LCPs were modelled using the PathDistance tool, implementing Naismith’s Rule of Thumb based on four critical slope rasters (with critical slopes at 8%, 10%, 25% and 40%) (Figure 5). The comparison of the results showed that, irrespective of the critical slope raster used, the modelled LCPs leading towards the west and towards the south were generally the same and in both directions they follow along two stream courses respectively (the east-west goes along the Kokoretsa stream and the north-south along the Khavos stream). A similar all-prevailing least-cost path is not evident at the north-northeast side of the case study area, where the algorithms present a tendency to follow the multitude of minor stream courses. It is important to note, however, that through this procedure it became possible to model the course of a possible road that would connect Mycenae in the fastest and easiest way to the west and the well-known Tretos pass, which connected Corinthia and the valleys of Nemea and Kleonai to the Argolic Plain. This section of the optimal road network has been modelled for the first time and is missing from all previous documentations and reconstructions of the Mycenaean road network at Mycenae.

Figure 4. Destination locations encircling the study area for modelling optimal LCPs originating from the acropolis of Mycenae.
Figure 5. Universally optimal LCPs based on different critical slope rasters originating from the Acropolis of Mycenae. The routes coincide up to a certain point only in the case of destination points to the west and to the south of the Acropolis.

What is also interesting is the fact that none of the optimal paths crosses the main area of Mycenae’s mortuary landscape. Detour seems to be the keyword here, leading to the possible conclusion that most of the tombs were constructed at a distance and relatively “hidden” from the major roadways leading to and from the town of Mycenae.

If we accept that the tombs were constructed at locations irrespective of the optimal road network that would have serviced the settlement of Mycenae in its communication with other areas, then the choice of locations would have imposed the establishment of a secondary road network suitable for the needs of the community’s funerary rituals (transportation of the dead to their resting place and their escort by a funerary procession). It is to be expected that the pre-existing (optimal) road network would have served these needs to some degree as well. Nevertheless, the final parts of this secondary road network would have been designed so as to service each tomb or group of tombs.

As mentioned already, however, the area where the majority of the tombs were constructed is very hilly, and any algorithm tested as yet seems to avoid this area as unsuitable for travelling by any means. The same result is reached even when one tries to force the software to “think” that a traveller is forced to travel across the hilly area of the tombs. In order to try to force the software to chart a course through the hilly area, I set up two sets of diagonally opposed points: the 1st set of point A(from) to point A(to) and the 2nd set of point B(from) to point B(to). The points were placed so that the Euclidean (straight) paths between the points of each set crossed through the area of the tombs. The two Euclidean paths cross each other close to point C in figure 6, where a well is depicted on 19th century maps of the area. Even then, however, the LCPs modelled followed courses around rather than through this area (Figure 6).
11 The Evidence from Historical Maps of the Hinterland of Mycenae

Yet, people walked through this area of Mycenae’s hinterland not only in prehistory but also to this day. The paths depicted on 19th century C.E. historical maps of travellers to Greece and Mycenae are most informative, since these pre-industrial rural paths were used for travelling with more or less the same means as in the Mycenaean times (on foot, on horseback, by cart or wagon) and were not designed for cars. It should be mentioned that the first cars did not appear in Greece until the 1890s and their use remained restricted to only a few and mostly in urban centres until the Great War. Consequently, the roads depicted on these historical maps of Mycenae could help us understand the secondary network that might have serviced the tombs west of the Panaghia ridge.

W. Gell (1777–1836) was a British diplomat and member of the Dilettanti Society, under whose commission he travelled to Greece and Asia Minor. In his “Itinerary of Greece”, Gell (1810, pp. 25–27) described his approach to Mycenae on horseback as he was coming from Nemea. Gell was following the main road towards Argos (to the southwest of Mycenae) that crosses the western part of the case study area from North to South. To the east of this road Gell illustrates in his map of Mycenae (Gell, 1810, map 3) a network of minor dirt roads suitable for travelling on foot and by horse (Figure 7).
The same network of dirt roads is illustrated in Hauptmann B. Steffen’s map of the area (Steffen, et al., 1884) entitled “Mykenai mit Umgebung” and in Karl Baedeker’s map of Mycenae (Baedeker, 1894, map source: URL1). Steffen’s map constitutes the first map of the site and its hinterland produced with modern scientific standards at the large scale of 1:12,500 for the general area of Mycenae and of 1:750 for the Acropolis of Mycenae ever since the Carte de la Morée had been produced by the Expédition de la Morée in 1832 (Witmore, 2013). Steffen’s detailed survey of the area recorded a series of archaeological surface remains that were described by the German archaeologist and later Curator of the Epigraphical Museum of Athens, H. G. Lolling (1888–1894). Baedeker’s map is a reproduction and translation in English of Steffen’s map. Consequently, the following discussion based on the historical maps will be based on Steffen’s map.

Steffen’s georeferenced map (Figure 8) was used as the basemap for the digitisation of the 19th century road network in the study area. The roads indicated were distinguished into four tiers described in the map’s legend: the Chaussee mit massive Brücke (Road with massive bridge), the Verbindungsweg (Connecting road), the Feldweg (Track across fields), and the Fussweg oder Saumpfad (Footpath or mule track). The roads shown in the area of the tombs to the west of the Panaghia ridge were of the last two types, suitable for pedestrians and herd moving, but not for wheeled traffic, as only circa 19% of their route lies on slopes of less than the critical grade of 8% (see Figure 9). Nevertheless, the roads cross-cut the area of the main mortuary landscape and the tombs seem, merely upon visual inspection, to lie along or at small distances from these modern roads.

What one realizes from studying these historical maps is that there existed in pre-industrial times at Mycenae a network of secondary or tertiary roads and tracks that was being used extensively (at least enough to be considered worthy of mapping by a cartographer). As already shown, the algorithms used to model pathways in GIS software miss these less important networks and, thus, render any results faulty or inadequate in the least (Figure 10).

A final attempt to overcome this problem and understand the choice of locations for the tombs vis-à-vis these roads involved the modelling of an optimal road network following the same procedure as earlier but for the smaller area encompassing the hills west of the Panaghia ridge where the majority of the tombs were located. A point C was set in the approximate centre of the funerary area on the location of a still existing well, probably an important location that might have attracted travellers even in antiquity. The optimal
LCPs were modelled as originating from point C and moving towards all possible directions. Destination points were placed along a line encircling the area of the tombs at a radius of 300 m from point C (Figure 11). The LCPs produced with this procedure were largely compatible to the roads depicted on Steffen's map of 1884, indicating that it is a rather successful procedure for reconstructing the now lost road network that might have serviced the Mycenaean tombs (Figure 12).

**Figure 8.** The georeferenced map of Mycenae compiled by Steffen (Steffen, et al., 1884, map 2) and the digitized 19th century road network in the hinterlands of Mycenae.
Figure 9. Correlation of percent slopes with the roads illustrated in Steffen’s map of Mycenae (Steffen, et al., 1884, map 2).

Figure 10. The optimal LCPs based on various critical slope rasters and the 19th century C.E. road network in the hinterlands of Mycenae.
**Figure 11.** The LCPs based on an 8% critical slope raster originating from point C towards all directions.

**Figure 12.** The LCPs based on an 8% critical slope raster originating from point C towards all directions, the 19th century road network and the chamber tombs west of the Panaghia ridge and the settlement of LBA Mycenae.
12 Discussion

What is important to note on Figure 11 is that, when the last set of optimal LCPs (black lines) is examined in relation to the tombs’ locations, it appears that the chamber tombs at Mycenae were constructed at locations along or very near these optimal roads (Figure 12). This observation could be interpreted as indicating that the tombs were constructed at locations that could have been reached with the minimum possible effort for that particular rugged landscape. The fact, however, that the larger part of these optimal routes falls on slope gradients (percent) that are well beyond the critical slope window (8%–12% slope) for wheeled traffic indicates that these routes were suited only to pedestrian or horseback travelling (Figure 13).

![Figure 13. Correlation of percent slopes with the LCPs based on an 8% critical slope raster originating from point C towards all directions.](image)

Consequently, it proves that the Mycenaeans took into consideration a hierarchical order of factors when choosing the location for a tomb: first the topographical and geological profile of the location and then the tilt and elevation of the slope so that the tombs could be reached as easily as possible.

The conclusions reached at this point also shed light on the performative aspects of the paths leading to the tombs. It is possible that funerary processions to the tombs would follow, at least initially, the universally optimal paths discussed first in this paper, which connected the settlement to other regions and were largely suitable for both pedestrian and wheeled traffic. The transportation of the dead, their funerary offerings and any other equipment necessary for the peri-funeral rituals that would have taken place could have been performed on carts drawn by horses or oxen. Nonetheless, once the processions reached the hilly area of the majority of the tombs, they necessarily would have changed to being undertaken solely on foot: the dead and the rest of the equipment would have been carried by the people themselves or with handcarts. This change in the means of travel for the funerary procession also made an important impact on the performative aspects of the procession: perhaps the speed lowered, perhaps each participant took over some load to carry and perhaps the order and formation of the participants changed according to the relation to the dead, their personal or social standing or the equipment that they carried.

Distance and ease of access from the settlement to the tomb, expressed in the least cost of the funerary procession in energy and time, did not play any significant role in the choice of the tombs’ locations. This choice, however, can also be seen as the result of putting more weight onto the symbolic importance of the funerary procession itself as a multi-sensory performative practice (Boyd, 2014, 2016; Kavoulaki, 2000,
2005; Santillo Frizell, 1997–1998). Recently, this aspect of the funerary processions has been discussed extensively in relation to the generalized increase of the distance from the settlement area of the LBA tombs, especially from the LH IIIA period (14th century B.C.E.) onwards, when a clear distinction is observed at Mycenae between the landscape of the living and that of the dead (French, 2009). Following this line of thought, it can be argued that the longer the distance to be covered by the procession, the longer the time that would be available for the display of both the dead and his/her funerary equipment, for the display of the procession’s participants and their relative position, role and dress in the procession, and the larger the cost of organization and effort for the transportation of the dead, the grave goods and the paraphernalia of the funerary ritual before, during and after the burial (Efkleidou, 2017, pp. 343–369, 2018, forthcoming). All these attributes of the processions could have made an important impact on the display and negotiation of the identities of both those who organized the burial of a deceased and those who participated or viewed the funerary procession (Cavanagh & Mee, 1998, p. 107).

A final note of caution remains to be made that involves our present-day notions and reconstructions of funerary processions in the Mycenaean period. Even though there has not appeared to date any extensive discussion of the actual form that a funerary procession would have taken in the Mycenaean period, underlying notions of the use of wheeled means of transportation for the dead to their burial ground are popular (Boyd, 2014, 2016; Cavanagh & Mee, 1990; 1998, pp. 53–54; Marinatos, 1962). Within this context, some scholars have also associated the ritual deposition of equids with their use as drought animals for the funerary cart that was used for the transportation of the dead to the tomb (Hielte-Stavropoulou, 2004; Protonotariou-Deilaki, 1990; Stikas, 1965). While there is no conclusive evidence to the contrary of the use of wheeled means at the funerary processions, the results of the present analysis of Mycenae’s funerary landscape have shown that the organization of a funerary procession was more complicated than is usually presumed. To conclude, it is proposed that our reconstructions of ancient funerary practices must also be geo-contextualised, that is they must take into consideration the topography of the natural landscape of respective settlements and the effect that it had on the way funerary practices were organized, performed and/or evolved through time. It is also necessary to find ways to incorporate into our analyses more factors that might have affected the performance of processions (such as attraction to monuments and/or other symbolic landmarks), as well as more intangible ones (such as tradition, mythology or liminality).

Acknowledgments: The data for the present study were first gathered and mapped for the needs of my PhD thesis at the Aristotle University of Thessaloniki, which was funded by the A. Onassis Foundation and the Leventis Foundation. I would especially like to thank the organizers of the conference Unlocking Sacred Landscapes: Digital Humanities and Ritual Space, Giorgos Papantoniou, Apostolos Sarris, Christine E. Morris and Athanasios K. Vionis, for accepting my conference presentation and for offering me a bursary to attend the conference. I also extend my gratitude to both anonymous reviewers, whose comments helped me improve this paper.

Abbreviations

GIS – Geographic Information System
LBA – Late Bronze Age
MH – Middle Helladic
LH – Late Helladic

URL sources of Historical Maps

URL 1: http://el.travelogues.gr/item.php?view=53512 (accessed: 1/2/2019)
Mycenae. Aikaterini Laskaridis Foundation. TRAVELOGUES. TRAVELLERS’ VIEWS. Places – Monuments – People. South-eastern Europe – Eastern Mediterranean, Greece – Asia Minor – Southern Italy, 15th–20th century

URL 2: http://eng.travelogues.gr/item.php?view=42150 (accessed: 1/2/2019)
Map of the area of Mycenae. Aikaterini Laskaridis Foundation. TRAVELOGUES. TRAVELLERS’ VIEWS. Places – Monuments – People. South-eastern Europe – Eastern Mediterranean, Greece – Asia Minor – Southern Italy, 15th–20th century

References

Andreadi, E. & Braggiotti, L. (Eds.). (2003). Archaeological atlas of Mycenae. Athens: The Archaeological Society of Athens.

Baeder, K. (1894). Greece, handbook for travellers. Leipzig: Baedeker.

Bevan, A. (2011). Computational models for understanding movement and territory. In V. Mayoral Herrera & S. C. Pérez (Eds.), Tecnologías de Información Geográfica y análisis arqueológico del territorio: Actas del V simposio internacional de arqueología de Mérida (pp. 383–394). Mérida: Anejos de Archivo Español de Arqueología.

Bevan, A. (2013). Travel and interaction in the Greek and Roman world. A review of some computational modelling approaches. In S. Dunn & S. Mahoney (Eds.), The Digital Classicist 2013 (pp. 3–24). London: Institute of Classical Studies/Wiley-Blackwell

Bevan, A., Frederick, C., & Krahtopoulou, N. (2003). A digital Mediterranean countryside: GIS approaches to the spatial structure of the post-Medieval landscape on Kythera (Greece). Archeologia e Calcolatori, 14, 217–236.

Blakolmer, F. (2008). Processions in Aegean iconography II: Who are the participants? In L. A. Hitchcock, R. Laffineur & J. Crowley (Eds.), Dais: The Aegean feast. Proceedings of the 12th international aegean conference / 12e Rencontre égéenne internationale, University of Melbourne, Centre for Classics and Archaeology, 25-29 March 2008. Aegaeum 29 (pp. 257–268). Liège and Austin: Université de Liège & University of Texas at Austin.

Boyd, M. J. (2014). The materiality of performance in Mycenaean funerary practices. World Archaeology, 46(2), 192–205. doi: 10.1080/00438243.2013.879045

Boyd, M. J. (2016). Fields of action in Mycenaean funerary practices. In A. Dakouri-Hild & M. J. Boyd (Eds.), Staging Death: Funerary performance, architecture and landscape in the Aegean (pp. 57–88). Berlin, Boston: De Gruyter.

Carver, S. & Wrigtham, M. (2007). Shrinking wild lands: Assessing human intrusion in the Highlands of Scotland, 1870 to 2004, using Geographical Information Systems. In A. Watson, J. Sproull & L. Dean (Eds.), Science and stewardship to protect and sustain wilderness values: Eighth world wilderness congress symposium; September 30-October 6, 2005; Anchorage, AK. Proceedings RMRS-P-49. (pp. 357–366). Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Cavanagh, W. G. (1987). Cluster analysis of Mycenaean chamber tombs. In R. Laffineur (Ed.), Thanatos: Les coutumes funéraires en Egée à l’âge du Bronze. Actes du colloque de Liège (21-23 avril 1986), Aegaeum 1 (pp. 161–169). Liège: Université de l’Etat à Liège.

Cavanagh, W. G. (2001). Recent references to Bronze Age roads in the Aegean. In K. Branigan (Ed.), Urbanism in the Aegean Bronze Age (pp. 180–181). London and New York: Sheffield Academic Press.

Cavanagh, W. G. & Mee, C. B. (1990). The location of mycenaean chamber tombs in the Argolid. In R. Hägg & G. C. Nordquist (Eds.), Celebrations of death and divinity in the Bronze Age Argolid: Proceedings of the sixth international symposium at the Swedish Institute at Athens, 11-13 June, 1988 (pp. 55–64). Stockholm: P. Åström.

Cavanagh, W. G. & Mee, C. B. (1995). Mourning before and after the Dark Age. In C. Morris (Ed.), Klados: Essays in honour of J. N. Coldstream (pp. 45–61). London: Institute of Classical Studies, University of London.

Cavanagh, W. G. & Mee, C. B. (1998). A private place: Death in prehistoric Greece. Jonsered: Paul Åström Förlag.

Crouwel, J. H. (1981). Chariots and other means of land transport in Bronze Age Greece. Jonsered: Paul Åström Förlag.

Cavanagh, W. G. & Mee, C. B. (1998). Mourning before and after the Dark Age. In C. Morris (Ed.), Klados: Essays in honour of J. N. Coldstream (pp. 45–61). London: Institute of Classical Studies, University of London.

Cavanagh, W. G. & Mee, C. B. (1998). A private place: Death in prehistoric Greece. Jonsered: Paul Åström Förlag.

Crowel, J. H. (1981). Chariots and other means of land transport in Bronze Age Greece. Jonsered: Paul Åström Förlag.

Dickinson, O. T. P. K. (1977). The Origins of Mycenaean civilisation. Göteborg: Paul Åström.

Efkleidou, K. (2017). Organosi tou chorou kai koinonikes tafottes sti Mikinaiki Argolida. Symvoti sti meleti tis arheologiais tou topiou me ti chrisi Sistimaton Geografikon Pliroforion. [Landscape organisation and social identities in the Mycenaean Argolid. A contribution to the study of landscape archaeology with the use of Geographic Information Systems] Athens: Pedio. [in Greek]

Efkleidou, K. (2018). Architectural conspicuous consumption and design as social strategy in the Argolid during the mycenaean period. In A. Brysbaert, V. Klinkenberg, A. Gutiérrez Garcia-M. & I. Vikatou (Eds.), Constructing monuments, perceiving monumentality and the economics of building. Theoretical and methodological approaches to the built environment (pp. 65–86). Leiden: Sidestone Press.

Efkleidou, K. (forthcoming). Ritual processes between death and politics. In H. Whittaker von Hofsten & A.-L. Schallin (Eds.), Aegean processions and ceremonies in context. Oxford: Archaeopress.

Fontenari, S., Franceschetti, S., Sorrentino, D., Mussi, F., Pasolini, M., Napolitano, M., & Flor, R. (2004). r.walk. GRASS GIS manual. Retrieved from https://grass.osgeo.org/grass72/manuals/r.walk.html (accessed: 30/1/2019)

French, E. B. (2002). Mycenae: Agamemnon’s capital. The site in its setting. Gloucestershire: Tempus Publishing.

French, E. (2009). Town planning in palatial Mycenae. In S. Owen & L. Preston (Eds.), Inside the city in the greek world: Studies of urbanism from the Bronze Age to the Hellenistic Period (pp. 55–61). Oxford: Oxbow Books.
French, E. & Shelton, K. (2005). Early palatial Mycenae. In A. Dakouri-Hild & S. Sherratt (Eds.), Autochthon: Papers presented to O. T. P. K. Dickinson on the occasion of his retirement, Institute of Classical Studies, University of London, 9 November (pp. 175–184). Oxford: Archaeopress.

Gell, W. (1810). The itinerary of Greece with a commentary on Pausanias and Strabo and an account of the monuments of antiquity at present existing in that country compiled in the years M DCCC I : II: V: VI. London: T. Payne.

Hägg, R. (2001). Religious processions in Mycenaean Greece. In P. M. Fischer (Ed.), Contributions to the archaeology and history of the Bronze and Iron Ages in the Eastern Mediterranean: Studies in honour of Paul Åström (pp. 143–147). Wien: Österreichisches Archäologisches Institut.

Herzog, I. (2013a). The potential and limits of Optimal Path Analysis. In A. Bevan & M. Lake (Eds.), Computational approaches to archaeological spaces (pp. 179–211). New York: Routledge.

Herzog, I. (2013b). Theory and practice of cost functions. In F. Contreras, M. Farjas & F. J. Melero (Eds.), Fusion of cultures. Proceedings of the 38th annual conference on computer applications and quantitative methods in archaeology, Granada, Spain, April 2010 (pp. 375–382). Oxford: Archaeopress.

Hope Simpson, R. (2002). The Mycenae roads and mycenaean chariots. Mouseion, 2(2), 125–133.

Jansen, A. (2003). The Mycenaean roads in the survey area. In E. Andreadi & L. Braggiotti (Eds.), A Study of the remains of mycenaean roads and stations of Bronze-Age Greece. Lewiston: The Edwin Mellen Press.

Kavoulaki, A. (2005). Observations on the meaning and practice of Greek pompe (procession). In M. Haysom & J. Wallensten (Eds.), Current approaches to religion in ancient Greece. Papers presented at a symposium at the Swedish Institute at Athens, 17-19 April 2008 (pp. 135–150). Stockholm.

Lavery, J. (1999). Some notes on Mycenaean topography. Bulletin of the Institute of Classical Studies of the University of London, 37, 165–171.

Lavery, J. (1995). Some ‘new’ mycenaean roads at Mycenae: Eupuágyai Mux láyai. Bulletin of the Institute of Classical Studies of the University of London, 40, 264–267.
Llobera, M., Fábrega-Álvez, P., & Parcero-Oubiña, C. (2011). Order in movement: a GIS approach to accessibility. *Journal of Archaeological Science, 38*(6), 843–851. doi: 10.1016/j.jas.2010.11.006

Llobera, M. & Sluckin, T. J. (2007). Zigzagging: Theoretical insights on climbing strategies. *Journal of Theoretical Biology, 249*(2), 206–217. doi: 10.1016/j.jtbi.2007.07.020

Lock, G., Kormann, M., & Pountcett, J. (2014). Visibility and movement: towards a GIS-based integrated approach. In S. Polla & P. Verhagen (Eds.), *Computational Approaches to the Study of Movement in Archaeology. Theory, Practice and Interpretation of Factors and Effects of Long Term Landscape Formation and Transformation* (pp. 23–42). Berlin/Boston: De Gruyter.

Marinatos, S. (1962). Anaskafai en Pylo [Excavations at Pylos]. *Praktika tis en Athinais Archaiologikis Etaireias [Proceedings of the Archaeological Society at Athens], 1957*, 118–120. [in Greek]

Mee, C. B. & Cavanagh, W. G. (1984). Mycenaean tombs as evidence for social and political organization. *Oxford Journal of Archaeology, 3*(3), 45–65.

Mee, C. B. & Cavanagh, W. G. (1990). The spatial distribution of mycenaean tombs. *Annual of the British School at Athens, 85*, 225–243.

Milka, E. (2010). Burials upon the ruins of abandoned houses in the Middle Helladic Argolid. In A. Philippa-Touchais, G. Touchais, S. Voutsaki & J. Wright (Eds.), *Mesoheilaidika. Μεσοελλαδικά: La Grèce Continentale au Bronze Moyen. H Ηπειρωτική Ελλάδα στη Μέση Εποχή του Χαλκού. The Greek Mainland in the Middle Bronze Age. Actes du Colloque International Organisé par l’École Française d’Athènes, en Collaboration Avec l’American School of Classical Studies at Athens and the Netherlands Institute in Athens, Athènes, 8-12 Mars 2006* (pp. 347–355). Athènes: École française d’Athènes.

Minetti, A. E. (1995). Optimum gradient of mountain paths. *Journal of Applied Physiology, 79*, 1698–1703.

Minetti, A. E., Maia, C., Roi, G. S., Susta, D., & Ferretti, G. (2002). Energy cost of walking and running at extreme uphill and downhill slopes. *Journal of Applied Physiology, 93*(3), 1039–1046. doi: 10.1152/japplphysiol.01177.2001

Murrieta-Flores, P. (2010). Travelling in a prehistoric landscape: Exploring the influences that shaped human movement. In B. Frischer, J. Webb Crawford & D. Koller (Eds.), *Making history interactive. Computer applications and quantitative methods in archaeology (CAA): Proceedings of the 37th international conference, Williamsburg, Virginia, United States of America, March 22-26* (pp. 249–267). Oxford: Archaeopress.

Mylonas, G. (1966). *Mycenae and the mycenaean age*. Princeton, New Jersey: Princeton University Press.

Naismith, W. W. (1893). *Notes and querries: Cruach Ardran, Stobinian, and Ben More*. Mycenae and the mycenaean age, Princeton, New Jersey: Princeton University Press.

Polla, S. & Verhagen, P. (Eds.). (2014). *Computational approaches to the study of movement in archaeology. Theory, practice and interpretation of factors and effects of long term landscape formation and transformation*. Berlin & Boston: De Gruyter.

Posluschny, A. (2012). Von Nah und Fern? Methodische Aspekte zur Wegeforschung. In O. Dally, F. Fless, R. Haensch, F. Pirson & S. Sievers (Eds.), *Politische Räume in vormodernen Gesellschaften. Gestaltung - Wahrnehmung - Funktion. Internationale Tagung des DAI und des DFG-Exzellenzclusters TOPOI (Berlin 2009)* (pp. 113–124). Rahden/Westf.: Verlag Marie Leidorf.

Protonotariou-Deilaki, E. (1990). The tumuli of Mycenae and Dendra (poster). In R. Hägg & G. C. Nordquist (Eds.), *Celebrations of death and divinity in the Bronze Age Argolid. Proceedings of the sixth international symposium at the Swedish Institute at Athens, 11-13 June, 1988* (pp. 85–102). Stockholm: Paul Åströms Förlag.

Santillo Frizzell, B. (1997–1998). Monumental building at Mycenae: Its function and audience. *Opuscula Atheniensia, 22–23*, 103–116.

Shelton, K. (1993). Tsountas’ chamber tombs at Mycenae. *Archäologische Epheméries, 132*, 187–210.

Shelton, K. (2000). Four chamber tomb cemeteries at Mycenae. *Archäologische Epheméries, 139*, 17–64.

Shelton, K. (2003a). The cemeteries. In E. Andreoli & L. Braggiotti (Eds.), *Archaeological atlas of Mycenae* (pp. 35–38). Athens: The Archaeological Society of Athens.

Shelton, K. (2003b). The chamber tombs. In E. Andreoli & L. Braggiotti (Eds.), *Archaeological atlas of Mycenae* (pp. 35). Athens: The Archaeological Society of Athens.

Steffen, H. B., Lolling, H., Robinson, H. S., & Schliemann, H. (1884). *Karten von Mykenai: auf Veranlassung des Kaiserlich Deutschen Archäologischen Instituts aufgenommen und mit erläuterndem Text. Berlin: Dietrich Reimer.*
Tobler, W. (1993). Three presentations on geographical analysis and modeling: Non-isotropic geographic modeling speculations on the geometry of geography global spatial analysis. National center for geographic information and analysis, Technical report 91(1).

Verhagen, P., Brughmans, T., Nuninger, L., & Bertoncello, F. (2012). The long and winding road: combining least cost paths and network analysis techniques for settlement location analysis and predictive modelling. In I. Romanowska, P. M. Flores, C. Papadopoulos & A. Chrysanthis (Eds.), CAA2012 Proceedings of the 40th conference in computer applications and quantitative methods in archaeology, Southampton, United Kingdom, 26-30 March 2012 (pp. 357–366). Southampton: Pallas Publication.

Voutsaki, S. (2010). Middle Bronze Age: Mainland Greece. In E. H. Cline (Ed.), Oxford handbook for aegean archaeology (pp. 99–112). Oxford: Oxford University Press.

Voutsaki, S., Ingvarsson-Sundström, A., & Dietz, S. (2011). Tumuli and social status. A re-examination of the Asine tumulus. In E. Borgna & S. Müller Celka (Eds.), Ancestral landscapes. Burial mounds in the Copper and Bronze Ages (Central and Eastern Europe - Balkans - Adriatic - Aegean, 4th-2nd millennium B.C.) (pp. 445–461). Lyon: Maison de l'Orient et de la Méditerranée.

Voutsaki, S., Sarri, K., Dickinson, O., Triantaphyllou, S., & Milka, E. (2007). The Argos ‘tumuli’ project: a report on the 2006 and 2007 seasons. PHAROS. Journal of the Netherlands Institute in Athens, 15, 152–192.

Wedde, M. (2004). On the road to the godhead: Aegean Bronze Age glyptic procession scenes. In M. Wedde (Ed.), Celebrations: Selected papers and discussions from the tenth anniversary symposium of the Norwegian Institute at Athens, 12-16 May 1999 (pp. 151–186). Bergen: The Norwegian Institute at Athens.

Weilhartner, J. (2013). Textual evidence for aegean Late Bronze Age ritual processions. Opuscula Atheniensia Romaniensia, 6, 151–173.

Wells, B. (1990). Trade routes in north-east Argolis. Hydra: Working Papers in Middle Bronze Age Studies, 7, 87–91.

Wheatley, D. & Gillings, M. (2002). Spatial technology and archaeology. The archaeological applications of GIS. London & New York: Taylor & Francis.

White, D. A. (2015). The basics of Least Cost Analysis for archaeological applications. Advances in Archaeological Practice, 3(4), 407–414. doi: 10.7183/2326-3768.3.4.407

Wilkie, N. C. (1987). Burial customs at Nichoria: the MME tholos. In R. Laffineur (Ed.), Thanatos: les coutumes funéraires en Égée à l’ âge du Bronze. Actes du colloque de Liège (21-23 avril 1986) (pp. 161–169). Liège: Université de l’ Etat à Liège.

Witmore, C. (2013). The world on a flat surface: Maps from the archaeology of Greece and beyond. In S. Bonde & S. Houston (Eds.), Representing the past: Archaeology through text and image (pp. 125–149). Oxford: Oxbow Books.

Xenaki-Sakellariou, A. (1985). Oi thalamotoi tafoi ton Mykinon: anaskafis Chr. Tsounta (1887-1898) / Les Tombes à chambre de Mycènes: fouilles de Chr. Tsountas (1887-1898),[The chamber tombs of Mycenae: excavation of Chr. Tsountas (1887-1898)] Paris: Diffusion de Boccard. [in Greek and French]