# ARCHAEOLOGIES OF ROADS

Edited by
Tuna Kalaycı

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# Preface

Tuna Kalaycı

Scholars broadly interested in movement studies gathered in Florence, Italy, on November 7–8, 2019, for a conference titled "Archaeologies of Roads." The conference invited landscape-oriented papers on the topics of archaeology, history, geography, and anthropology from across the globe. It aimed to bring digital/computational approaches to roads together with the phenomenology, aesthetics, emergence, and ideology of roads. Acknowledging the complexity of defining a road, we used the term "road" in the broadest sense to envelope all possible categorizations, including trails, paths, highways, byways, and so on. Seventy registered participants and many other listeners made the gathering a fruitful one.

At the end of the meeting, participants were invited to contribute to an edited volume that would recognize and summarize the conference results. The sixteen papers that were submitted are organized here into three main sections: "Routes" focuses broadly on the physical aspects of roads, from their material conditions to how and why they connect things; "Methods" explores some of the key ways in which roads can be studied; and finally, "Metaphors and Constructing Histories" emphasizes the intangible character of roads. Like other edits books on roads, this volume shows that it is impossible to contain such a broad theme within well-organized sub-topics, imposed categories, or established standards—this is probably because a road is not only the container of an action, but also the action itself. Physical manifestations of actions may be put in some sort of order, but the intentionality, fulfillment, and embodiment of any action are challenging to define. Thus, the book's three sections are a superficial attempt to construct a narrative that guides its overall flow.

It took a good four years to finalize this volume; it was a rather bumpy ride, but we have finally arrived at our destination. Some individuals deserve special mention for their role in this work: Nicola Masini (formerly CNR-IBAM, now CNR-ISPC), John Wainwright (Durham University), and Scott Branting (University of Central Florida), who opened the conference with their keynote talks and set a high bar for the rest of us; and perhaps most importantly, Marina Pucci (Università degli Studi di Firenze), who hosted the event. Without Marina's support, this book could not have materialized.

The contributors to this volume deserve wholehearted thanks, especially for their collegiality and patience throughout the publishing process. Thanks also to Bill Caraher, Director of The Digital Press at the University of North Dakota, who also patiently waited for the final copy to arrive on his desk before undertaking its layout and design. An exceptional thank you is due to Becky Seifried, who was involved in the project from the first days of the conference, and whose editing work drastically improved the academic quality of this volume.

The Modern Geospatial Practices for Ancient Movement Praxis (GeoMOP) project provided the rationale for organizing the conference and publishing this book. GeoMOP was funded under the Horizon 2020 Marie Skłodowska-Curie Actions (grant agreement ID: 747493) and coordinated by the Consiglio Nazionale delle Ricerche. The editor offers his gratitude to Nicola Masini for agreeing to host the project, to John Wainwright for providing a secondment phase for the project, and to Anna Maria Briuolo for guiding the project as we travelled through unknown bureaucratic territories.

# Archaeologies Of Roads: An Introduction

Tuna Kalaycı

Roads are peculiar among archaeological objects, in that they dissolve the boundaries between what is knowable and what is not. Few artifacts have the same substance, transcendence, and immanence as roads—words that might help us think about them through a philosophical lens. An object of the past is rarely valued or used for the purpose its bearers originally imagined: today, artifacts are displayed behind glass windows, statues greet visitors in museum corridors, and deserted settlements are turned into archaeo-parks.[1] There are no more scheduled plays in ancient theaters; when there is an event, the spectator is perfectly aware that they are occupying a space from and of the past. The mixing of temporalities is intentional, adding to and altering the meaning of the performance. The modern observer in an ancient theater is constantly reminded of the anachronisms at play. But roads exhibit a different form of spacetime.

A road can be both ancient and modern *at the same time*. Tourists walking the streets of Pompeii are using the same infrastructure that existed in Roman times. Their modern feet are adding to the ancient use wear, even though only a few share with the paving stones the same admiration they have for the standing architecture. The streets of Pompeii become invisible as time and space mix along them. Roads stretch not only in space, but also in time: in Greece, wayfarers still use Ottoman-period *kalderimia*—cobblestone roads built mainly for the use of hoofed animals that facilitated rural transportation up until the 1970s (Forbes 2007:90); in the United States of America, Hopi still use parts of their ancestral trails on foot and horseback (Snead et al. 2009a:26).

We shift our attention to the pilgrims across the globe who most clearly exemplify the mixing of space and time. Pilgrimage spans a range of agencies, from those of individuals to those of complex

[1] Ancient settlements with modern occupation might be a prime exception to this argument. Here we can draw a distinction between the archaeologist who visits a place periodically for work and the dweller who continuously inhabits the place.

institution(alisms). The road somehow marks a beginning and an end at the same time. The hope for some form of change[2] weighs on the pilgrims in Tinos, Greece; some even crawl on their knees up toward the hilltop church. Faith, penance, and perseverance blend space and time, and the pilgrim's road becomes spaceless and timeless. Yet, the complete opposite is true for the day-to-day roadside vendors as they advertise their merchandise (Dubisch 1991:3). The on-site ritualistic performance and the off-site economic performance—one heavenly and one earthly—coexist side by side around the road. The same also goes for more secular settings. Overall, Klaeger (2012) labels these activities as "dromocentric," whereby the ephemerality of interaction between travelers and roadside people contributes to the structuring of a rhythm of life.

Whether it be a sacred path in the woods that gives an eerie sense of a fairy having just passed by or a loud six-lane highway with behemoth machines racing to arrive somewhere, the road purges the landscape and marks a seemingly empty space. We do not often see objects intentionally situated in the middle of a road.[3] People tend to make sure roads are "clean," as if they want to keep them invisible, to keep them out of the way. However, through the act of cleaning, a road attains one of its first meanings; the emptiness of a road is by design, and for that very reason, no road is empty. The road is not only a container for an action, but also the action itself.

The opposite is also possible. Objects that slow down, control, or stop an otherwise naturally continuous flow can appear in the form of checkpoints, palace guards, stop signs, bollards, automated gates, or electronic passes. The traveler's gaze is cast ahead to look for future obstructions; a future impasse (in both space and time) will change the course of travel, even at the journey's onset. It seems like objects of control are a semantic violation—against the road's invisibility.

The road itself can also become an act of violence in the form of infrastructure (Rodgers and O'Neill 2012). Roads broadcast the societal message of a stable and prospective future (Reeves 2017:717)—but a future that is created by and for the group that holds the power of building, appropriating, and controlling the roads.[4] For this reason, the

[2] A form of metamorphosis, perhaps; see the discussion of metafores below.

[3] This is probably why archaeologists can only rarely locate objects that can be used to (relatively) date roads, unless they carry a special meaning, such as inscriptions on milestones (see Ordozgoiti, this volume).

[4] See Amarashinghe, Kalaycı, and van Aerde, this volume.

road requires not only material conditions, but also fantasies (Larkin 2013:333). Reaching a destination is conditioned upon engineering (im)possibilities, but also histories, an agreement about those histories, and the spatio-politics challenging these agreements (Reeves 2017:712).

As fantasies bring unruliness and open-endedness (Reeves 2017:716), the material road finds its way in the immaterial, and so the road becomes metaphor. The Greek word μεταφορές (*metafores*) maps to the English word "transportation." It is no surprise, then, that one must take a metaphor to go from one place to another (de Certeau 1984:115). In the same vein, Larner (2004:70) sees the "same startling word painted on the side of one truck after another, the word *metaforai*." And trains, among other means of transportation, also carry metaphors around (see Kurt, this volume).

So, the road is also the bearer of many metaphors: "[t]o learn the Way is to learn the self" (Heisig et al. 2011:708). Religious and spiritual texts mention the road favorably. One *hadith*[5] reports: "while a man was walking in the road, he found a thorny branch in the road and he moved it aside. Allah appreciated his deed and forgave him" (Sahih Muslim 1914). It seems even the gods like to keep the roads clean. Taoism literally means "The Way." Shinto can be translated as "the way of the *kami* (god, divinity, or spirit)." According to Kōsaka Masaaki, "Words are the expression of people; roads are the expression of the earth. In words people occupy the center; in a road, the earth is central" (quoted in Heisig et al. 2011:711).

And we shift our focus away from humans. Roads are not exclusively human phenomena. At times, people preferred to settle along existing animal corridors (e.g. Purtill 2017). It is no surprise that animals and humans can share geographical knowledge, especially when it comes to migratory routes (e.g. Stépanoff 2012). At other times, animals became the road-makers and created unique landscapes of movement. In Upper Mesopotamia, for instance, centuries-long movement of flocks incised the soil and formed "hollow ways" (Wilkinson 1994); these roads are still visible in satellite imagery millennia later (Ur 2003).

Roads can also be exclusively non-human phenomena. Wato and colleagues (2018) argue that African elephants have knowledge of scarce water resources and, thus, create specific movement patterns

[5] In the Islamic doctrine, a hadith is a report about what the prophet Muhammad said or did.

especially during dry seasons. In fact, studies of spatial memory and navigation suggest that a wide range of animals can follow paths (Atkinson et al. 2002:134). Plants are also on the move, but their paths are mainly constricted by other agents. For instance, during the summer and fall, dark green Prosopis steppe weeds stretch along the hollow ways (Wilkinson et al. 2010). The rhythm of animals moving in the past, guided by humans, created a rhythm for today's plants to follow—all along the same road.

## The Classification Problem

So far, we have purposefully collapsed all types of movement media under the umbrella "road" and, in doing so, possibly violated a series of semantic norms, which only further complicates an already complex matter. There is a plethora of words to describe or label a road one way or another: trails, paths, trackways, hollow ways, corniches, causeways, gravel roads, motorways, pavements, and runways—to name only a few. This rich nomenclature reflects efforts to classify the phenomenon of movement and may be based on material, location, economics, traffic, topography, or multiple other cascading differences.

The classification of roads is a problem in other research domains, too. For instance, Adafer and Bensaibi (2017) classify roads based on their seismic vulnerabilities. As they focus on physical characteristics, their parameter set ranges from landslide potential to compaction quality. Similarly, D'Andrea and colleagues (2014) suggest a functional classification, but one that is based on fuzzier boundaries. Examples are numerous, and a technophysical classification is almost always possible, especially when roads are transformed into digital objects. Yet, sociotechnical classification remains open to challenges.

Realizing this complexity for historical and archaeological contexts, Snead and colleagues (2009b:275) offer a set of comparative variables:

1. Amount of construction/ over what time
2. Technology of movement
3. Characteristics of terrain
4. Points/ places of access (terminal points, resources, facilities, shrines)
5. Ownership/ access/ stewardship
6. Functions
7. Form/ network organization
8. Scale
9. Meaning

The type/class of a road or movement is satisfactory if one can touch upon all these (and other) key variables. And in archaeology, maybe due to the lack of "classifier data," road classes appear to have their origin in oppositions. A binary framework helps the archaeological narrative flow. A public road implies there is also a private one. An emergent (bottom-up) road network suggests a planned (top-down) form also exists. Simple dirt tracks call for the possibility of building imperial highways in the future, when the technology reaches some form of maturity.

Without a doubt, these binaries are instrumental for studying a road. But, we should remember that a road also spans everything in between, and that it can even be self-contradictory. With time, roads may shift in meaning, or two different meanings may take hold at the same time. In the end, roads are the objects of both fascination and terror (Masquelier 2002:831). Roads are filled with perils and possibilities (Klaeger 2013:448). Roads constrict environmental damage while also facilitating destruction (Diener and Batjav 2019:789). If the assertion is correct that roads span everything between binaries, then it is also possible to suggest that roads are *open places*—they are both physically open and conceptually open to change, transformation, subversion, and revolution. For instance, in his analysis of the Boudiccan Revolt (60–61 CE), Witcher (1998:68) suggested that "by using Roman roads to move through a Roman landscape, to Roman places, the rebels were issuing a devastating ideological message to the Roman authorities." In an instant, a top-down plan was utilized from the bottom up. It should come as no surprise, then, that roads are one of the main platforms for transformation, since their appropriation as public space (i.e. in the phrase "take to the streets") appears to be one of the next steps toward change across the globe (e.g. Baykan and Hatuka 2010; Fisher et al. 2019; Holston 2014; Traugott 1993).

## Roads-as

Categorizing roads into particular types is a limiting framework. In this section, the aim is to perform a mental exercise with the hope of expanding the existing framework used in (ancient) road studies. We approach the road phenomenon by stepping *away* from classifications and *toward* thematizations. To tackle the large corpus of roads, we study them —as something else. So, a double metaphor is born: whatever we intend to map onto a road (e.g. transportation of staples, least-cost paths), we instead map to a broader class (e.g. infrastructure, digital object). In doing so, one can argue that the specificity of roads is naturally reduced.

We pick one of two mappings: *roads-as-infrastructure* and *roads-as-digital-object*. There is no doubt that selecting one of these themes is an authoritarian exercise, if not an arbitrary one. Yet, the exercise can be productive; as in other mapping processes, we acknowledge that an authorship of the map is unavoidable. But the broader the thematization, the shallower the power.

### *Roads-as-Infrastructure*

It is generally accepted that roads provide access to goods, facilitate services, increase societal association, and fulfill many other beneficial functions; overall, roads improve the conditions of life. Even a simplistic introductory chapter like this one can immediately cite multiple examples of why we build roads and the complexities associated with them. One key issue lies in the institutional and everyday habits of and motivations behind the movement praxis. Roads concretize the politics of ethnicity (e.g. Mains and Kinfu 2016), of labor and employment (e.g. Diener and Batjav 2019:786), and of the individual (e.g. Dalakoglou 2012:578). In this regard, the axiom that roads are always beneficial and necessary for human progress is also part of the modernist discourse at large (Harvey and Knox 2015:4–9). But, as we connect the core with the periphery, the domestic with the public, the urban with the rural, or the archaeological site with the surrounding landscape, we also need to ask if and why "roads bring lower transaction costs, greater prosperity and an easier, more secure, way of life" (Wilson 2004:526). To answer these critical questions, our starting point could be to consider the road *as-infrastructure*. In fact, archaeologists are already familiar with these "infrastructure projects" in the form of the Achaemenid Road, the Roman Road, the Inka Road, and so on.

In order to gain a different perspective on the modernist discourse, we can follow Rodgers and O'Neill as they build a critical framework of infrastructure projects. They suggest there may be two types of violence associated with infrastructure: active and passive (Rodgers and O'Neill 2012:407). As an active form of violence, infrastructure can be built or utilized for surveillance, intimidation, and collective punishment. With respect to roads, for instance, violence may be materialized in the form of roadblocks; Israeli checkpoints in the occupied West

Bank constitute one of the most visible examples (Amir 2013; Naaman 2006; Tawil-Souri 2011). In the past, checkpoints were probably similarly deployed for security, taxation, or other purposes (e.g. Abudanah et al. 2020). Roads connect people, but they can also facilitate systematic social disaggregation or displacement, a rather frequent occurrence in developmental programs (e.g. Hibszer 2013). In extreme and traumatic cases, mass deportations must have had significant impact on future generations while adding historicity to the roads used in these forced exoduses. Examples of this are, unfortunately, myriad.[6]

In passive violence, infrastructure is not maintained well (or at all), and any investment that is made favors one group over others (e.g. Burgess et al. 2015). This violence may come under the guise of select improvements, and roads may exclude disadvantaged communities by proxy since the integration of these groups into a road network requires additional steps (Demenge 2015:3). Exclusionary and uneven development can also stem from a selective flow within the networks of social, economic, and political power. By the 1870s, for instance, it was possible to travel between London and Cambridge in an hour, but it would still take almost a day to journey 50 miles east of Cambridge. Similarly, London was connected to Paris by phone long before it was connected to Bristol (May and Thrift 2003:17–18).

The argument so far has been about how roads-as-infrastructure require a closer look at the ways in which they may be fantasized and built. In this regard, there is significant scholarly critique (e.g. Alvey 2014; Strauch et al. 2015). Yet, Bennett (2018) also reminds us that the relationship between road construction and resistance to development is complex and that the process contains ample opportunisms and compromises. No space is neutral, and some form of negotiation is always necessary so that material and immaterial fantasies can be told. Through these negotiations, the periphery can gain access to goods and services that were produced in the core. Roads are spaces where actors' "social relations cluster and adhere" (Wilson 2004:529)

[6] For instance, see the deportation route taken by the Dadrian family during the Armenian Genocide by the Ottoman Empire. Vahram Dadrian's (2003) diary includes a narrative woven around the road. Also see Oded (1979) for the infamous deportations during the Neo-Assyrian Period. The "Trail of Tears"—the ethnic cleansing and displacement of Native Americans by the United States government—is a more recent example with a direct reference to the route of the death march.

and where multiple unstable forces operate in tandem to create a sense of stability. In return, infrastructure in general and roads in particular gain the capacity to enchant (Harvey and Knox 2012:525).

We continue unpacking the modernist discourse of infrastructure-based development using Virilio's influential work *Speed and Politics*. There, the author describes the conditions of modernity, coins the term "dromocratic society," and emphasizes governance by speed (Virilio 2006:12). Since roads transcend space and time, is it not possible to extend Virilio's dromocratic society back in human history? Constructing a road (whether emergent or planned) brings "modernity" to the landscape. Here we refer not to the modernity of the West, but rather to the sociological concept; at the end of the day, modernity is not a description of our time alone (James 2015:32), and we can construct a developmental discourse for any period of human history. For example, when the Achaemenid Empire built an efficient postal system to overcome the problems of access in a vast state (Colburn 2017:875), they "modernized" the landscape. Within this historical context, it is possible to utilize the development discourse not in terms of quantitative, but rather qualitative changes (James 2015:38). Following this argument, the imperial states of the Romans, Chinese, or Ottomans were all dromocratic societies, but so were the Early Bronze Age societies of Upper Mesopotamia, where the movement network likely had an emergent/bottom-up form (Ur 2009); here the thematization once again dissolves oppositions. Therefore, it is further possible to claim that the politics of infrastructure not only are a modern phenomenon, but also are visible in archaeological contexts where many actors ranging from individuals to states played their very own roles. In 50 BCE, Curio's proposal to take over a road program was rejected by the late Republic Senate, despite the fact that the Republic had both the means and the finances to take on such a program. "In the cutthroat political atmosphere of the late Republic, it seemed better to do without new roads than to give any one man the struggle for political power" (Wiseman 1970:151).

The "modernization" of ancient landscapes by the imperial power affected local labor and productive relations. The Inka state had engineers and supervisors whose jobs included road construction and maintenance. Staff were strategically located so that roads were always functional (D'Altroy 2018:11–12). However, the laboring class in charge of building and maintenance was the *mitmaqkuna*, who were removed from their ancestral lands by the Inka and involuntarily settled in other places to perform specific tasks (D'Altroy 2005; Jenkins 2001). In Amaybamba (modern Qochapata, Peru), *mitmaqkuna* came from the Chachapoyas and were put in charge of maintaining the roads and clearing them from encroaching vegetation. For them, the road had little to do with movement. In fact, the road was constructed in such a way that it required maximum maintenance (Wilkinson 2019:39–41).

Exclusivity through prohibition or limiting of use was common on imperial roads (D'Altroy 2018:10). But what was envisioned by the top of the imperial hierarchy did not always match reality on the ground. In early modern Japan (1603–1868) the centralized feudal system prohibited the private use of roads, and travel was possible only with permits. Nevertheless, individuals kept using the imperial roads by purchasing permits or through deception, or alternative "side roads" emerged (Vaporis 2012:99). In a similar case, roads were supposed to serve the Classical Era Chinese state (323–316 BCE), but powerful families instead profited from the roads by setting up their own transportation and courier services along them (Nylan 2012:44).

The focus on roads-as-infrastructure attempts to reveal the flow of power. Even though the discussion provided here is a simplified version of a complicated, intertwined relationship between actors and roads, it reminds us that a road is not always the container of action—it can also be the action itself. And for this reason, the road may be considered a heterotopic object (Foucault 1986). So, while it is necessary to investigate the material processes that assign objective meanings to space and time (Harvey 1989:204), we should also move beyond this dualism (May and Thrift 2003:1). The concept of roads-as-infrastructure dissolves the boundaries of arbitrary oppositions: of past and present, and of time and space.

### *Roads-as-Digital-Objects*

Digital archaeology has emerged as a new paradigm, and there is a vast body of literature that explores its advantages and pitfalls while building a dedicated theory or theories (e.g. Daly and Evans 2006; Huggett 2015). As digitalism transforms the archaeological object, the unique nature of archaeology also "calls for a re-examination of [an] epistemology outside of the realm of positivism and scientism" (Dallas 2016:319). Defining the digital object is an immense metaphysical task (see Hui 2016), which we do not attempt here. However, we do offer a brief description in order to build the argument that follows.

Roads are turned into digital objects when they are remotely sensed, digitized, mapped, and modeled. In terms of documentation, the technological progress we have achieved within the last few decades is basically to pixelate or vectorize roads on screens rather than to ink them on paper. When it comes to analysis, we continue to rely on algorithms and mathematical equations that are based on grand generalizations. On the other hand, scholarship continues to make significant advancements: for instance, in object representation. At the object level, 2D inked pottery profiles are replaced by digital reconstructions that give a researcher full ability to measure and experiment with the digital object. At the landscape level, virtual and augmented reality applications offer a means for contextualizing archaeological data through digital representations.

Due to their monumentality and distinctive shapes within complex backgrounds, roads were detected by airborne sensors very early. Zammit (1928) reported probably the earliest aerial evidence for tracks while working in Malta. Poidebard (1934) mapped road systems, among other landscape features, in Syria. Archaeologists were quick to deploy electronic sensor systems for the documentation of roads. Lyons and colleagues (1976) investigated Landsat imagery to map the historical road network in Chaco Canyon and applied image enhancement techniques to reveal parts of the movement network. Today, we have much more sophisticated methods for detecting roads, such as object-based image analysis (Maboudi et al. 2018). Nevertheless, even after four decades, scholars are mainly using sensor data only to make the process of road detection and mapping easier.

The advent of Geographic Information Systems (GIS) was a game changer for digital archaeology. Studies of movement also greatly benefited from this technology, due not only to the mapping capabilities of GIS, but also to the tools the software provided for conducting spatial analysis for modelling. Among these, least-cost analysis (LCA) has become one of the most common techniques. LCA uses a series of parameters based on environment (e.g. slope, vegetation cover), background (e.g. barriers), object (e.g. age, sex), and subject (e.g. cultural attraction) in order to predict potential movement paths through a given landscape. The technique is prevalent in studies of movement in archaeology, but it is not free of methodological issues (Herzog 2014).

The second primary process by which roads are transformed into digital objects is space syntax, a term that encompasses a series of theories and methods for analyzing the configuration of space. Space syntax studies build mathematical syntactic generators while searching for a societal logic of spaces (Hillier and Hanson 1984). With regard to roads, they capitalize on the axiality of these features by representing roads as axial lines and segments (Batty 2004). Therefore, space syntax is more suitable for the analysis of streetscapes where, for instance, it is claimed that angles between street axes have a logic behind them because people prefer minimizing angles as they move toward a destination (Dalton 2003).

There is criticism of studying movement using least-cost analysis (e.g. Lock and Pouncett 2017:133) and space syntax (e.g. Pafka et al. 2018), as these methods tend to be reductionist in how they represent and model movement. This reductionism stems from the simplicity of spatial primitives (in the case of GIS) and shape-free syntactic generators (space syntax); therefore, the criticism mainly highlights the inability of these techniques to attach meanings to spaces, such that they cannot become places.[7] We do not even broach the topic of how to marry the complexity of roads-as-infrastructure with roads-as-digital-objects. Yet, one can open another door for a different type of question: is the digital road not advanced enough to represent its inherent complexities, or is it that only particular capacities are selectively highlighted over others? This is more of a science and technology studies question, so we touch upon it only briefly so as to not lose sight of the main topic.

If we pay attention to the technopolitical dimensions of creating digital objects, we could argue that digital reductionism is not merely a natural consequence of the inability of mathematics or technologies to reflect the complexity of roads. We also have to consider that these tools build upon the modern sociopolitical necessities of territorialization and, in a way, are the very tools that enable particular means of territorialization. So, we can speculate that roads-as-digital-objects not only contribute to the production of a particular type of place (contrary to the argument that they are reductionistic), but they also deliberately transform spaces into uncontested and seemingly neutral territories. The status quo can remain so long as it annihilates, distorts, and codifies spaces of potential change, such as roads. A different outlook, then, can be possible only when we reveal the current power dynamics of digital production and, in turn, dismantle their technopolitical oversight.

7 For an overview of the issue of representationalism in GIS, see Hacıgüzeller 2012.

## Archaeologies of Roads

The contributions to this book highlight the inherent multiplicity of (ancient) roads, with meanings ranging from cosmogonic to militaristic. They show that any effort to classify roads will likely fall short when we consider these peculiar objects in their totality. The authors' work reveals that contemplating roads "-as" can be a productive exercise. In this book, we encounter examples of roads-as-infrastructure or -as-digital-objects, but also we see the authors evaluating roads as objects that are symbolic, persistent, militaristic, and more. Needless to say, it is possible to read them in other ways, following the form "roads-as-[descriptor]." This thematic lens to interpreting roads seems to be potentially creative. And now we discuss the chapters in alphabetical order, taking a different path than where the table of contents potentially directs us.

Amarasinghe, Kalaycı, and van Aerde study the Silk Road network as an object of political infrastructure. Their aim is to shed light on the modern "Belt and Road Initiative" (BRI) project led by China. The authors begin their investigation by highlighting the Silk Road's intricate history, composed of multiple agents ranging from individuals to empires. They scrutinize the normative historiography of the Silk Road and pinpoint the problematic areas in the narrative. Their focus is mainly to identify the Chinese contributions to this Eurasian project, as well as how the current narrative is selectively exploited by the BRI project as a proxy for China's ambition to achieve global governance.

Burigana, De Guio, and Magnini discuss the road-as-infrastructure in northern Italian prehistory. According to the authors, in arranging their territory and as a response to increasing population numbers, past inhabitants "followed a number of hyper-coherent spatial/functional rules" related to "a top-down power hierarchy." Therefore, they suggest the construction and maintenance of the dense road network (i.e. infrastructure) required labor that was controlled by the elite, hinting at the neo-Wittfogelian "flow of power" hypothesis. Their work is a prime example of a comprehensive remote sensing study of roads-as-digital-objects. The study also includes hydrological modelling to enhance the interpretations about the road network. The authors conclude that some parts of the network might have had a double functionality: connectivity (via roads) and land-use protection (via embankments). The message is clear: while roads are invaluable sources in and of themselves, it is only through a thorough documentation and analysis of (archaeological) landscapes that we can grasp their meaning and function.

Cimadomo, Di Palma, and Scardozzi explore roads-as-transient-objects and roads-as-objects-of-interrelation in the Roman Near East. While there are indications of militaristic motivations behind road-building in this area, their militaristic use eventually ended and the system probably fell into disuse. But the authors claim more about these roads. The network of forts and, therefore, roads connecting them together entailed a division of worlds: the worlds of sedentary farmers and (semi-)nomadic pastoralists. Their argument also implies that the road was a material manifestation of the usual binary: inside vs. outside or domestic vs. wild.

Crépy, Manière, and Redon highlight the challenges in considering roads-as-digital-objects. The authors successfully apply least-cost path models to document the ancient road networks of the Eastern Desert of Egypt. The strength of their work lies in its reliance on various well-chronicled travelers' accounts. They are also mindful in their detailed analysis of the model's limitations. In particular, they remind us of the importance of understanding the agents in a model. In mathematical terms, different agents bring about different model parametrization, an issue that is widely overlooked in movement modelling. Otherwise, we contribute to the risk of not differentiating between "an actual or purely hypothetical road." Thanks to their reflexive attitude, however, we also realize that these purely hypothetical digital roads, which do not align with the actual objects, nevertheless open up new research avenues.

De Gruchy and Lawrence guide us through the history of research across greater Mesopotamia as they consider roads-as-scholarly-objects. Their work reveals a deep-rooted interest in questions about who moved, why they moved, and how they moved. We read about a rich arsenal of methods, ranging from the study of historical and ancient texts to spy satellites, and from early forms of network modeling to modern ethnographic studies of roads. But the authors also remind us that land transportation is only one side of the coin; the unique and extensive system of canals and channels in southern Mesopotamia must have been used by boats. Thanks to the authors, we also contemplate the limitations of current research: what are the modern algorithms optimizing for, or why do we generally assume that travelers were pedestrians?

Kerr focuses on Australia's legendary Birdsville Track, a road-as-an-object-of-fantasy. The author discusses how and why a road might attain legendary status, and in this process how the road becomes a medium for bolstering some identities while forgetting others. Many used the Birdsville Track: the drovers, settlers, and mail carriers, but also Aboriginal peoples, European missionaries, and Afghan cameleers. It is through the amalgamation of their stories that we understand the multi-layered history of the road and realize it is both tangible and intangible at the same time. In the earlier journeys, the physical road was crosscut by the songlines that guided the performer toward food, water, and shelter in a desert environment. Today, the road mainly attracts tourists hoping to experience the "genuine" outback life in the "wilderness"—thus, a new fantasy is born from the shifting memories of the road.

Kozhukhovskaia treats roads as symbolic objects. In her words, "[a]s roads pass from the physical world into the metaphysical, geographical space becomes mythological." The Pontic–Caspian steppe populations of the past utilized the concept of the road in such a way that it became a cognitive mapping of both this world and beyond. The Axis Mundi was not only a two-dimensional path, but also a vertical symbolism that ran between the upper world and the underworld. It is none other than the tumulus that formed this vertical symbolism, while at the same time acting as road sign, a *sine qua non* for nomadic life in a vast open steppe. Burying the dead with wagons and chariots, especially in dismantled form, was the perfect Bronze Age steppe symbolism. We observe a similar phenomenon in Greek mythology when the deceased boards Charon's boat, and in the Mesopotamian mythological figure of Urshanabi, the ferryman of the Hubur, which means both "river" and "netherworld" at the same time. It is not much of a surprise, then, that the steppe cultures embraced the river as a representation of the afterlife journey. In her words again, "the river was a symbolic replica of the world axis."

Kurt highlights the road-as-infrastructure-building in the Ottoman Empire. For this infrastructure to be realized, two distinct fantasies had to be embraced by the state and its contractors: the better mobilization of troops and the opening of markets. It was only when these two imaginations aligned that construction of the road became viable. Yet, an unexpected result was brought about in everyday life: the project facilitated easy travel and further opened up the Empire to foreign visitors. This fact that would eventually shape the practice of archaeology within the Empire. Kurt's article also reminds us that the transportation network is much more than the roads themselves, as the building of other relevant infrastructure is often a complex matter.

Lewis tackles roads-as-digital-objects and challenges how roads are digitalized and conceptualized in least-cost path studies. The case study from Cumbria, England, cascades the landscapes of movement with the landscape of cairns. Lewis starts with a basic but powerful axiom that "direction-dependent visibility limits potential visibility to the confines of humans' field-of-view." Especially for a road like a ridgeway, a walking agent's field-of-view naturally becomes an important part of the movement practice. Thanks to archaeologists' constant interest and ever-growing experience in least-cost analysis, there is a rich body of literature on least-cost-path-informed interpretations of roads; nevertheless, there is a gap in knowledge about the ways in which we treat roads as digital objects, and this is a gap that Lewis sets out to patch. And as with any other digitalization, the process is open, and the model is subject to improvement. The peculiarity of roads again becomes visible here: a single digital line (or a corridor of numbers) can contain multiple actions actions—in this case, both movement and sight.

Lopez Garcia takes us to the western Roman provinces in his discussion of the road-as-infrastructure. His work is exemplary in the sense that it combines on-the-ground research with epigraphic and remote sensing data. It is through the intricate combination of these datasets that we can achieve some level or sense of informational accuracy and further appreciate the marvel of Roman road-building. Though born out of militaristic, socioeconomic, or political needs (or a combination of the above), "[t]he construction of roads depended absolutely on the nature of the landscape." Here, we can imagine the labor time necessary to carve grooves into the rock or to build stone supports for slopes.

Ordozgoiti takes us to the eastern Roman provinces in discussing the road-as-political-object. Through this study, we realize that roads were materialities upon which the image of the ruling Roman families was reflected. The author studies inscriptions on statue bases, architectural elements, blocks, and especially milestones, and he explores the balanced dynamics between local populations and Roman imperial families. In particular, Ordozgoiti notes that "the milestones exemplified here the central power's authority (e.g. the power to repair and modernize roads), and for this reason the Latin language was used, while the Greek language was used on statue pedestals, plaques, or tombstones—features that imperial and local elites used for self-representation." This suggests that the local approach to imperial motivation is compromising when it comes to road-building and maintenance, but preservationist in more private settings. And maybe also thanks to this pragmatic resistance, the Licinia family, the ruling family at the time, "suffered a debacle in the promotion of its personal image."

Pakkanen and Donati focus on the road-as-digital-object in their search for construction standards. Their case study is Mantineia, an important city in the central Peloponnese, Greece. The authors make use of the results of geophysical prospection, which revealed an extensive portion of the city layout. Using cosine quantogram analysis, they aim to find a standardized unit length that the city builders might have utilized, and they argue against the blind use of foot-units (e.g. the "Doric" or "Samian" foot) in the analysis of ancient town planning. Their analysis suggests that "ancient town planners derived the design module from a five-multiple of the cubit standard of 0.495–0.504 m and applied it to the dimensions of a single housing unit. This single unit was then used as a basis for implementing much, if not all, of the orthogonal street system." Even though there are some varying block lengths and the measurement bias exceeds the standards, they are able to put forward a convincing history of an ancient city-planning process. In doing so, they highlight the role of *planners* themselves as opposed to the act of *planning*.

Serventi and Vuković introduce the road-as-persistent-object. Thanks to their meticulous documentation of the road network in southern Liburnia, Croatia, we are able to trace past movement from prehistory onward, with great temporal depth. In the road palimpsest we can observe many agents, ranging from ancient traders to modern shepherds and from transhumant pastoralists to settled communities. In their work, we also realize that roads are objects of intuition. In a complex and challenging terrain like Velebit Mountain, and especially when trade and safety are the prime concerns, the authors seek (as do we all) "the shortest and most convenient crossing," "the most logical and simplest passes," or a "reasonable and safe passage," with the motivation of controlling the "central pass" or "alternative passes." After all, humans have been traveling since time immemorial, and they hope to make their journey the easiest and least costly. This intuition, however, is the product of our present time. Their work is a reminder that it would be wrong to assume people always moved in the same way and with the same motivations. As the authors show, the prehistoric inhabitants chose direct, but steep, trails to cross over Velebit, but by Roman times, and up until more recent periods, people preferred low and probably longer routes to avoid steep slopes. We must always explore roads in spacetime.

Stefanakis explore roads-as-economic-objects on the southwest coast of Rhodes, Greece. Archaeological surveys suggest that the ancient deme of Kymissaleis operated in a dynamic, productive landscape. So, if there was a site, there must also have been a road. While this is a trivial statement to make, it also reveals how much evidence we lack when it comes to documenting ancient roads—especially in a complex Mediterranean geography. In Kymissaleis, roads "form a substantial part of the local economy," despite the fact that there is limited material evidence for roads. The rugged Mediterranean topography is also significant because of the ways in which it constrains movement; the ruleset behind building a road appears to be the same for ancient roads and paths—welcome news for practitioners of least-cost analysis.

Vorsanger shows how roads can operate as objects of necessity, politics, and sacredness all at the same time. The author convincingly argues that the making of Archaic Athens went hand-in-hand with the formalization of a road network: milestones were erected, myths were created, boundaries were sharpened. Along the roads, herms offered education for the country folk, perhaps another attempt to unify lands in the midst of competition between city-states. As these road markers came to dot the landscape, the centrality of Athens was further asserted; the road network assisted in territorial unification. In particular, the road between Athens and Eleusis—the Sacred Way—helped Athenians to assert their authority over the landscape, especially since the region of Eleusis was the source of border conflicts between Megara and Athens. In this amalgamation of things, how can one actually atomize a road and pinpoint the makers of it? And was it that the politics of the Athenians cultivated the sacredness of an already-important road, or rather that the sacredness of the road facilitated the development of Athenian identity?

## A Shortcut to the Beginning

This introductory chapter aimed only to reveal the apparent complexity of the road, be it a modern or an ancient one. The starting argument was that roads crosscut space and time such that they can be both ancient and contemporary, simultaneously. The suggestion was that contradictories might be naturally dissolved in the spacetime continuum, allowing us to avoid classification. For instance, the road-as-spacetime-object can be both planned and emergent simply because it is not only the container of actions, but also the generator of actions. And we argue further that the road is an object in which the dualism of body and mind is less visible. "The Road goes ever on and on"

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# Chapter One
# Route Studies Across Greater Mesopotamia: Past, Present, And Future

Michelle de Gruchy and Dan Lawrence

The last 20 years have seen an explosion of research on ancient route networks in Southwest Asia, particularly across the Greater Mesopotamia region covering modern Iraq, northern and eastern Syria, southern Turkey, and western Iran (Figure 1). Much of this research has been driven by the use of remote sensing data, particularly Corona spy photography, to map route networks at unprecedented scales. The long history of archaeological research in the region also provides an abundance of legacy data, as well as historical texts, which can be integrated with remote sensing data and modeling approaches. The physical, archaeological traces of routes and past movement come in a variety of forms: bridges, paired sites at crossing points, formally paved roads, informally paved tracks, cuts through terrain (including, sometimes, steps cut into bedrock), rural or desert routes lined with stones, hollow ways (both terrestrial and marine), and wheel ruts worn into bedrock (Alizadeh et al. 2004:76; Jotheri et al. 2019; Stone 2020; Wilkinson 2003:60–68). With more than 12,000 hollow way segments, over 100 canals, and road systems within some settlements now mapped, the region provides a rich empirical dataset. More recently, scholars have begun to use formal modeling approaches to investigate patterns of movement. The combination of material remains and modeling resources means that route studies in Southwest Asia are primed to answer complex questions about past mobility, the habitus of travel of different cultures across space and time, and how traffic changed in response to events or, alternatively, how existing traffic flows influenced events. In this chapter we provide an overview of the history of route studies in Southwest Asia up to the present day, focusing on the evidence which remains in the landscape and the modeling approaches that can be used to make inferences about past movement. We end by suggesting avenues for future research.

The first studies of ancient routes in Greater Mesopotamia took place in the nineteenth century, informed by classical literature

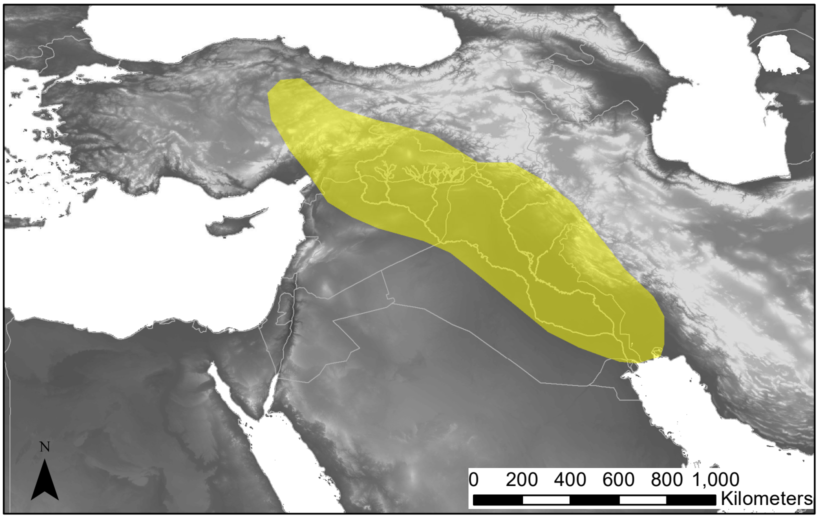


**Figure 1.** The region of Greater Mesopotamia covering the full extents of the Tigris and Euphrates Rivers, as well as regions frequently connected to Mesopotamian culture: the Zagros Mountains and Central Anatolia.

(Kinneir 1818; Rennell 1800), while other nineteenth-century travelers documented their routes meticulously and noted where they believed their paths followed in the footsteps of classical figures (Leake 1824; Wilson 1884). The authors of these earliest studies followed the routes as described in their source books—or at least noted where their journeys overlapped with earlier travelers—and wrote narratives both about the conditions and locations of the route and about the sites and sights seen along the way. None could be described as archaeological studies, but they demonstrate an interest in historical/ancient routes even in this period of antiquarianism (Trigger 2006).

This was followed in the early twentieth century by important anthropological and ethnographic documentation that, together with the nineteenth-century sources and ancient textual sources (Dercksen 2004; Larsen 1967; Leemans 1960; Liverani 1992; Ristvet 2011), now provide important insights into forms of travel before the automobile replaced animal traction in Southwest Asia (and around the world) and the draining of the marshes led to the displacement and near-erasure of traditional lifeways in parts of southern Iraq (Bell 1916, 1917; Cooper and Schoedsack 1925; Fulanain 1927; Oates 1968; Ochsenschlager 2004; Rajab 2003; Thesiger 1964). Historical travel guides can also provide details about travel in this era, albeit from a specific perspective (Baedeker 1898).

These ancient and now-historical sources also help researchers to better understand the nature of the travel that took place along those routes: the provisioning and equipment required, the distances that could be covered, the speeds of travel, and the various social and even political considerations that needed to be taken into account. Additionally, for the marshes of southern Iraq, there are more recent works that draw upon ethnographic interviews with people old enough to remember how things were organized in a pre-mechanized world (Al-Dafar 2015; Alwash 2013; Rost et al. 2011). From these sources, it is possible to learn about the different types of boats that were used in the marshes, how they were propelled, and many of the different activities that took place. The designation of the Iraqi Marshlands as a UNESCO World Heritage Site in 2016, ongoing conservation efforts (Al-Adilee 2019, 2020; Janabi 2017), and the funding of projects seeking to preserve traditional boat-building skills and other crafts could once again bring some of these scenes back to life (Lewis 2019), although climate change and water shortages are now causing unprecedented challenges (Jotheri et al. 2022:12)

After almost a century of development and technological innovation, archaeology is beginning to be able to examine routes with the level of detail that the antiquarian studies sought, interested not just in the fact that there were routes, but also in the twists and turns and shapes of the routes and the significance of those forms for the lived experience of the people who journeyed them: who they were, how they traveled, what they saw, and who they met along the way (Branting 2004, 2007; de Gruchy 2017; de Gruchy and Cunliffe 2020). In Mesopotamia, unlike other regions that enjoy the preservation of individuals' footprint tracks (Bell 2020; Roberts et al. 1996), we will never be able to access the level of individual experience through material culture alone, but we can see the collective footprints of populations of travelers and begin to think about the people who journeyed those ancient routes (Branting 2004, 2007; de Gruchy 2017; de Gruchy and Cunliffe 2020; Wilkinson et al. 2010).

## Discovery and Recording

Perhaps the most significant development in the history of the archaeology of routes in Mesopotamia took place when a French priest flew a plane over Syria in the 1920s. Antoine Poidebard (1934) was the first to recognize the dark lines radiating outward from sites like Tell Brak in Syria as the archaeological traces of ancient routes, although he never guessed just how old they were. Later, van Liere and Lauffray (1954/55) argued that the oldest hollow ways could date to the Bronze Age, and we now have evidence that they may have begun to form in the Late Chalcolithic period (Wilkinson et al. 2010). Nonetheless, Poidebard's photographs and the drawings he traced from them are the earliest documentation of the features archaeologists now refer to as hollow ways. Later, in the 1980s, Oates and Oates (1990) would use Poidebard's documentation to successfully ground truth the hollow ways around Tell Brak. At the same time, Poidebard's photographs, alongside other aerial photographs available at the time, also informed Kennedy and Riley's (1990) study of Roman roads in Syria and Jordan. In Anatolia, where the physical traces of past routes are rarely visible in aerial photographs, French (1981, 1988, 1998, 2012, 2016) conducted a comprehensive study of Roman milestones to identify and map Roman routes.

Another important development during the twentieth century was the use of ancient, rather than historical, texts to reconstruct ancient routes from the past. By the start of the twentieth century many thousands of cuneiform tablets had been unearthed from across Southwest Asia, and decipherment of cuneiform script had already taken place about a century before, aided by the trilingual script on the Behistun Monument (Matthews 2003:1–11). In the mid-twentieth century, cuneiform scholars like Goetze (1953) and Hallo (1964) began examining itineraries recorded in cuneiform tablets to reconstruct the routes of ancient travelers. Likewise, Liverani (1992:141–148) made use of itineraries detailing Ashurbanipal II's military campaigns to reconstruct the contemporary road system and identify seasonal use patterns. Larsen (1967) examined a corpus of Old Assyrian cuneiform texts from the second millennium BCE to learn more about caravan procedures at that time: the bureaucracy involved in sending and receiving a caravan of goods, as well as the people and animals involved, what they carried, the routes they took, and where they stopped along the way. Johnson and Wright's work in the 1970s was similar—examining connections between sites in western Iran (Wright and Johnson 1975; Wright et al. 1975)—but is better appreciated as a forebearer of network analysis. The straight lines they drew overtop their maps symbolize connections based on common material culture rather than an attempt to map the routes along which those connections took place.

Not all routes in Mesopotamia were land-based. Across southern Mesopotamia, an extensive system of canals and channels formed

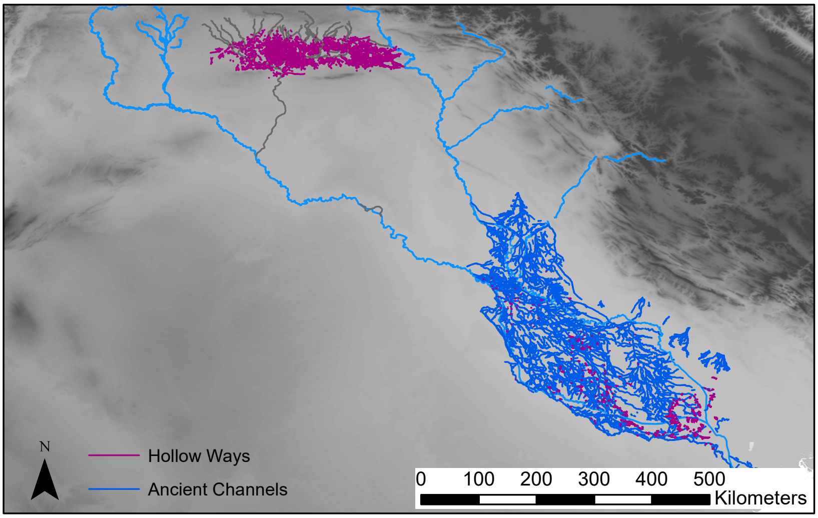


**Figure 2.** The digitized routes across Greater Mesopotamia.

important routes for boats since at least the fourth millennium BCE (Algaze 2008; Jotheri et al. 2019; Potts 1997; Wilkinson 2013; Wilkinson et al. 2015). During the 1960s and 1970s, Robert McCormick Adams conducted a large survey in central Iraq and, with Hans Nissen, two further large surveys in southern Iraq (Adams 1965, 1981; Adams and Nissen 1972). Adams noticed that the hundreds of sites recorded in the surveys followed linear patterns and hypothesized that these lines of sites evidenced the courses of ancient water channels. By literally connecting the dots, Adams (1981) was able to map 150 water channels across the region. This work is noteworthy as the first attempt to map the ancient water channels of Iraq, and it has since been enhanced by Hritz (2010), Hritz and Wilkinson (2006), Jotheri (2016), Rayne (2014, 2015), and others (Figure 2). Two decades later, it was in part due to Adams' advocacy that in 1995 the US government declassified the images from its Cold War satellite program, Corona (Casana et al. 2012).

In the early 1990s, before the declassification of Corona imagery, Tony Wilkinson conducted a remote sensing survey of hollow ways in Southwest Asia using aerial photography and a high-resolution contour map of the area, focused on the area covered by the North Jazira settlement survey (Wilkinson 1993; Wilkinson and Tucker 1995; see also de Gruchy and Cunliffe 2020). Later, this survey was expanded to cover the region around Tell Beydar (Ur and Wilkinson 2008). Wilkinson also examined the physical characteristics of the mapped

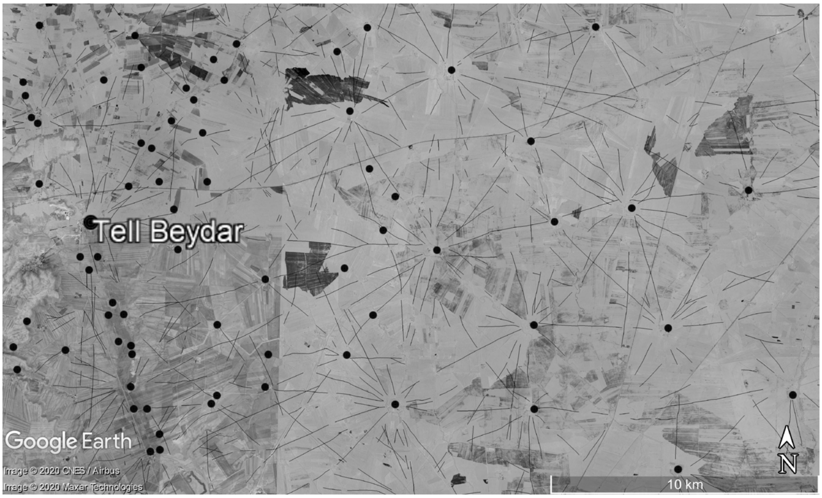


**Figure 3.** Hollow ways in the landscape around Tell Beydar, Syria, located in the North Jazira region, as mapped by Ur (2010a). Sites documented by the Tell Beydar Survey (Wilkinson 2000) and identified from remote sensing in Google Earth Pro are indicated as points on the map.

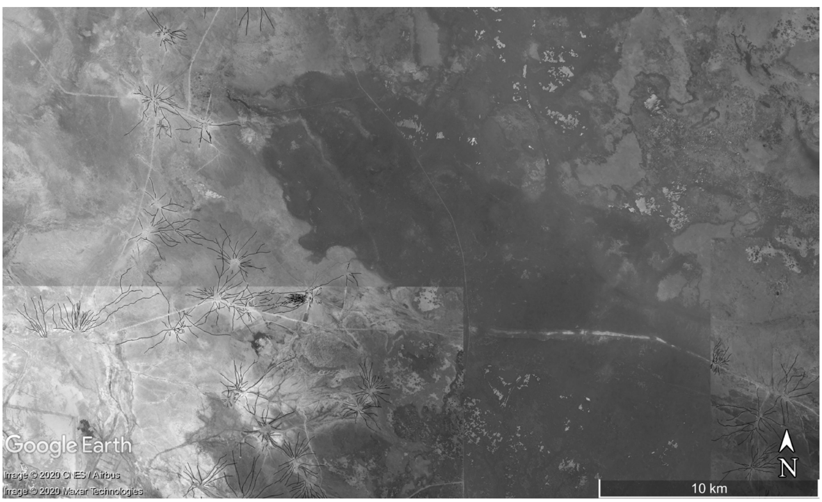


**Figure 4.** Hollow ways around sites near Haur (marsh) al Hamar in southern Iraq, visible as an extensive dark patch in the imagery, as mapped by Jotheri and colleagues (2019).

hollow ways to learn more about the nature of their formation and made the first interpretations about the volume of traffic that traversed them (Wilkinson 1993). Like van Liere and Lauffray (1954/55), he noted the association between hollow ways and Bronze Age sites—in particular, the mounded Early Bronze Age tell sites—but also between hollow ways and sites of other time periods (Wilkinson 1993:551–556). Through this dating by association, Wilkinson (1993:555–556) was the first to suggest that the hollow ways of the North Jazira might predate the Bronze Age. The declassification of Corona spy photography was transformative for this research because the spatial coverage of the program allowed mapping to be undertaken over very large areas. Ur (2010a) conducted a second survey of hollow ways across the North Jazira region, well beyond the confines of the North Jazira survey around Tell al-Hawa in northwestern Iraq (Figure 3). This work resulted in a map of over 6,000 hollow way across northeastern Syria and northwestern Iraq (Ur 2010b, but see also Altaweel 2005; Altaweel and Hauser 2004; Casana 2013; Laugier and Casana 2021; Mühl 2012; Ur et al. 2013) that has enabled scholars since to investigate movement in this region (de Gruchy 2017; de Gruchy and Cunliffe 2020; Raccidi 2013). Moreover, the map that was produced allowed for the distinguishing of three different categories of hollow way: hollow ways leading from settlements to surrounding agricultural fields; hollow ways leading from settlements to open pastureland beyond the agricultural fields, where the hollow ways tend to fork and fade away; and long-distance hollow ways that connect settlements (Wilkinson 2003:118–120).

Corona imagery has the advantage of capturing features that have since been erased from the landscape by agricultural expansion and intensification, urbanization, and large development projects such as dams. This is particularly useful for hollow ways, as they are often ephemeral features which do not survive even moderate intervention, such as ploughing. In landscapes where hollow ways have been preserved until relatively recently, modern high-resolution imagery can also be useful for recording and mapping hollow ways. Open-source platforms such as Google Earth and Bing Maps make it easy to assess damage to known hollow ways (de Gruchy forthcoming) and expediently map hollow ways in new areas. A study in 2019 doubled the number of known hollow ways by surveying the entirety of southern Iraq from Baghdad to the Persian Gulf using Google Earth as the primary source of imagery (Jotheri et al. 2019). Like the map of hollow ways produced for the north, the map of digitized hollow ways from this survey enabled the researchers to identify two different types of hollow way: short, dendritic hollow ways from settlements to surrounding marsh resources, and long-distance hollow ways between settlements (Figure 4; Jotheri et al. 2019).

## Excavation

Over the course of the twentieth century, there were many efforts to map routes but relatively few efforts to ground check them. None of the routes that were mapped through remote sensing, from cuneiform itineraries, through surveyed milestones, or by connecting linear arrangements of sites were excavated. In the late 1990s, McClellan and Porter (1995) asked an important question: what if the hollow ways radiating outward from sites were water drainage features rather than routes? As spidery, erosional features descending from mounded sites, they would certainly gather rainwater (McClellan and Porter 1995). How do we know that these features were routes? The challenge instigated a prolonged debate, mostly unpublished, with scholars making use of Digital Elevation Models (DEMs) to assess the hydrological properties of individual hollow ways. The matter was resolved by Wilkinson and colleagues (2010) through the excavation of three hollow ways close to Tell Brak, Syria, and subsequent analysis of their formation using geoarchaeological techniques. This work confirmed what was long suspected: that the hollow ways were routes formed by traction. Moreover, the excavations revealed their scale, with two of the three hollow ways once eroded to a depth of over one meter. A single pot sherd at the base of the fill in one of the hollow ways supported the hypothesis that van Liere and Lauffray (1954/55) had proposed half a century before: the hollow ways date back to at least the Early Bronze Age (Wilkinson et al. 2010). Since hollow ways are formed through erosion, they are negative features in the landscape and the fill inside them postdates their use. For this reason, when a hollow way is excavated, the date of the material at the bottom is only a *terminus ante quem*. It is also uncertain how long it took for the hollow way to erode to its final depth, further obscuring its age. Dating by association to the linear arrangements of sites that occur along the hollow ways across Mesopotamia suggests that the oldest hollow ways date to the early fourth millennium BCE (de Gruchy 2017; Jotheri et al. 2019; Ur 2010b:85).

## Modeling

The modeling of past movement presents numerous challenges. Ideally, the modeler would have a complete understanding of who traveled (age, sex, physical characteristics such as height and health); how those people traveled (walking, riding, rowing, punting, etc.); what the people brought or carried with them (goods/provisions, pack animals, herded animals, wagons, etc.); where they traveled to/from; when they traveled (seasons, day/night); and any sociopolitical considerations that would influence why they took one route over another. All these factors can affect whether a route would have been possible, its relative difficulty and speed compared to alternative routes, and the social or political costs (trespassing, trampling crops/gardens, etc.; Branting 2004; de Gruchy et al. 2017; Herzog 2014; Kalaycı, this volume). Any limitations or exceptions in the capabilities of travelers or any animals or vehicles accompanying them, as well as any known travel customs, can be incorporated into a least-cost path route model as "costs" to be minimized.

Archaeologically, the numerous hollow ways evidence the actual routes people traveled, while texts at least partially inform us about who traveled the routes, when, with what, and how—particularly from the second millennium BCE onward, but with some earlier textual evidence from the third millennium BCE (Barjamovic 2011; Dercksen 2004; Goetze 1953; Hallo 1964; Larsen 1967; Ristvet 2011). Particularly valuable is Larsen's (1967) work compiling Old Assyrian caravan procedures from numerous cuneiform texts that documented merchant travel between Assur (northern Iraq) and Kültepe (central Turkey) during the second millennium BCE. Dercksen's (2004:249–288) research on Old Assyrian institutions, including those related to pack animals and caravans, provides a complementary resource for further understanding the nature of various second millennium BCE travel considerations. These texts include information about the acquisition of pack donkeys and even what to do if a donkey became unwell.

Nonetheless, it is important to remember that these historical documents do not provide a comprehensive picture of everyone who traveled. Individual travelers are occasionally mentioned as joining caravans for a portion of their journeys, but details about these individuals are scant (Larsen 1967). Additional subpopulations of hollow-way users can be inferred by the spatial patterning of the hollow ways themselves. It is probably safe to assume that various people who worked in agricultural fields at different times of the year used the hollow ways between their settlement and the surrounding fields (Wilkinson 2003:111–120). Likewise, sedentary settlement-based pastoralists and their flocks would have used the hollow ways that connected to pasture beyond the agricultural fields (Wilkinson 2003:120–123). Undoubtedly, various other subpopulations made use of the various routes documented by the hollow ways for other purposes, if only to visit neighboring villages for social reasons. Leary (2014) provides a general overview of the many different types of mobility in the past, including the movement of slaves or the journeys of pilgrims, as well as an explicit reminder that women also moved across the landscape. Undoubtedly, many categories listed in his chapter apply to most regions of the world throughout many time periods, including Mesopotamia.

The modeling of past movements, however, requires consideration of more than just who traveled, how they traveled, and details into the nature of their travel. It is also important to consider the landscape through which they traveled (see, for example, Kuzhukhovskaia, this volume). For least-cost path mapping, this needs to be done not just generally, but also on a pixel-by-pixel basis—spatial reconstructions, or maps, of past land cover are required. For more recent time periods, modern natural land cover types of a region can be used as a reference for reconstructing past land cover (Soto-Berelov et al. 2015); however, for the more distant past, methods based on excavated paleoenvironmental remains that allow for entirely different types of land cover than those currently represented in the landscape are required (de Gruchy et al. 2016). Such reconstructions have only recently become possible at the scale required to impact route systems; earlier examples tend to be very general due to the data that was available (see, for example, the map by Hillman in Moore et al. 2000:Figure 3.7). Spatially reconstructed past land cover maps are developing rapidly, making use of advances in machine learning (Soto-Berelov et al. 2015) and the capacity of Geographic Information Systems to integrate archaeobotanical information (de Gruchy et al. 2016). A new set of spatial reconstructions of past land cover across the region from 8000 to 2000 BP is currently being developed by the Climate, Landscape, Settlement and Society (CLaSS) project, including data from climate modeling. Additionally, the LandCover6K project aimed to produce a global picture of land use at 6000 BP based on archaeological evidence. The Landcover6K maps of potential land use and actual land use modeled across Southwest Asia is forthcoming (Welton et al. forthcoming). Both the LandCover6K maps and the CLaSS spatial reconstructions will be immensely valuable for future models of movement.

Across the Greater Mesopotamian region, route modeling can be broken into four categories: route corridors modeled from commodity chains (termed *archaeotopograms*; Wilkinson 2014); pedestrian modeling along long-distance routes (de Gruchy 2016, 2017; de Gruchy and Cunliffe 2020); traffic-pattern modeling within a closed street network (Branting 2004, 2007); and traffic-volume modeling (Kalaycı 2015). The remainder of this section will concentrate on the latter three, each of which directly relate to archaeological traffic features and seek to extract information from them.

### *Long-Distance Route Modeling*

Hollow ways are particularly valuable for research into route modeling because of their formation process. Unlike roads, which can be centrally planned and exist regardless of usage patterns, hollow ways are only formed when sufficient traffic occurs along a route to cause the erosion of a hollow or linear depression in the landscape. For this reason, the shapes of the hollow ways (i.e. where/when they curve, and in which direction) provide archaeologists with evidence of the travel practices or habitus of people in the past (see Bourdieu 1977:53, 94). The traffic responsible for their erosion could be the traction of people, vehicles like wagons or carts, and/or animals like flocks of sheep and goat, as in northern Mesopotamia (Raccidi 2013; Wilkinson 2003:111–120; Wilkinson et al. 2010). Alternatively, the traffic could be from the repetitive movement of boats through a densely vegetated water environment (Jotheri et al. 2019). The formation of a hollow way can be quite rapid with very high volumes of traffic, as observed along the Syrian-Turkish border after 2011 (de Gruchy and Cunliffe 2020) and, once formed, evidence indicates that hollow ways can be used and reused for centuries or even millennia, and even perhaps paved over to form part of a modern road system (de Gruchy 2017; de Gruchy and Cunliffe 2020).

The visibility of hollow ways in imagery enables researchers to model and then statistically evaluate various hypotheses about travel practices in the past (de Gruchy 2016, 2017; de Gruchy and Cunliffe 2020). This line of research has already demonstrated the limitations of common methods of producing least-cost paths based on the physical variables of time, energy, or distance (de Gruchy 2017). Focused on single variables, these common methods fail to accurately describe the complexity of human decision-making, which often takes into account multiple variables. Branting (2012) illustrates this by describing how a (time-based) least-cost path model would take him directly to his meeting on time, but in reality, time allowed for him also to deviate from the fastest route to pick up a cup of his favorite coffee on the way. Arriving on time for a meeting with a favorite coffee is better than simply arriving on time for a meeting, but a simple model that only optimizes based on time and does not factor coffee-culture will never capture this behavior (for a second, real-world example from nineteenth-century Turkey of the complex and varied motivations that can influence route planning, see Kurt, this volume). Another limitation to these common methods is the assumption that travelers are pedestrians—rather than pedestrians accompanied by pack animals, or people riding horses or camels or donkeys—even though it is known from a variety of sources that this was not always the case (Larsen 1967; Littauer and Crouwel 1979; Raccidi 2013; Ur 2009:192–193; Wilkinson 2003:62).

Raccidi (2013) draws on terracotta models, as well as funerary, glyptic, and textual evidence, to distinguish various types of wheeled vehicles used by inhabitants of northeastern Syria in the third millennium BCE. As he notes, the region as a whole is quite flat and conducive to wheeled transportation (Raccidi 2013:21). Making use of the digitized hollow ways by Ur (2012), he focuses on four long-distance routes across the western Khabur Triangle in northeastern Syria, including two routes described in cuneiform texts (Raccidi 2013:22–23). These routes, selected from the preserved hollow ways, are visually compared to least-cost paths modeled based on the easiest (lowest slope) routes. Due to the flat terrain, these easiest routes are generally fairly direct between origin and destination. There is little to no overlap between the models and the preserved hollow ways, suggesting that other factors guided the route choice decisions of the people who traveled the selected long-distance hollow way routes (Raccidi 2013:20). This is not surprising, since the terrain is sufficiently flat that a wagon is not constrained by slope to particular corridors in the landscape. Land cover (e.g. shrubs, grass, agricultural fields, or the presence of an existing dirt path), soil compactness, and sociopolitical considerations all may have been factors instead.

As with pedestrian modeling, the modeling of other forms of movement—from wheeled vehicles to animals (pack, riding, or herds)—must critically consider the limitations of the form or agent of movement and as many details as possible about the landscape within which the movement took place. Some data on the abilities and limitations of different modes of transport exist in textual sources and ethnographic accounts, and some research has taken place (Dercksen 2004:249–288; Littauer and Crouwel 1979), but the body of literature aggregating and analyzing this data remains patchy, with some forms of transportation (e.g. pedestrian movement and wheeled vehicles) better understood than others (e.g. riding a camel/donkey or punting a boat), although this is changing (Crépy et al., this volume). A model of camel movement developed by Manière et al. (2021) is an important example.

### *Street Modeling*

Although roads do not provide the same direct information about past travel as do hollow ways, where complete plans (streets and buildings) of sites exist, roads can be incredibly useful for understanding past traffic patterns and providing insight into the dynamics of a site. A road may exist regardless of usage, but where a road is part of a full site plan, it is possible to model that usage based on spatial associations between roads and other features. Nowhere is this better exemplified than at the site of Kerkenes Dağ in modern Turkey (Branting 2004, 2007).

In the Late Iron Age, Kerkenes Dağ was a walled settlement with clear boundaries. Inside the walls of the settlement, a complete plan of streets and buildings dating to the Iron Age has been derived from a combination of geophysical prospection and excavation, providing a rare opportunity to model traffic patterns. Using a detailed topographic map of the site and this street plan, Branting (2004, 2007) conducted a series of complementary analyses into the movements of the site's Late Iron Age (550–330 BCE) inhabitants. One was a comparison between the known street plan and (energy-based) least-cost path route models based on the topography of the city, using the gates as start and end points (Branting 2007). A second analysis made use of the known street plan to produce models of traffic volumes along each street (Branting 2004:118–125). The third analysis used the various models of street traffic volumes to evaluate which buildings the greatest number of people would pass by while walking through the settlement (Branting

2004:125–131). This third analysis was repeated for different age and sex categories of the population (Branting 2004:136–152). A fourth analysis used the traffic models to extrapolate the catchment of each gate (Branting 2004:132–135). This involved identifying the nearest gate for each block, which had the effect of grouping the blocks of buildings within the settlement into distinctive collectives (perhaps representing neighborhoods). As Branting (2004, 2007) has stated before, these models helped with identifying centers of activity and, therefore, how those busy areas related to urban service infrastructure, such as palace compounds, temples, or marketplaces.

### *Traffic Volumes*

The ability to model traffic volumes along hollow ways or roads outside of walled, bounded settlement plans is an unresolved area of research. While it has long been recognized that the variable width and depth of hollow ways should be indicative of traffic volumes (Casana 2013:271; Ur 2009:181), extrapolating even relative values is complicated by a range of factors, from the type of traffic to the underlying soil characteristics. Additionally, it is hypothesized that the traffic along the hollow way would itself change underlying soil characteristics like compactness and moisture retention (Kalaycı 2015; Kalaycı et al. 2019). Existing research into detecting relative traffic volumes along routes across the wider landscape has used Normalized Difference Vegetation Index (NDVI) values as a proxy for detecting variations in soil compactness along hollow ways, with promising results (Kalaycı 2015).

## What is the Future of Mesopotamian Route Studies?

The major phase of mapping hollow ways in Southwest Asia is not over; more are being discovered regularly as prospection and fieldwork continues, and many more remain to be recorded. There are many regions that have simply not been surveyed, and we know from older work that there are other forms of roads, such as paved Roman roads, that still need to be mapped digitally. In southern Mesopotamia, where hollow ways have recently been mapped using Google Earth, additional segments remain undocumented due to lower resolution imagery and the lack of available Corona spy photography (Jotheri et al. 2019). U2 imagery, which predates Corona by 5–10 years, has the potential to reveal hollow ways that vanished from the landscape during the 1960s (Hammer and Ur 2019).

Although there are thousands of known hollow ways across the region, their age is not yet firmly established. Only three hollow ways out of over 12,000 have been excavated and published. This is not a representative sample. From those three, a single sherd at the bottom of a single trench provides the firm evidence that these features date to at least the third millennium BCE (Wilkinson et al. 2010). While some authors have argued that the earliest of these features formed in the fourth millennium BCE (de Gruchy 2017; Jotheri et al. 2019; Ur 2010b), no excavation has yet provided confirmation. Understanding the formation of the hollow ways has important implications, particularly as their formation could either coincide with or otherwise immediately predate the Uruk Phenomenon or Uruk Expansion (ca. 3600–3100 BCE)—a period of unprecedented interregional interaction across Greater Mesopotamia (Algaze 2008; Pournelle and Algaze 2014; Stein 1999). The potential that traffic volumes reached the magnitude required to cause the formation of hollow ways either during the period before the Uruk Expansion or at the start of the Uruk Expansion could help clarify the origins and debated nature of this cultural phenomenon. Hollow ways also provide indirect evidence of agriculture, since they have been interpreted as formations resulting from the constraining of movement through agricultural zones. As such, their dating could provide information on the timing of agricultural intensification and extensification, a key debate in the emergence of urban forms in this region (Styring et al. 2017).

Finally, the potential of route modeling for understanding more about past mobility through the archaeological features that record those traffic flows—hollow ways and roads—is still being realized. Much experimental work is required to better model pedestrian movement, to enable the modeling of different types of movement (traveling with animals, wagons, or carts; riding a camel; rowing a boat, etc.; see Crépy et al., this volume), and to better understand, quantitatively, the magnitude of traffic required for a hollow way to form. Additionally, the spatial reconstruction of land cover across the region will contribute to a better understanding of the formation of the hollow ways and will enable researchers to begin to factor land cover into route models.

The quality and variety of material evidence and the efficacy of remote sensing approaches in the dryland environments of Southwest Asia means our region has much to contribute to route studies. We would argue that this potential can best be realized by combining the empirical record with a wide variety of modeling approaches at multiple scales.

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**Figure 1.** The position of Liburnia and Velebit Mountain in relation to the eastern Adriatic coast. The inset shows the area analyzed in this paper. Imagery courtesy of Google Earth. Map by Morana Vuković.

# Chapter Two
# The Importance of Velebit Mountain in the Connectivity and Trade of Southern Liburnia

Zrinka Serventi and Morana Vuković

During the Iron Age, the territory of Liburnia was the native place of the Liburni; it encompassed the coastal area from the Raša River to the Krka River and all adjacent islands, as corroborated by numerous archaeological finds as well as ancient literary sources (Figure 1; Kurilić 2008:9; Matijašić 2006:81). According to these sources, the Liburni formed at the turn of the second to first millennia BCE (i.e. the transition from the Bronze to Iron Age), and they were autonomous until the Romans expanded to the eastern Adriatic coast and established the Roman province of Dalmatia (Batović 1987:339; Dimitrijević et al. 1998:306; Kurilić 2008:9).[1] In contrast to other groups on the eastern Adriatic coast (e.g. the Dalmatae, Histri, Iapodes, and Illyrians), there are no sources—either material or written—attesting to Liburnian resistance to the Romans; on the contrary, the common consensus among scholars is that they were quite willing to cooperate (Kurilić 2008:14–19).[2] The territory of Liburnia was always a seafaring region. Its inhabitants were in constant contact with foreign people, and the maritime routes they traveled were connected intrinsically with prehistoric trails that led from the coastal area into the hinterland (Brusić 2007:17; Čače 2006:67). The first proper roads were built with

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[1] Numerous articles and books have been written on the topic of the Liburni and their history; see, e.g., Barnett 2017:63–97; Batović 1987:339–390; Čače 1985; Čondić and Vuković 2019; Kurilić 2008; and Suić 1955a, with accompanying literature. Among the ancient sources that mention the Liburnian territory, the most precise was Pliny (*N. h.* 3.139–3.141), although information also can be found in Appian (*Ill.* 1.3; *Bell. Civ.* 2.6.39), Livy (*Ab urbe cond.* 10.2.4), and Ps. Skylax (*Peripl.* 21); for more on these sources with accompanying interpretation, see Suić 1955b:149–165 and others.

[2] For more on the province of Dalmatia—which incorporated the territory of Liburnia after the Roman expansion—and the wars waged on that territory, see, e.g., Matijašić 2009; Šašel Kos 2005; and Wilkes 1969, with accompanying literature.

the Roman expansion; however, many of them were overlaid on the already-existing Iron Age road system, and these routes were used in post-Roman times, as well (Bojanovski 1974:22).

The Liburnian territory encompassed many different areas, both culturally and geographically. It consisted of the larger and more fertile islands of the Kvarner Gulf, as well as the smaller, barren islands of southern Liburnia and, on the mainland, the harsh and hostile territory of Velebit Mountain (and the coast beneath it), which contrasted with the fertile lands of Ravni kotari and Bukovica (Kurilić 2008:9; Magaš 2013:163–196). Therefore, the Liburnian territory was diverse and heterogeneous, and in large part Velebit Mountain was the most impressive marker in the topography of the area. Namely, Velebit was (and still is) a unique space of communication and division. It stretches for about 150 km from the Kvarner Gulf in the north to the Zrmanja River in the south, and even though it is not the tallest mountain in Croatia, it is one of the most challenging to pass (Dubolnić 2008:9; Magaš 2013:49). However, since it divides the coastal area from Lika and the vast majority of the continental territory, the native peoples (primarily the Liburni and Iapodes) were forced from the earliest times to find ways over the mountain, in this way tracing the first provisional roads and passes. Consequently, the transport routes had to be adapted to the existing unforgiving terrain, especially in winter. In this context, several existing mountain passes were of strategic importance throughout the ages (both prehistoric and modern), such as Vratnik near Senj, Baške Oštarije near Karlobag, and Mali Alan near Tulove grede, even though some of them are located at more than 1,400 masl (Černicki and Forenbaher 2016:12–15). Apart from their pastoral importance during the Iron Age and later periods, these routes also were used in trade, particularly in salt and lumber (Dubolnić 2008:9).

Therefore, the main obstacle to transport between Liburnia and its hinterland was Velebit Mountain, which even now is quite difficult to pass, and in winter the modern roads are often closed due to strong winds and snow. Because of this, for a long time the prevailing notions among scholars were that most of the Liburnian territory was not very influential in connections and trade with the hinterland, that trade routes were predominantly concentrated in the south, and that the Liburni acquired the majority of their foreign goods via maritime trade. However, with recent archaeological excavations and field surveys—many of which were conducted by the authors of this paper—the importance of Velebit and its adjacent area in ancient transportation routes and trade has been reinterpreted. Therefore, the primary aim of this paper is to present for the first time the aforesaid research, reconstructing as precisely as possible the Iron Age routes taken from the southern Liburnian coast over Velebit into its hinterland and illustrating the routes' importance in trade and cultural exchange. Furthermore, since these routes are often quite hard to date, their continuity in later historical periods will be considered, as well. We also will present several settlements that were necessary for securing safe trade along these routes and demonstrate their influence on the development of Iron Age communities and culture. In such a way, we aim to show that this part of Velebit was as vibrant and important during the Iron Age as were other parts of Liburnia.

## The State of Research and the Routes of Southern Velebit

As mentioned above, for a long time the prevailing notions among scholars were that the northern and central Liburnian territories on the whole were not very influential in Iron Age connections and trade with the hinterland, and that the trade routes were mostly concentrated in the south (Čače 2006:67; Miletić 2006:129; Zaninović 1978:39). Consequently, the Ravni kotari and Bukovica areas have been more extensively researched, with a particular focus on the roads that connect some of the largest Liburnian hillforts and settlements (e.g. Nedinum, Asseria, Corinium, Varvaria, and Burnum). This discrepancy in research also exists because roads are more visible in such landscapes and because they connect better-known hillforts, many of which were used continuously into Roman times (and later). Segments of roads from various periods have been discovered and excavated—especially around Asseria and Burnum—in the form of either well-trodden paths or proper roads with stone paving, ruttings, border walls, and even milestones (Miletić 1993a, 2006:129–130). Furthermore, Roman sources occasionally mention roads and important trade centers, although they still rarely deal with the Velebit area. For example, ancient sources that reference Roman military exploits in Dalmatia may also describe important settlements and locations, as well as document distances between settlements and mention relatively verifiable geographical locations and roads. Still, ancient sources—apart from those describing the wars against autochthonous peoples of the eastern Adriatic—mostly focus on the situation that existed during Roman rule, which often does not correspond to the circumstances of the Iron Age. The most important sources in this context are the *Tabula*

*Peutingeriana*, *Itinerarium Antonini*, *Ravennatis Anonymi Cosmographia*, Ptolemy's *Geographia*, Pliny's *Naturalis Historia*, and Appian's *Historia Romana* (Brusić 2007; Čače 2003, 2006, 2008; Cesarik 2017; Glavaš 2010; Miletić 1993a, 1993b, 2004, 2006:129–131).

Therefore, due to such discrepancies in scientific studies, we have focused our research on the lesser-known area of southern Velebit. Although this territory is for the most part unexplored archaeologically, in recent times its importance in ancient transportation routes has been re-examined, and, consequently, a clearer archaeological map of the area can be made. Namely, older publications dealing with this area have been few and far between (e.g. Abramić and Colnago 2011 [1909]; Batović 2004; Buttler 1933; Glavičić 1984), but more recent field surveys in the area and occasional—although limited—archaeological excavations have shed new light on the overall problems of trade and communication as well as the locations of Liburnian hillforts (Dubolnić 2006; Vuković 2018). Apart from this, the conclusions about the road system of southern Velebit presented in this paper are based on the identification of Iron Age material, hillforts, and trails from extensive field surveys and several archaeological excavations that were conducted by the authors.

According to the aforesaid research, there are several important Iron Age routes in the territory between the west end of the municipality of Starigrad and the Zrmanja River. Among the most important are those which pass over the Malo Rujno and Veliko Rujno Plateaus and Velebit Mountain toward Lika. The most likely equivalent to these roads was the pass through Velika Paklenica Canyon. Furthermore, the road from Modrič to Sveti Rok stretches over the Malo Libinje Plateau, while the road from Jasenice leads over Tulove grede, which nowadays is called Majstorska cesta (Figure 2).

Up to the territory of Gračac, routes used the Prezid Pass, which was the shortest and most convenient crossing from the territory of Golubić and Žegar and their hillforts toward Lika. There are also three more passes which span over this southernmost, desolate crag of Velebit. The first trail goes from the Krupa River across Duboki dol toward Vučipolje and then, most likely, toward the Una River valley. The second leads between the Zrmanja and Krupa Rivers toward the Ljut Plateau, and then over Razdolje toward the deep canyon of the eastern stream of the Zrmanja River. The third is the one that spans from the Ljut Plateau through the ravine toward Mokro polje area. This now largely isolated territory was quite important historically as


1. Veliki Sikavac
2. Silna gromila
3. Gradina Malo Rujno
4. Gradinica Malo Rujno
5. Sv. Trojica
6. Šilježetarica
7. Gradina Veliko Rujno
8. Cave in Zub Buljme
9. Zaskok
10. Vaganačka pećina
11. Kojići - Milovac
12. Argyruntum area
13. Gradina Marasovići
14. Visoka gradina
15. Paklarić
16. Gradina Seline
17. Mitrova gradina
18. Sv. Jakov
19. Zekića gradina
20. Kusača
21. Bucići
22. Gradina Kneževići
23. Sv. Ivan
24. Sopnjača
25. Velika gradina
26. Nadgradina
27. Gradina Modrič
28. Gradac
29. Razvršje
30. Dračevac
31. Jurčevića gradina
32. Križ
33. Gradina Šibenik
34. Bojnik
35. Pržunac
36. Zelenikovac
37. Visoka glavica
38. Razvršje
39. Kraljičina vrata
40. Fratarska glavica
41. Gradina Modrići
42. Muškovci

**Figure 2.** A map of the selected area from Starigrad Paklenica to Jasenice. Imagery courtesy of Google Earth. Map by Morana Vuković.

an intersection of trails, roads, and borders, not only during the Iron Age but also during the Middle Ages and in early modern times (Černicki and Forenbaher 2016:35, 111–123, 199–215; Glavaš and Miletić 2013:546–551; Vrkić 2017:35).

Apart from being the most logical and simplest passes over Velebit, their use is also attested and marked by archaeological sites, hillforts, and burial mounds. Furthermore, there is a continuity in use of the same sites for habitation: small villages existed along these paths in both ancient and more recent times that were connected by trade, pastoralism, and family ties (on the southern slopes of Velebit, life can be found up to 900 masl). The remains of the oldest prehistoric periods can be found in caves (e.g. Vaganačka Cave), while for the Bronze and Iron Ages, more visible signs—like the remains of hillforts and tumuli—can be found in the surrounding area. Settlements dating to more recent times are often found in the vicinity of these prehistoric sites—even in the same locations. This is not surprising, since Velebit is a karstic area with limited water resources and fertile fields for livestock grazing and agriculture, which limited and shaped life in this territory. Consequently, the Iron Age trails that we know of today (or at least hypothesize about) most likely formed even before the

**Figure 3.** Part of the route leading from Seline to Sv. Jakov. Photograph by Morana Vuković.

appearance of the Liburni, and they are for the most part the simplest and most logical routes across and over the mountain (Figure 3). Furthermore, some of these trails and passes had clear importance during the early Roman Empire and in late antiquity, and the remains of more recent roads (e.g. Majstorska cesta) can be found, as well, which proves their importance in this part of southern Velebit. The southwestern


**Figure 4.** A view from the top of Veliki Golić toward the Veliko Rujno and Malo Rujno Plateaus. Photograph by Morana Vuković.

slope of Velebit also is covered with numerous trails that connected settlements belonging to various periods, and, although the majority of those trails are now rough goat paths, those of greater importance were better constructed and more permanent (Dubolnić 2006; Faber 1995, 2000; Glavičić 1984; see also de Gruchy and Lawrence, this volume, for routes and route modelling in a completely different landscape, the Mesopotamian region).

Basically, due to the demanding terrain—which is a decisive factor in the location of routes in the area of southern Velebit—there were few options for reasonable and safe passage over the mountain. Consequently, people living in this area during the Iron Age, as well as in later times, had no choice but to use and reuse the same road systems. The inhabitants' interaction with their surroundings was, therefore, shaped and limited by the harsh life they led, and thus it is questionable whether or not they were able to negotiate different routes in such circumstances. In the following text, we shall give a more detailed description of these routes divided into two sections: those in the wider territory of Starigrad, and those located in the area between Jasenice and the end of the Velebit massif.

## Routes in the Territory of Starigrad Paklenica and Jasenice

The southern slope of Velebit, stretching from Starigrad to the Veliki Vaganac and Mali Vaganac Plateaus and the Veliko Rujno and Malo Rujno Plateaus, is the area with the oldest communication routes over Velebit (Dubolnić 2008:9; Faber 1995:256). One of the strategically most important locations on these trails is the area west of Starigrad along the Veliko Rujno and Malo Rujno Plateaus, approximately 5 km in length and situated at 900 masl (Figure 4). These plateaus were inhabited until recently, and they generally contain the largest fields in southern Velebit. They also represented hubs of pastoral and trade communications between the coast and Lika (Dubolnić 2008:10; Faber 2000:16). They were certainly inhabited during the Bronze and Iron Ages, as attested by three hillforts (Gradina on the Veliko Rujno Plateau, and Gradina and Gradinica on the Malo Rujno Plateau; Glavičić 1984:11–15), while the pottery found on Veliko Rujno indicates that cultures in Lika and the coastal area interacted throughout these periods (Dubolnić 2008:12; Faber 1995:259, Note 7, 2000:24–25).

Numerous trails, which had a significant role during prehistory, led up to the Veliko Rujno and Malo Rujno Plateaus, and three of them in particular were of great importance. The first leads from the village of Tribanj Šibuljina over Zavrata toward Malo Rujno (Faber 1995:256). This well-built trail starts from the coast in Tribanj Šibuljina and at 300 masl passes several prehistoric sites (Figure 2: no. 2): on both the east and west sides of the trail, there are several smaller hillforts and burial mounds (Dubolnić Glavan 2009). This is the westernmost trail leading from the coast to Malo Rujno, and the Gradina and Gradinica hillforts (Figure 2: nos. 3 and 4) controlled the approach to the aforesaid plateau.

One of the starting points for the next trail is the hillfort of Sv. Trojica, situated at the foot of the mountain (Figure 2: no. 5). This Iron Age hillfort is one of the biggest and most important settlements in Podgorje.[3] The importance of this location throughout the ages is attested by a Byzantine fort built beneath the Iron Age hillfort, as well as by the remains of a shipwreck in the cove of Šlježetarica in the immediate proximity of this site (Figure 2: no. 6; Dubolnić 2007:34). This fort had a prominent position that overlooked the wider area, both land and sea, with a view of the strategically crucial location, the strait of Ljubačka vrata, to the west; this strait was controlled by another Byzantine fort on the island of Veliki Sikavac (Figure 2: no. 1; Gluščević and Grosman 2015:146). From the Sv. Trojica hillfort, the trail leads toward the western part of the Veliko Rujno Plateau, and from here it goes directly north toward one of the most important mountain passes in this part of Velebit, called Ribnička vrata (Figure 2: pass b), and onward to the pastures of Oglavinovac and Počitelj in Lika. Also, one trail leads from this important crossroads to the Malo

[3] Podgorje is a general name for the southwestern slopes of Velebit (Leksikografski zavod Miroslav Krleža 2021).

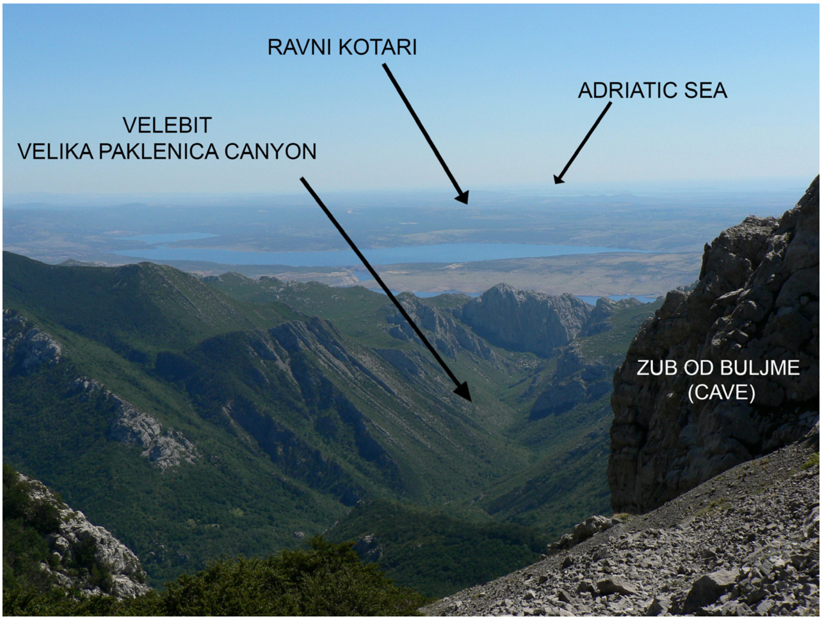


**Figure 5.** A view from the eastern side of the Buljma Pass toward Velika Paklenica Canyon. The cave in Zub Buljme is situated in the base of the rock on the right side of the picture. Photograph by Morana Vuković.

Rujno Plateau to the west, and the other branch leads over the Veliko Rujno Plateau and Gradina (Figure 2: no. 7) to the east (Dubolnić Glavan and Glavaš 2011:108, Map 1; Faber 1995:255).

Among the most important areas that enabled communication between the coast and Lika was the Veliki Vaganac Plateau. There are several possible routes that led to this area, as well as further on to the southeastern edge of the Veliko Rujno Plateau. They all start at Starigrad in the Argyruntum area (Figure 2: no 12), where several Bronze and/or Iron Age hillforts and watchtowers have been detected: the Kojići–Milovac hillfort (Figure 2: no. 11), Gradina Marasovići (Figure 2: no. 13), Visoka gradina (Figure 2: no. 14), and the Paklarić hillfort (Figure 2: no. 15; Dubolnić 2006:16, 2007:8, 2008:10; Faber 1995:259, Note 7; Jurić 2002:90). It is not unusual to construct hillforts or watchtowers near such important trade routes; for example, the Kojići–Milovac hillfort had a view of its entire surroundings, including Ravni kotari and, on its other side, the adjacent islands. Furthermore, burial mounds can be found along this path. The Zaskok hillfort (Figure 2: no. 9), on the western side of the Veliki Vaganac Plateau, could have controlled the northwest entrance to the plateau and, thus, effectively controlled the entire area. The Veliki Vaganac Plateau (ca. 600 masl) played a crucial part in the Iron Age trade route to Lika (Dubolnić 2008:11), and the importance of this area throughout the ages is clear: the plateau was inhabited until the 1970s and was used for summer pasture (as attested by numerous stone cisterns), but also the finds from Vaganačka Cave span the Mesolithic to the Iron Age (Figure 2: no. 10). From the Veliko Rujno and Malo Rujno Plateaus, trails lead toward several mountain passes at an elevation of 1,250–1,350 masl, including Buljma (Figure 2: pass c), Ribnička vrata (Figure 2: pass b), and Jelovačka vrata (Figure 2: pass a). Through them, the ideal summer pastures for livestock could be reached: pastures like the Oglavinovac, Javornik, and Struge Plateaus on Velebit and those around the Medak and Počitelj hillforts in Lika. This is attested by several caves with prehistoric finds (e.g. the cave in Zub Buljme [Figure 2: no. 8]; Dubolnić 2008:12) and by the remains of more recent transhumant pastoralism, like shelters and resting places (Belaj 2004; Marković 1980:16, 26–28).

The Rujno Plateau—as well as the important Buljma Pass—could be reached through Velika Paklenica Canyon (Figure 5; Faber 1995:255). Two Bronze/Iron Age hillforts guarded the entrance to the canyon: the Gradina hillfort on the east slope of Veliki Vitrenik (and west of the entrance to the canyon) and the Paklarić hillfort on the east side of the canyon (Dubolnić 2006:16–17; Jurić 2002:90). Apart from Paklarić, several hillforts have been recorded in the area between the Velika and Mala Paklenica Canyons: Gradina Seline (Figure 2: no. 16), Mitrova gradina (Figure 2: no. 17), and Zekića gradina (Figure 2: no. 19). In order to communicate with settlements in Lika, apart from going through Velika Paklenica Canyon, inhabitants of these hillforts used other trails, some of which most likely are still used by shepherds today. The location of the shepherds' chapel of Sv. Jakov (Figure 2: no. 18) at the crossroads of these trails clearly proves their importance. Mala Paklenica Canyon is significantly harder to pass, and in all likelihood it was used only as a hiking trail. The Kusača and Bucići hillforts (Figure 2: nos. 20 and 21) controlled this pass from the east (Dubolnić Glavan 2009:503, 2010:536), and next to it was one of the shepherds' trails leading to the Malo Libinje Plateau.

Other high-altitude plateaus suitable for communication and inhabitation are Veliko Libinje and Malo Libinje. We shall present the trail which led from the foot of Velebit Mountain over Malo Libinje and on to Lika, above all because this route remained in use


**Figure 6.** The Malo Libinje Plateau and the Gradina Kneževići hillfort. The canyons of Mala Paklenica and Velika Paklenica are visible in the background, as is the highest part of Paklenica National Park. Photograph by Morana Vuković.

until present times, and because numerous archaeological finds attest to its importance throughout history (Dubolnić 2006:23–24; Faber 1995:258; Glavičić 1984:7–10).

One of the more important trails linking the coastal region with Lika can be found in the area where Velebit descends directly to the easternmost part of the Velebit Channel. This territory has a great concentration of Iron Age hillforts that controlled the trail and the entire area. One such hillfort, Gradina Modrič (Figure 2: no. 27), is located on a notable promontory (Dubolnić 2006:22–23). The position of this hillfort was clearly significant, as is attested by the later construction of a Byzantine fortress at the same location (and this is also undoubtedly connected with the aforementioned Byzantine fortresses at Sv. Trojica and the island of Veliki Sikavac; Gluščević and Grosman 2015:146). If we take into consideration both the maritime and caravan routes, this location had crucial importance as the easternmost point where the Velebit hillside could be reached by sea, and from it one could reach either deeper into hinterland or Bukovica and Ravni kotari.

Precisely from the position of the Gradina Modrič hillfort begins an old trail leading uphill toward the Malo Libinje Plateau. Along this path there are two more Bronze/Iron Age hillforts (Velika gradina [Figure 2: no. 25] and Nadgradina [Figure 2: no. 26]); recent villages; Sopnjača Cave (Figure 2: no. 24), which was used during various periods (field survey has indicated its period of use from the Iron Age to the Middle Ages; Dubolnić 2007:12–13); and beside the path on the west side of the Malo Libinje Plateau, the Iron Age hillfort of Gradina Kneževići (Figure 2: no. 22). It is not surprising that this area was inhabited despite the overwhelming amount of karst that surrounds it, since this is one of the few places on Velebit that has extensive fields for agriculture and livestock as well as relatively easily available water. This is also the place where different roads and tracks intersect. We have decided, therefore, to examine the Gradina Kneževići hillfort as a small case study of the recent excavations and field surveys conducted by the Archaeological Museum Zadar in this area.

The aforesaid hillfort is located on a karst hill and has several levelled terraces, which were defended by steep bulwarks and one massive stretch of defensive ramparts (Figure 6). The first official archaeological exploration of this area started at the end of the 1970s, when two Iron Age graves were excavated near the hillfort (Glavičić 1984:7–10). At the beginning of the twenty-first century this area was surveyed again (Dubolnić Glavan 2009), but the first systematic archeological excavations focused especially on the Gradina Kneževići hillfort were carried out in 2018 by the Archaeological Museum Zadar (under the supervision of Morana Vuković, curator at the museum). The research, which has encompassed both the area of the settlement within the hillfort as well as the necropolis at the base of the hill, is still ongoing, and the results of these excavations have yet to be published. Recently excavated archaeological finds, especially local and imported pottery, indicate that the site was used for a long time, most likely throughout the Iron Age. Due to the harsh, rocky, and steep terrain, the archaeological strata have been severely affected by both weather conditions and human activities (e.g. the building of stone walls and paths, the use of the space for pasture), since the nearby village of Kneževići is still inhabited. The existence of a flat necropolis at the base of the hillfort—one of very few such necropolises in the territory of Velebit—indicates that this was not just a temporary settlement or a watchtower (Glavičić 1984:7–10).

Furthermore, several groups of burial mounds have been found in the vicinity that most likely belonged to the inhabitants of this hillfort (Dubolnić 2006:23–24; Glavičić 1982:39–42). During recent archaeological excavations conducted in 2020 by the Archaeological Museum Zadar, a few more burial mounds were found, all located on the east side of the hillfort beside the aforementioned route leading to the next plateau. On that next plateau, remains were found of the drystone-walled shepherds' church of Sv. Ivan (Figure 2: no. 23). The church was built on one of the largest prehistoric burial mounds next to this route and is also in the vicinity of Ivanjska lokva, the watering place for cattle (Glavičić 1982:39–40). This church, as well as the pastures, were used by the inhabitants of Podgorje and Lika, which attests to the importance of this territory throughout time for both commerce and communication (Marković 1980:44). A wide territory could be controlled from the top of the Gradina Kneževići hillfort, which was crucial since this was where different roads and tracks intersected. The road that passed beside the hillfort not only connected settlements on the coastal side with those on the other side of the mountain (located around Sveti Rok and Lovinac; Figure 2: pass f), but also from this area it was possible to transverse the highest zone above 1,500 masl (Figure 2: passes d and e) and to communicate with the communities in the territory of Raduč and even further west toward Medak. The Malo Libinje area was also used for important horizontal communication routes, which were used to reach Paklenica Canyon to the west as well as the pass of Kraljičina vrata to the east. Therefore, this location was not only important for local connections and populations, but also for transiting cattle herders (i.e. transhumant pastoralism) and for wider trade between the coast and the deep hinterland (Marković 1980:28, Figure 11). Furthermore, it most likely had a role in the demarcation of different communities and populations living on Velebit.

Another trail—detected already by the beginning of the twentieth century in the remains of a Roman road, but most likely datable to the pre-Iron Age period—leads from Maslenica to Lika (Šarlija 2010:7). Since this Roman road is located near a large number of prehistoric sites, it is highly possible that the road partly used the previously established prehistoric route. Several hillforts have been detected in the wider territory of Maslenica, from Rovanjska to the mouth of the Zrmanja River: Gradac (Figure 2: no. 28), Razvršje (Figure 2: no. 29), Dračevac (Figure 2: no. 30), Jurčevića gradina (Figure 2: no. 31), Križ (Figure 2: no. 32), and Gradina Šibenik (Figure 2: no. 33) on the western side of Zrmanja, and Bojnik (Figure 2: no. 34) and Pržunac (Figure 2: no. 35) on the eastern side of Zrmanja. The tracks of this road can be detected from the coast up to the hillfort situated at Dračevac. From this point, the road climbs between the hillforts of Gradina Zelenikovac (Figure 2: no. 36), Visoka glavica (Figure 2: no. 37), and Razvršje (Figure 2: no. 38) toward Gornja bukva, the Kraljičina vrata Pass (Figure 2: pass g), and another mountain pass called Mali Alan in order to reach Lika,

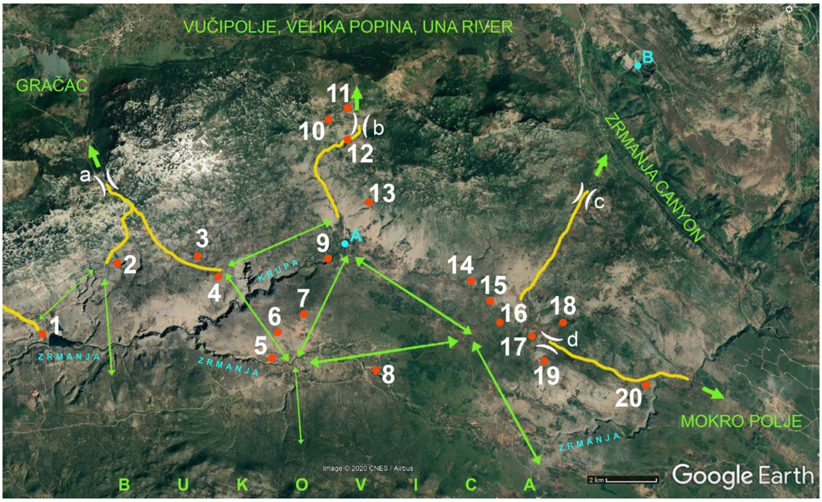


**Figure 7.** A map of the selected area from Jasenice to the end of the Velebit massif. Imagery courtesy of Google Earth. Map by Morana Vuković.

Sveti Rok, and Lovinac. Remains of the Roman road (Figure 2: no. 39) overlap with the presumed prehistoric trail, as attested also by hillforts found along the way, and its importance is further supported by its use during the Middle Ages and in the early modern period (Dubolnić Glavan and Glavaš 2011:108; Šarlija 2010:7–10, Map 1). Another branch of the road led from Obrovac along the eastern border of Jasenice, beside the hillforts of Gradina Modrići (Figure 2: no. 41) and Fratarska glavica (Figure 2: no. 40), and then joined the previously mentioned trail near the Kraljičina vrata Pass (Šarlija 2010:3, Map 1). Even today this route is used by the more recent road, Majstorska cesta, which proves the importance of this pass and trail in general. Also, the area from Tulove grede to Prezid is a specific and wide karstic territory, and because of this, the communication network was more complex. Unfortunately, this area is poorly explored, and, consequently, we can only hypothesize that the two main routes led toward Lika over the area of Mala Žuljina and Velika Žuljina (Figure 2: nos. 41 and 42, pass h).

## Routes from Jasenice to the End of the Velebit Massif

This part of Velebit, stretching from Jasenice to the end of the Velebit massif, is different from the previously analyzed segment. First of all, the area is dominated by the canyons of the Krupa and Zrmanja Rivers (Figure 7: points A and B). The Zrmanja Canyon also marks Velebit's southeasternmost boundary. Here, the Velebit massif is slightly lower, and the majority of the peaks do not exceed 1,100 masl, with the exception of the most impressive karst peak of Crnopac (1,400 masl). The end of the mountain massif turns toward the south, and the source of the Krupa River is located in this natural "amphitheater." Despite the harsh terrain, scarce resources, and lack of arable land, life was still possible in this territory because of these two rivers, the Krupa and Zrmanja. On the other hand, this area was a natural crossing and a space where communication was possible in all directions: to the south toward Bukovica and Ravni kotari, as well as next to the Zrmanja River toward the sea; to the southeast toward the Krka River; and, in the end, across Velebit toward Lika and Bosnia and Herzegovina. This territory of southern and southeastern Velebit, from Tulove grede (Majstorska cesta) in the west to Zrmanja in the east, is poorly explored archeologically. Apart from some research conducted at the beginning of the twentieth century, only a few more archaeological excavations and field surveys have been organized since then (Abramić and Colnago 2011 [1909]; Buttler 1933; Katić 2019; Vrkić 2017; Vrkić and Kulenović Ocelić 2020; Vučić 2009), at least up until 2018, when systematic field surveys were initiated under the Archaeological Museum Zadar (Vuković 2018).

The territory of the southeastern slopes of Velebit, particularly the fertile fields next to the Zrmanja and Krupa Rivers, enabled a high concentration of settlements. Although we do not know the "political" organization of this territory during the Iron Age, it is quite clear that the area had great strategic importance and that hillforts were placed in positions near or leading to mountain passes in order to control a certain area and to be able to communicate with each other. Apart from these hillforts, numerous stone mounds have been detected in this area (Figure 7: nos. 15 and 16). Aside from being used for burials, they also might have had a strategic importance similar to that of the intriguing and extensive drystone boundary wall that stretches from the Krka River to the source of the Krupa River (Vrkić 2017; Vuković 2018:71–72). There are also four important crossings in this territory: Prezid (Figure 7: pass a), Duboki dol (Figure 7: pass b), Razdolje (Figure 7: pass c), and crossings around the Ervenik hillforts (Figure 7: pass d).

The Prezid Pass was crucial for the Bronze/Iron Age hillforts next to the Krupa and Zrmanja Rivers, from Zaton Obrovački to Golubić and Žegar, including Muškovci (Figure 2: no. 42; Figure 7: no. 1), the Bilići hillfort (Figure 7: no. 3), Veselinovića gradina (Figure 7: no. 4), Smokovac (Figure 7: no. 9), Gradinica Nadvoda (Figure 7: no. 5), Ćosina gradina (Figure 7: no. 6), Trebačnik (Figure 7: no. 7), and Gradina Prndelji (Figure 7: no. 8). Most likely this is the area through which the main routes connecting to the Iron Age settlements in Iapodic territory (on the other side of Velebit) passed (Cesarik 2018:112). Even in the last century this mountain pass was still used to access higher pastures (Marković 1980:48), and in the last few decades it was the location of the most important modern road (prior to the construction of the highway) connecting Dalmatia with the hinterland (Černicki and Forenbaher 2016:36, 203). The closest Bronze/Iron Age hillfort able to control the Prezid Pass from the coastal side of Velebit was the Bilići hillfort, which overlooked one of the eastern roads leading toward the pass (Vuković 2018:54). Several archaeological sites and associated finds were detected during recent field surveys in this area, both those that are ongoing and those undertaken during the laying of the gas pipeline (Figure 7: no. 2; Dubolnić Glavan 2015:26–28).

Apart from the previously known hillforts, during the recent field survey the Ruja hillfort was discovered (Figure 7: no. 10); located at 945 masl, it is one of the highest settlements in the entire territory (Vuković 2018:80–82). It is located on a ridge that controls alternative passes over this part of Velebit. However, the central pass in this area is the one leading over Duboki dol, and it was obviously vital from early prehistoric times on (Abramić and Colnago 2011 [1909]:230; Glavaš and Miletić 2013:551). Apart from being controlled by the previously mentioned hillforts, this pass additionally was secured by Gradina Gostuša (Figure 7: no. 13), and in the pass itself was the Bronze/Iron Age hillfort of Duboki dol (Figure 7: no. 11), situated right next to the road (Batović 2004:871; Vuković 2018:74–79). This pass is easily accessible from the wider area of the Krka River and Bukovica, and it is one of the lowest passes on Velebit (ca. 750 masl). From Lika, this road reached all the nearby hillforts and led directly to the Una River and the settlements in the territories of Gračac to the west and Popina to the east. This was also crucial in later periods (i.e. during Roman times), when a well-built Roman road was constructed to connect Burnum with Smokovac (most likely ancient Hadra) and then traverse over Duboki dol further on to Lika (Figure 7: no. 12; Glavaš and Miletić 2013:546–551). This pass was inhabited until recent times, and the route of the Roman road was later reused. Also, eighteenth-century borders attest to the importance of this area; namely, this was the

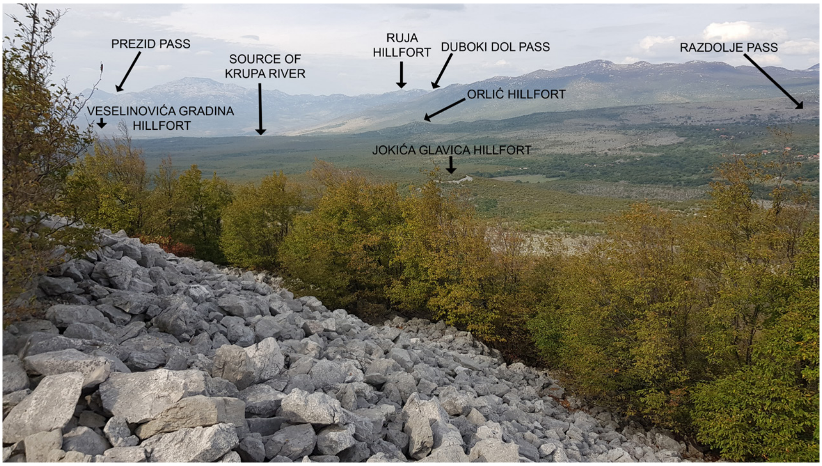


**Figure 8.** A northern view from the Kočo hillfort. Photo by Morana Vuković.

area that separated the Austro-Hungarian Monarchy from Venetian Dalmatia, and these boundaries are still used as the borders of current-day municipalities (Vuković 2018:76, 82).

Four Bronze/Iron Age hillforts at Ervenik—Kočo (Figure 7: no. 19), Jokića glavica (Figure 7: no. 17), Gradina Kabići (Figure 7: no. 18), and Orlić (Figure 7: no. 14)—control the passes over the easternmost branches of Velebit (Figure 8), leading to the Zrmanja River Canyon and further on toward Mokro polje and Krka (with several burial mounds strewn along the path [Figure 7: no. 20]; Vuković 2018:71). The recently discovered border wall found in the vicinity of these hillforts clearly indicates the importance of this area in the Iron Age (Vrkić 2017; Vuković 2018:71–72), and although the entire Iron Age communication network cannot yet be reconstructed, the routes predominantly followed the easiest trail along and over the slopes of Velebit toward the Zrmanja River and the available river passes. A Roman road found in the vicinity (i.e. west of the aforesaid hillforts) attests to the importance of this area in the periods after the Iron Age.

## Connection to Maritime Routes and Trade

Of course, these Iron Age trails and roads were eventually connected to the coastal centers and coves that served as ports on the eastern Adriatic maritime route and, especially important for our area of interest, to the Novsko ždrilo and Novigradsko more (Novigrad Sea), which is the easternmost point where goods could be shipped by sea (Brusić 2007:17–26; Čondić and Vuković 2019:19; Šarlija 2010:25–36). The pre-Roman and Roman-period maritime routes primarily used the eastern Adriatic, since it was safer, it had more coves and islands where refuge could be sought from unfavorable weather, and its sea currents expedited the journey. This, in turn, gave the Liburni great influence over sea trade, since a large part of this trade crossed through their territory, but it also meant that many foreign goods could be transported to the coastal centers (the most important being Iader) and then further inland over routes that crossed the Velebit range.[4] It was possible to walk over many of these roads in one to two days, meaning that merchandise could be delivered to Lika (and vice versa) in a relatively short time (Dubolnić Glavan and Glavaš 2011:109; Faber 2000:17; for least-cost path analyses and choosing the simplest routes, see Crépy et al., this volume). It could be said that the communities on Velebit turned their shortcomings into strengths, using extensive cattle breeding, salt and lumber trade, and their transit importance to compensate for a lack of arable land. Therefore, these routes had a great importance in trade, cultural exchange, and basic survival for these communities.

The contact between coastal areas and the hinterland during the Iron Age can be seen in the similarities of pottery production and metalwork (e.g. spiral ornaments, Greek type pottery, glass beads from the Mediterranean, the use of amber), and they clearly indicate a two-way street of trade and communication (Faber 2000:24–25). Namely, Greek pottery, especially after the establishment of Greek colonies in the Adriatic, most likely came to the hinterland from the coast. However, amber predominantly came from the Baltic along the amber road, reaching both the Iapodes and the Liburni, perhaps even arriving first to the hinterland and then to the Adriatic, although another direction could also have been used (Dimitrijević et al. 1998:293–298, 308). Spiral ornaments were quite common among Iron Age societies in the eastern Adriatic, especially among the Liburni and the Iapodes, who shared similar types of fibulae, pendants, and other decorative ornaments (Batović 1987:349–351, 363–367; Dimitrijević et al. 1998:283, 308; Dreschsler-Bizić 1987:448–455, 479). Among the most indicative finds attesting to the connections between these two peoples are

[4] For the seafaring routes that passed along the eastern Adriatic coast, see Brusić 1970, 1991, 1993, 2007; Čečuk 1968; Gluščević 1994; Kozličić 1990; Kozličić and Bratanić 2006; Serventi 2012; and Vrsalović 1979. For the ancient sources that mentioned Liburnian seafarers, see Barnett 2017:70–79, with accompanying literature.

fibulae with horse figures, which share visible similarities in type and production (Blečić 2004:87). Glass beads were also popular, although those depicting human faces are quite rare; the latter originated in the Phoenician and Punic world, and they have been found in Nadin in Liburnian territory, in Prozor and Kompolje in Iapodic territory, and even deeper inland in Debelo brdo in current-day Bosnia and Herzegovina. Most likely these beads (pendants) were shipped along the eastern Adriatic route to Liburnia and other coastal areas and then transported inland (Čelhar and Kukoč 2014). Other material indicators of such trade routes are coins—more accurately, Numidian, Carthaginian, Illyrian, Greek, and to a lesser extent Roman Republican coins. Namely, these coins were discovered predominantly at the hillforts of southern Velebit and Lika, but in all likelihood they came from the Liburnian area into the territory that was dominated by the Iapodes (Cesarik 2018; Dubolnić Glavan and Glavaš 2011:95–121). All of these finds attest to strong connections between the Liburnian territory and its hinterland during the Iron Age—particularly with the Iapodic area and the people who lived there—and the routes that we have presented in this paper must have played an important role in these contacts. These routes also attest to the resilience of local peoples who saw Velebit Mountain not as an impassable obstacle, but rather as a continuation of their environment, which could be managed and overcome.

## Conclusion

The territory of Velebit Mountain has been a place of connection and separation from prehistory to present times. As one of the most impressive mountain massifs in the Adriatic, it is an outstanding example of karst terrain, which shaped and limited the lives of the people who inhabited those areas. However, despite it being so challenging, cultures and peoples from the earliest prehistoric times found a way to thrive even in such harsh surroundings. Throughout these periods, life on Velebit was always conditioned by the availability of water, pastures, and arable land. In the territory we have analyzed—the area of southern Velebit—the mountain massif reaches over 1,700 masl, and large portions of it are steep and impassable. All of these conditions, along with the challenging configuration of the terrain, dictated the organization of life, the means of communication, and the placement of routes, but they also led to the continuous use of the same trails and roads throughout the ages, with occasional modernization of road construction. Considering how even in modern times this mountain is so unforgiving, choosing the right trail meant the difference between life and death. The Iron Age routes that we have presented here—from Starigrad Paklenica over Jasenice to the end of Velebit massif—all have an abundance of evidence of being used for communication and trade: from hillforts, burial mounds, and caves, to the remains of road structures (belonging to various times) and, most distinctively, the mountain plateaus and mountain passes. Various archaeological materials found on both sides of the mountain attest to a lively communication between communities, mostly of the Liburni and Iapodes, who found ways to overcome the limitations of the terrain. Of course, although Velebit's terrain largely dictated the parameters of human society, especially in the Iron Age, this relationship throughout time was quite complex, and different periods and cultures had different needs as well as road-building and trading capabilities. Consequently, throughout prehistoric times the inhabitants of this area chose more direct, but steep, trails over Velebit; however, with the arrival of more complex roads (both Roman and more recent) this philosophy changed, leading to the emergence of lower-placed routes on terrains which were easier to overcome. This eventually popularized passes like Kraljičina vrata and Duboki dol, which were more suitable for roads that could be used for extensive trade and more frequent transport. This, in turn, meant that larger transport shifted toward the south, away from Velebit, but still all of these routes remained in use, particularly for small trade and transhumant pastoralism (and, in more recent times, for hiking and tourism). Moreover, tourism seems to be the way to popularize and revitalize these areas of southern Velebit today, with the greater incentive to foster communication between scientists leading projects dealing with this mountainous territory and members of the general public striving to see and learn about Iron Age communities in the eastern Adriatic.

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**Figure 1.** The island of Rhodes. Satellite map courtesy the Laboratory of Cartography and Geographic Information Systems, University of the Aegean. Available at https://www.lib.aegean.gr/doryforikos-hartis-rodoy (accessed November 20, 2021).

# Chapter Three
# Investigating Land And Sea Routes in the Territory of the Ancient Deme of Kymissaleis, Rhodes

Manolis I. Stefanakis

Research on the ancient deme of Kymissaleis on the southwest coast of the island of Rhodes (Figure 1) started in 2006 as a project implemented by the Department of Mediterranean Studies at the University of the Aegean and the Ephorate of Antiquities of the Dodecanese. The research has been based on systematic excavation, walking expeditions, and observation in the context of the Kymissala Archaeological Research Project (KARP).[1] The main objectives of KARP are to understand the ways in which the inhabitants of the ancient deme adapted to the geomorphology of the region; to discern the relationship between geography, spatial development, and political division of the deme of Kymissaleis; and to elucidate the ways in which collective settlements form and how they interrelate.

Currently, a further attempt is being made to investigate the economy of the ancient deme—mainly in terms of occupation patterns and land use, cultivation, agricultural management, and animal husbandry—based on regional survey observations, a few sporadic and specific kinds of archaeological material, and the ethnographic record. In this context, roads and communication routes also form a substantial part of the local economy. This paper, therefore, will concentrate on the existing surface evidence in order to investigate possible routes and road networks that connected the various settlements and sites in the deme, thus facilitating communication between people and the transportation of goods in a rough and semi-mountainous area of Rhodes. Given the scarcity of extensive visible evidence, the views expressed here need to be further investigated and documented through systematic research and study in the context of KARP in the years to come.[2]

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[1] On KARP and the results of the research so far, see Stefanakis 2009, 2015, 2017a:3–5, 2017b, 2017c; Stefanakis and Patsiada 2009–2011; Stefanakis et al. 2015; see also Patsiada and Stefanakis 2014a, 2014b, 2016a, 2016b, 2016c; Stefanakis and Kalogeropoulos 2021.

[2] For the state of the art regarding the exploration of the Greek chora (hinterland) and the investigation of farming, see Margaritis 2015:333–334.

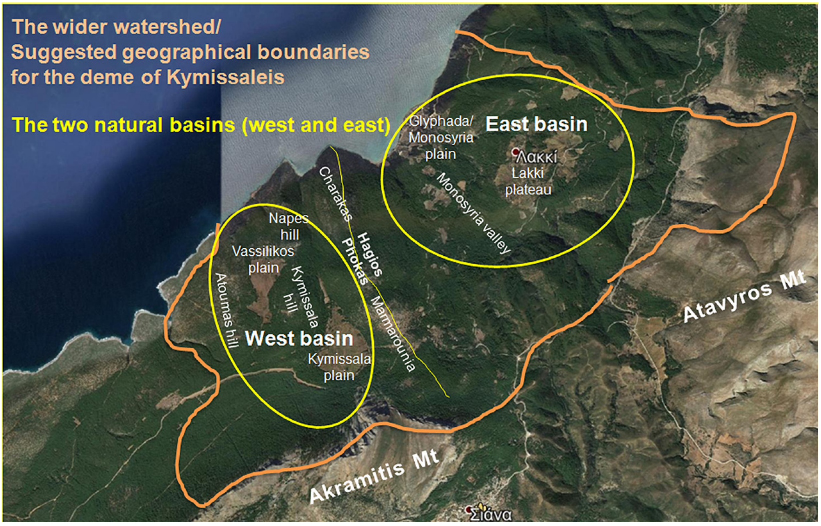


**Figure 2.** The two drainage basins in the area of Kymissala. Imagery courtesy of Google Earth.

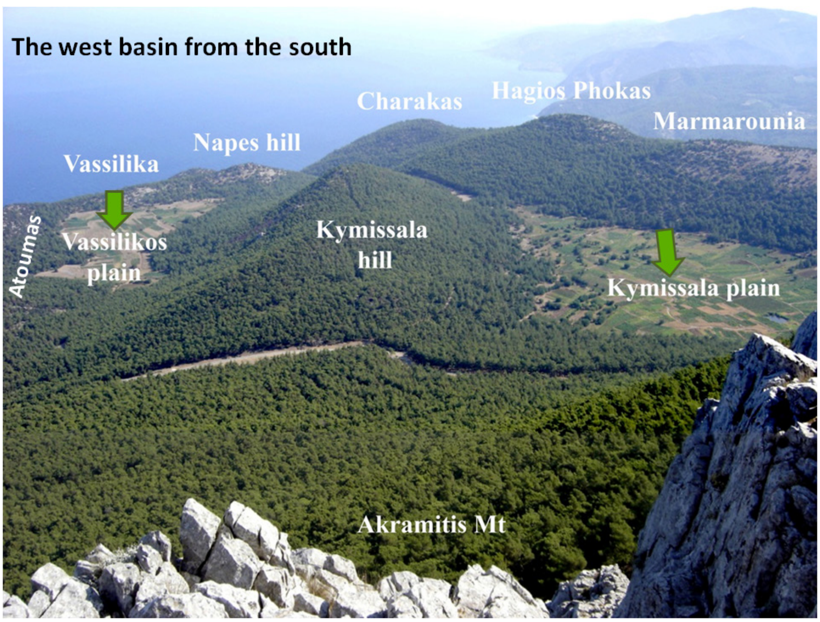


**Figure 3.** View of the west drainage basin (Vassilikos and Kymissala) from the ridge of Akramitis Mountain. Photograph courtesy of the Kymissala Archaeological Research Project.


**Figure 4.** View of the east drainage basin (Glyphada and Lakki) from the south. Photograph courtesy of the Kymissala Archaeological Research Project.

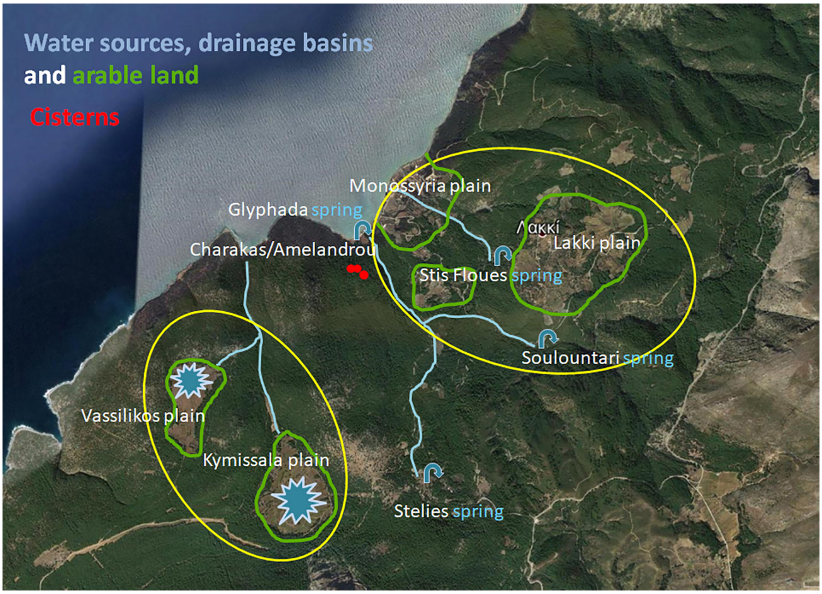


**Figure 5.** Springs and plains in the area of Kymissala. Imagery courtesy of Google Earth.


**Figure 6.** The water source and possible remains of the aqueduct at Stelies. Photograph courtesy of the Kymissala Archaeological Research Project.

## The Morphology of a Landscape

The geomorphology of the region of the deme is semi-mountainous, delimited on the south and east by the massifs of Atavyros and Akramitis Mountains.[3] Consisting of bays, shores, and seaside plains, it is a semi-mountainous region that reaches 419 masl, with fertile valleys and plateaus amongst hilltops. Inevitably, this type of geomorphology had its effect on the establishment of the road network and communication system, which had to overcome the difficulties deriving from the rough ground.

### *Two Natural Basins*

The hill of Hagios Phokas dominates the wider area of interest, preserving the ruins of the acropolis of Kymissaleis at its top (Figure 2). Connected with Hagios Phokas to the north and extending as far as the coast is Charakas Hill, while to the south, Hagios Phokas is connected with Marmarounia Hill, which extends south to the foothills of Akramitis. This range of hills creates a physical barrier running north to south, which divides the region into two large drainage basins: the west and the east.

The west drainage basin (Figure 3) is dominated by Kymissala Hill. The fertile, arable, homonymous plain extends at an altitude of 289 masl between the foot of Akramitis to the south and the hills of Hagios Phokas and Marmarounia to the east. A second arable plain, Vassilikos, is formed to the north, delimited on its north side by the homonymous, low hill and Napes Hill further east, and on its west side by the oblong Atoumas Hill, which extends from the shore to the northern foothills of Akramitis.

The east drainage basin of the Glyphada Valley (Figure 4) includes the arable land formed by the shore of Glyphada/Monossyria, as well as the arable Lakki Plain further inland to the south. It extends west to the Charakas – Hagios Phokas – Marmarounia range, which is dominated to the south by Alonia and Limbounara Hills, two of the low foothills of Mounts Akramitis and Atavyros, respectively, and by the low massif of Aroinites to the east (Stefanakis 2017b:10).

3 For a more detailed description of the region, see Stefanakis 2017b:10; Stefanakis and Patsiada 2009–2011:63–67.

*Water Sources*

The deme used to have abundant access to water all year round. Irrigation and water in the east basin possibly came from the spring at Stelies on the northern foothill of Akramitis, southeast of Marmarounia Hill (Figure 5). This spring must have been flowing since antiquity (Stefanakis 2017b:11, 16; Stefanakis and Patsiada 2009–2011:87). The spring could have supplied both basins with water, but mainly it supplied the west basin. Possible remains of water-supply aqueducts may still be seen north of the Stelies spring running toward the valley of Glyphada/Monossyria (Figure 6).

The still-plentiful springs of Souluntari and Stis Floues supply the torrent running through the Glyphada Valley in the east basin. Taking into consideration the fact that today these two springs flow all year round, they most likely maintained a constant flow in antiquity. In addition, the springs by the coast at the west end of Glyphada Bay must have provided plenty of water for the east basin.

As far as the west basin is concerned, no springs have been located up to now. The Kymissala and Vassilikos Plains, however, are known to concentrate and contain a large amount of moisture throughout the winter months.

Highland sites and remote settlements were provided with water either from highland springs, such as Stelies (409 masl), or from natural or dug cisterns in the rock that collected rainwater. Indication of water management is proven by at least seven cisterns located in the settlement of Charakas/Amelandrou at an elevation of ca. 188 masl (Stefanakis 2017b:13; Stefanakis and Patsiada 2009–2011:90).

In general, the geomorphological unity of the region, bounded by the watershed, naturally gathers water sources and atmospheric precipitation and leads them to a central system consisting of a network of rivers and streams that flow into the sea, as in the Glyphada Valley or the ravine of Yaliskari, as well as closed systems, such as the plains of Kymissala and Vassilikos, in which the water collects and then evaporates or is absorbed by the soil (see Figure 5). Inevitably, rivers, streams, and the valleys through which they flow formed a network of communication between the highlands and the shores of the deme.

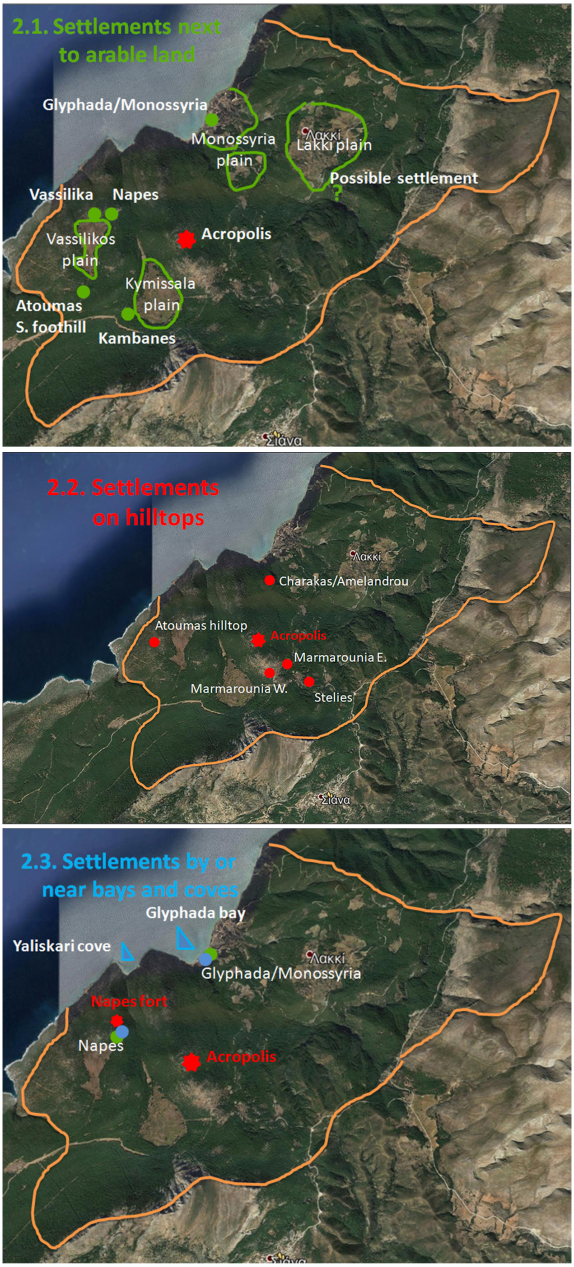


**Figure 7.** Settlements and arable land in the area of Kymissala. Imagery courtesy of Google Earth.

## Spatial Organization, Landscape Adaptation, and Economy

The network of roads and communication in general had to connect and serve a great number of sites scattered within the area's two basins. Ten out of the eleven sites identified to date (in the areas of Atoumas, Vassilika, Napes, Charakas, Glyphada/Monossyria, Stelies, Marmarounia West, Marmarounia East, Hagios Phokas South, and Kambanes) visually communicate with and are arranged around the hill of Hagios Phokas at a maximum distance of a 20- to 30-minute walk—probably through a complex network of roads and paths—and still retain extensive, visible remains. Only the Atoumas South Foothill site is not visible from the acropolis.[4] According to their location in relation to the landscape and its geomorphology, the settlements can be categorized into three types (Figure 7).

### *Settlements Next to Arable Land*

This type of settlement includes the sites of Kambanes, Atoumas South Foothill, Vassilika, and Napes in the west basin, along with Glyphada/Monossyria (and others expected to be identified in the near future) in the area of Lakki in the east basin. The sites are all located near a large arable piece of land, with immediate access to it; thus, their agricultural character must not be neglected.

### *Settlements on Hilltops*

This type includes the sites of Stelies (409 masl), Marmarounia West (404 masl), Marmarounia East (369 masl), Hagios Phokas South (361 masl), and Atoumas Hilltop (254 masl) in the west basin and Charakas/Amelandrou (188 masl) in the east basin, all of which are located atop hills and are not immediately related to any arable land.

### *Settlements By or Near Bays and Coves*

This type of settlement includes the sites of Glyphada/Monossyria and Napes. Glyphada/Monossyria (ancient Mnasyrion; Strabo 14.2.12) was established directly by the shore and most likely functioned as the port of the deme, since it is the only accessible anchorage on the rocky shoreline of the area (Stefanakis 2017b:13; Stefanakis and Patsiada 2009–2011:91). The settlement at Napes, on the other hand, is not

[4] On the identified settlements to date, see Stefanakis 2017b:11–14; Stefanakis and Patsiada 2009–2011:86–92.

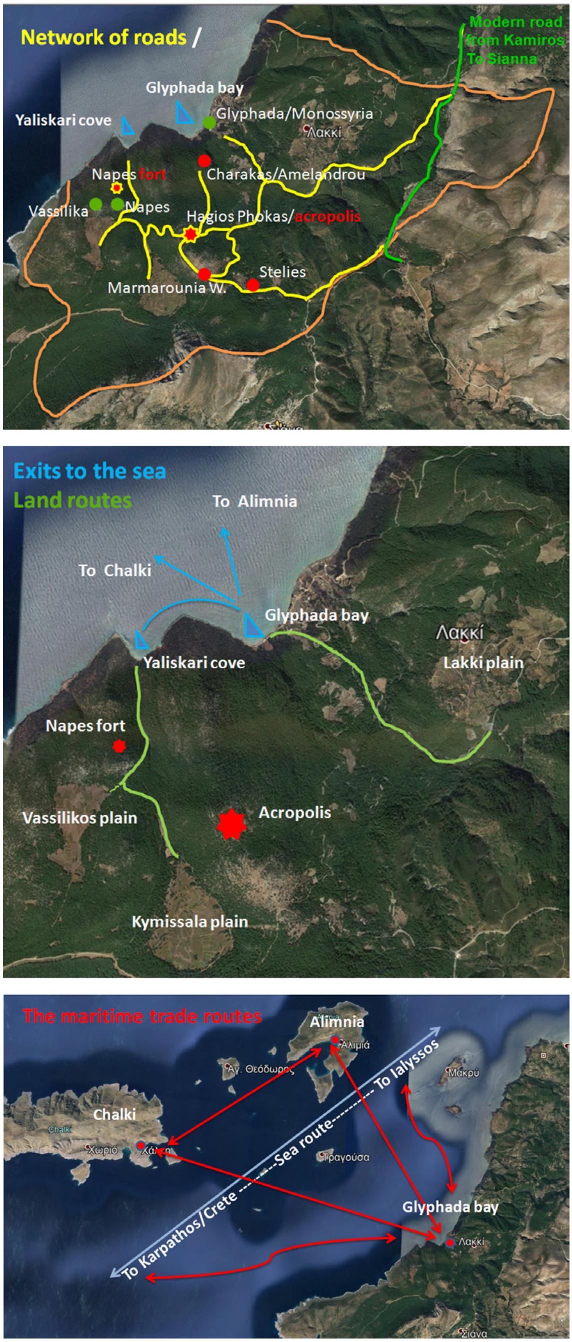


**Figure 8.** Roads, paths, and sea routes in the area of Kymissala. Imagery courtesy of Google Earth.

directly connected to the small cove of Yaliskari. It is, however, the nearest settlement to the shore and most likely controlled the valley route leading from the fertile Vassilikos Plain to the cove.

## Transportation of Goods: Land and Sea Routes

### *Roads and Paths*

This whole area of interest forms an administrative and economic unit that requires a complex and (in many cases) difficult network of communication, as the mountainous landscape of the region restricted roads and communication pathways. Roads are expected to have connected the acropolis with all the settlements and cemeteries in the area, as well as to facilitate the communication of the two major and distinct basins of the deme (Figure 8).[5]

During the past 13 years of research, extensive fieldwalking or pedestrian survey has been carried out in the area of interest, recording any superficial archaeological evidence encountered. We found that the success of this method was limited by a few important factors: namely, the area's complex geomorphology (i.e. extreme surface irregularities), thick forests, and dense, low vegetation that renders intensive fieldwalking impossible. Since it is not possible to document the surface record with intense detail, the extensive fieldwalking strategy has been chosen, a method that allows for more land to be covered using far less meticulous methods.

In investigating the vast area of Kymissala (21 km$^2$), the team does not walk the entire landscape systematically, but rather chooses survey locations based mainly on the local population's existing knowledge (i.e. known archaeological findspots) and expectations based on the topographical or geomorphological characteristics of the landscape. This type of "unsystematic reconnaissance" or "judgmental survey" is, in essence, always extensive. Limitations of this method include the different judgement calls made by experts in the field, and the fact that the experts' knowledge and experience is the key requirement for a successful sample. While the results from this project may—and

[5] Although much smaller in scale, the area of Kymissaleis could be compared with the vast area of Velebit Mountain in southern Liburnia, where a complex network of communication also was established in the context of the diverse and heterogenous nature of its harsh mountainous geomorphology; see Serventi and Vuković, this volume.

**Figure 9.** Retaining walls of the ancient road at Alonia. Photograph courtesy of the Kymissala Archaeological Research Project.

likely will—be biased because of the subjective nature of the collection strategy, in quite a few cases it has been possible to identify traces of ancient pathways and roads, which are of interest in the present paper.

Traces of an ancient road have been located connecting the sites of the two basins (Stefanakis 2017b:16–17). The ancient road enters the area of the deme at the northeast edge of Akramitis from the direction of ancient Kamiros. It follows the natural incline of the foothills southwest toward the plain of Kymissala, then passes through the sites of Alonia and Stelies to reach the site at Marmarounia (Stefanakis and Patsiada 2009–2011:86–87). Long and strongly built ancient retaining walls—most likely Hellenistic in date—follow the ancient road in some places, as has been observed at all the aforementioned sites (Figure 9); they are possibly the remains of an ancient main route arriving from Kamiros and leading to the acropolis of Kymissaleis.

The road continues toward the acropolis of Hagios Phokas. From there, it branches off to the two drainage basins in the region: one branch descending westward, passing through the quarries and necropolis of Kymissaleis at the west foothill of Hagios Phokas and then running northwest toward the plain of Vassilikos (Stefanakis and Patsiada 2009–2011:76). Here, formations dug in the hard rock of

**Figure 10.** Part of an ancient road formation dug into the rock on the west slope of Hagios Phokas. Photograph courtesy of the Kymissala Archaeological Research Project.

**Figure 11.** Part of an ancient road formation dug in the rock on the west slope of Hagios Phokas, with retaining construction. Photograph courtesy of the Kymissala Archaeological Research Project.

Hagios Phokas' west slope (Figure 10) and built retaining constructions (Figure 11) provide further evidence for human intervention in the natural environment in order to create routes of communication between the acropolis, the quarries, and the necropolis of Kymissaleis.

The other branch of the road turns northeast from the acropolis, descending toward the bay and valley of Glyphada and the Lakki Plain, but this area has not yet been systematically explored.

*Exits to the Sea and Sea Routes*

Each basin has an exit to the sea (see Figure 8). Northeast of Charakas, on the small bay of Glyphada, lies the only harbor along the rocky coastline that was accessible and navigable in antiquity, and which is now submerged below sea level due to later tectonic activity. Yaliscari Cove must have served the west basin, especially the plain of Vassilikos (Stefanakis 2017b:17) and Kymissala.

The site of Glyphada/Monossyria (3 masl) seems to have been an extensive seashore settlement. Next to the sea along the shore, many walls and the remains of an ancient habitation mainly dating to the Roman and Early Christian years are visible, now largely destroyed by the modern road. At the west end of the bay lie the ruins of an Early Christian basilica and a large necropolis (Stefanakis 2017b:13–15; Stefanakis and Patsiada 2009–2011:90–92). At the center of the bay and a few dozen meters west of where the modern road reaches the shore, the underwater traces of an old (most likely ancient) pier are evident, extending several meters to the north.

Due to the geomorphology of the territory, which would have made communication between the two fertile parts of the region difficult, Glyphada Bay and Yaliskari Cove are likely to have played an important role in affording each basin of the deme access to sea communication, thus facilitating the transportation of goods.[6]

It is quite probable that the harbor at Glyphada was an intermediate port of call on the sea route from Rhodes and Ialysos to Karpathos and eastern Crete and vice versa. It also was likely to have been in direct contact with the other two ports in the area, those on the isles of Chalki and Alimia, thus forming a "triangle" of trade (see Figure 8).[7]

## Some Speculations on the Economy of Kymissaleis

With respect to the trade route network, only a few preliminary thoughts regarding the economy of Kymissaleis may be put forward here.

### *Agriculture*

The fertile basins and plains of Vassilikos, Kymissala, Glyphada/ Monossyria, and Lakki, which are fully exploited for cultivation today, most likely would have been in similar use in antiquity, too (see Figure 5). The foundation of the settlements near or directly next to these plains must have been connected with farming and agriculture.[8] The terracing of land for cultivation[9]—widely observed in the western and

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[6] On the merging of roads and maritime routes for trade facilitation, see also Serventi and Vuković, this volume.

[7] For the history and archaeology of Chalki, see Giakoumaki 2011:169; for Alimia, see Bairami 2011:184; for the case of Mycenaean times, see Stefanakis 2019.

[8] On agriculture in ancient Greece in general, see Amouretti 1994; Isager and Skydsgaard 1995. On land use and the intensity of agricultural activity in the Classical and Hellenistic periods, see Margaritis 2015:345–346.

[9] In antiquity, terracing as a strategy for farming on steep slopes was practiced by creating a series of narrow strips of levelled platforms supported by retaining walls, which provided a means of cultivating trees, vines, and sometimes even cereals on sloped ground. On cultivation terraces in ancient

eastern lower parts and foothills of the Hagios Phokas – Marmarounia range all around the hill of Kymissala, in the area of Lakki, and in the foothills of Aroinites Mountain—most likely, but not conclusively, exhibits land transformation and use since antiquity for the needs of agricultural production.[10]

Terracing in Kymissala could have supported the wider cultivation of cereals, as well as grapes and olives, all three of the well-known crops of the Mediterranean ecosystem in the first millennium BCE (Papanastasis et al. 2004:5). It is known from the ethnographic record that the numerous terraces in the area were in use at least until the late nineteenth century, originally for the cultivation of cereal and tobacco.[11] Cereals, cultivated in the area in recent centuries and until the late nineteenth century, were processed at the windy hilltop of Alonia, a small plateau hosting a few dozen threshing floors that were built or rebuilt from ancient material, probably taken from the retaining wall of the ancient road that passes by it or from buildings in the nearby settlement at Stelies (Stefanakis 2017b:15; Stefanakis and Patsiada 2009–2011:86–87).

Vine cultivation and wine production also may have been among the main products of Kymissala in antiquity.[12] Not only was Rhodes famous for its wine in antiquity, but possibly Kymissala was as well, since it was included in the list of wine in the Zenona Archive.[13] The name Kymissalik[on?] was found on a jar next to other jars with the names Chia, Lesbia, and Thasion («οἴνου … Κυμισαλιḳ[ -ca.?- ]»; Edgar 1931:117, no. 59684). The name has been interpreted as a geographical adjective that described the product packed in the jar and that was used to denote the origin of the product; thus, it is likely that it referred to wine specifically from the area of the deme of Kymissa-

Greece, see Foxhall 1996:47–60. On terracing for olive tree cultivation, see Foxhall 2007:121–124.

[10] On the total lack of substantial archaeological evidence for ancient terraces, see Foxhall 1996:60–64. However, on ways of detecting ancient terraces and terrace walls and some criteria for dating existing terraces, see Price and Nixon 2005. For an attempt to trace ancient terracing in modern field boundaries, see Doukellis 1994.

[11] On the production of tobacco in the area, see Manousaki 2017:114; Stefanakis 2017a:2.

[12] On vine and grape cultivation in ancient Greece, see Brun 2003; Isager and Skydsgaard 1995:26–33; Janick 2005:279–281.

[13] I thank Dr. Nikos Litinas for bringing this to my attention. On the exports of Rhodian wine in Hellenistic and Roman Egypt, see Dzierzbicka 2015.

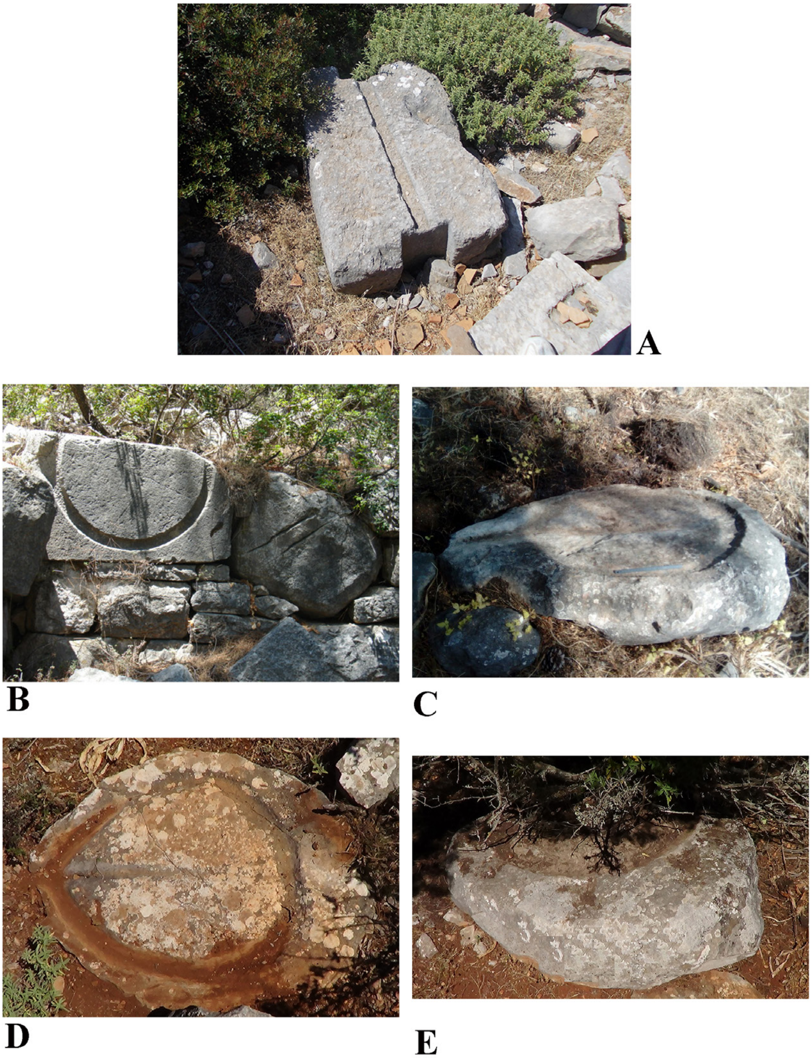


**Figure 12.** Stone olive press beds found in the area of Kymissala. Photograph courtesy of the Kymissala Archaeological Research Project.

leis, which was then transported to Egypt in a Rhodian amphora in Hellenistic or Roman times (Kruit and Worp 2000:87–88). If that is the case, then the area of Kymissala must have had been renowned for its production of a local wine variety. Vine cultivation, whether in the plains or mountains, is still practiced in Kymissala and in the wider area of Atavyros today, producing excellent wines of different varieties and tastes (Vergoti 2017:155).

In addition, olive oil production is attested in the area. Five stone olive press beds have been located within the archaeological area:[14] a rectangular press was embedded in a building at the settlement of Vassilika (Figure 12a); a press with a circular groove was reused as building material at the site of Kambanes at the southwest edge of Kymissala Plain (Figure 12b); and three more with circular grooves were found in the saddle between Marmarounia and Hagios Phokas Hills, directly north and south of a large building that in the future could be proven to be a farmstead (Figures 12c–e).[15] Their existence forms substantial evidence for the production of olive oil and, thus, of the cultivation of olive trees.[16]

Finally, figs (*Ficus carica*) were a prime product for the island of Rhodes, especially for the city of Kamiros and its surrounding area (Baumann 2004:28; Stampolides 2017), to which the deme of Kymissaleis belonged. Ancient literary sources, inscribed sherds, an amphora bearing an inscription, and private agreements in Hellenistic inscriptions all mention the cultivation of fig trees on the island (Palaiologou 2017; Stefanakis 2014:71; Stefanakis and Demetriou 2015:88–89). The testimony of Athenaeus of Naucratis (14.67), notes that Rhodian figs, called *vrygindarides* (*βρυγινδαρίδες*), were equivalent to the high-quality figs of Attica, while it is known that Rhodian figs were exported to Egypt («ἰσχάδων Ῥοδιακῶν κερ(άμια) ε» [Rhodian figs, five amphorae]; Edgar 1925:126–127, no. 59110, line 34). It was probably the important economic role of the fig for ancient Kamiros that

14 On olive presses in general, see, indicatively, Foxhall 2007:133–139. On the process of olive oil extraction, see Isager and Skydsgaard 1995:57–66.

15 For a case study of early Hellenistic farmsteads and their economy in mainland Greece, see, indicatively, Margaritis 2015. On the Classical farmstead in general, see Pettegrew 2001. On agricultural buildings in general, see Isager and Skydsgaard 1995:67–82.

16 On olive cultivation in ancient Greece in general, see, indicatively, Foxhall 2007:97–129; Isager and Skydsgaard 1995:33–40; Janick 2005:277–279. On olive tree cultivation in the Mediterranean in general, see Brun 2003; Loumou and Giourga 2003.

led the city to depict the fig leaf on its coins, sometimes with fruits on the obverse, throughout the mint's production from the Archaic to the late Classical years (Baumann 2004:28; Stefanakis and Demetriou 2015:83–89; Tsagari 2007a:235, 2007b:5–7). Although there is no archaeological evidence so far, fig tree cultivation is quite likely to have taken place in the area of the deme of Kymissaleis, while fig trees are still widely cultivated in the area today.

### *Pasturage*

Settlements located at higher elevations and at a distance from arable land are likely to be related to pasturage. Livestock were an important component of the Greek countryside in ancient times because they grow quickly.[17] Furthermore, sheep and goats are better adapted to the upland terrain of the Greek landscape than are cattle (Papanastasis et al. 2004:6). Locals reported to the Italian archaeologist Amedeo Maiuri that they had found an inscription on the acropolis of Kymissaleis; the inscription, now lost, contained a sacred law which forbade pasturage in the area of the sanctuary that is tentatively associated with Demeter (Maiuri 1916:294).

### *Quarrying*

Quarrying has always been an important means of exploiting local resources.[18] The two quarries located so far—one halfway up the west and northwest slopes of Hagios Phokas Hill, and the other on the southeast plateau atop Napes Hill—were extensively exploited for building purposes at least from the late Classical period until late antiquity (on the quarries, see Stefanakis 2017b:15–16; Stefanakis and Patsiada 2009–2011:76). The former is probably the main quarry from which grey limestone was extracted for the construction of the fortifications and the buildings of the citadel; the buildings in the settlements at

[17] On pastoralism in general, as well as for a detailed overview of the concept of "pastoral politics" and an in-depth reading of those parts of the evidence that support elite use of animal husbandry, see Howe 2008. For a concise presentation of pasturage during Archaic and Classical times, see Hadjigeorgiou 2011:2–4. On animal husbandry in general, see Isager and Skydsgaard 1995:83–85, and on sheep and goats being far more popular than cattle, see Isager and Skydsgaard 1995:91–93. On sheep, see also Kitchell 2014:168–170; on goats, Kitchell 2014:76–77. On the exploitation of domesticated animals and livestock in general, see Hodkinson 1988; Margaritis 2015:348–349; Sallares 1991.

[18] On quarrying in ancient Greece, see, indicatively, Dworakowska 1975.

Marmarounia, Stelies, and Kampanes; and the grave monuments at the necropolis. The latter is the quarry from which the gray limestone with orange-colored sediments derived, which was used to build the façades of many buildings and retaining walls in the settlement of Vassilika.

## Monitoring Routes and the Transportation of Goods

As mentioned above, the deme incorporated a highly defensible hilltop acropolis (Stefanakis 2017b:11; Stefanakis and Patsiada 2009–2011:72–76; Stefanakis et al. 2015:265–266), constructed at the highest and most central part of the basin. The acropolis controlled the two smaller watersheds to the east and west and visually communicates with ten out of the eleven sites identified to date, the harbor of Glyphada/Monossyria, and the harbors of Chalki and Alimia. The size of the fortress indicates that it was not the location of a large settlement, but rather served defensive and cultic purposes and had the capability of monitoring sites, the port at Glyphada, arable land, people, and goods (see also Serventi and Vuković, this volume, for a similar case with numerous hillforts that monitored routes in the Velebit area and especially in the territories of Starigrad Paklenica and Jasenice).

The acropolis has unobstructed views of the majority of the region and visually communicates with the fortified hilltop of Napes (269 masl). This hilltop functioned as a *peripolion*,[19] a small fort that supplemented and reinforced the functions of control by the acropolis of Hagios Phokas, which has no visibility—and thus control—over the valley that leads to Yaliskari Cove.

The fortified hilltop of Napes (Stefanakis 2017b:13) has unobstructed views of the isles of Chalki and Alimia; the hills of Charakas, Hagios Phokas, and Kymissala; the plain of Vassilikos; and the sites at Atoumas Hill, Atoumas South Foothill, and Vassilika. Most likely it enabled control of part of the shoreline and especially of Yaliskari Cove and the ravine that leads from the sea to the settlements at Napes and Vassilika and the Vassilikos Plain—parts of the territory that are not visible to, and therefore not controlled by, the citadel at the top of Hagios Phokas. Because of its location near the settlements of Napes

[19] On *peripolia*, see Stefanakis 2017b:17 and n. 38.

and Vassilika, the fort could have provided emergency shelter to the population of nearby settlements, in addition to providing control of the region.

## Old Roads, Modern Paths

The existence of all the above-mentioned elements indicates that Kymissaleis adapted features of the natural landscape to fit the needs of residential communities, and that it based its economy on its natural resources. Settlements were scattered around the acropolis, exploiting either arable land or highland resources or controlling access to the sea.

The fact that no site stands completely isolated and independent of the others implies that all the sites in the deme's territory participated in a complex network of established routes. With its corrugated landscape, the area of the deme must have both facilitated and hindered the flow of natural and cultural resources between sites, as well as both in and out of the region. In many cases, ancient roads seem to follow the same course as modern roads and paths, indicating common travel routes that were subject to topographic constraints throughout history.[20]

The network of roads, parts of which are still visible in several places, connects the main sites and the main plains and arable plateaus, facilitating the flow of products and communication between the various settlements in the deme. The acropolis seems to hold a crucial crossroads that connects—and thus controls—the two basins.

The intensification of the Kymissala Archaeological Research Project in the years to come—with more walking expeditions and on-site investigations in the area (it should be noted that the eastern part of the basin and especially the areas of Lakki and the southern foothills of Aroinites have not yet been explored), and also with systematic surface surveys, wherever feasible—is expected to provide much more information about the extent and spatial organization of the deme of Kymissaleis. This will be accomplished via the joint consideration of the types of visible archaeological evidence and their size, nature, spatial dispersion, and density, thus enabling interpretations of surface concentrations of archaeological evidence and their dispersion throughout the wider region over time. Moreover, it may

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[20] For the routes followed by the many visitors to the sites of Kymissala in the nineteenth century, see Stefanakis 2017d. For trails and passes used from antiquity to the recent era in the southern Velebit area, see Šerventi and Vuković, this volume.


**Figure 13.** The project to create walking paths in the area of Kymissala. Map courtesy of the Kymissala Archaeological Research Project.

be plausible to examine in more detail how the inhabitants of each site would have accessed resources through proximity to roads, sources of water, and arable land; how the site's landscape did or did not aid in protection from potential invaders; and, given that excavations are planned, how buildings and structures incorporated the environment into their design.

In addition, an attempt has been made recently to relate the archaeological evidence to cultural heritage and leisure, stretching the interdependence between landscape, roads and paths, and archaeology. Seeking external funding, the University of the Aegean successfully applied to the Regional Government of the South Aegean to support the project "Promotion of the Ancient Acropolis at Hagios Phokas and Its Interconnection with the Necropolis at Kymissala," to be implemented as part of a Development Agreement between the Greek Ministry of Culture and Sports and the University of the Aegean. Beyond the academic and research questions, the project aims to clear a considerable part of the ancient fortifications of the acropolis, excavate two sanctuaries in the saddle between Marmarounia Hill and Hagios Phokas Hill, and interconnect the archaeological site/settlement at Marmarounia with the sanctuaries, fortifications, quarries, and necropolis at Kymissala via a designated walking path (Stefanakis 2017a:5). In this context, much effort has been made to discern the proper paths, which most likely have been in use from antiquity to modern times. Traces of ancient roads and road constructions have been incorporated into various parts of the selected route.

The contribution of the Regional Government of the South Aegean to the financing of the research project will, in some respects, revive part of the ancient communication network (Figure 13). Literally, however, it will reinforce the prominence of the archaeological sites and the unique natural beauty of the environmentally important hill of Hagios Phokas and the Kymissala Plain, which is expected to be completed within the next year (Stefanakis 2017e:169).[21]

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21 Since the submission of this paper the Development Agreement has been fully implemented (Stefanakis et al. 2022).

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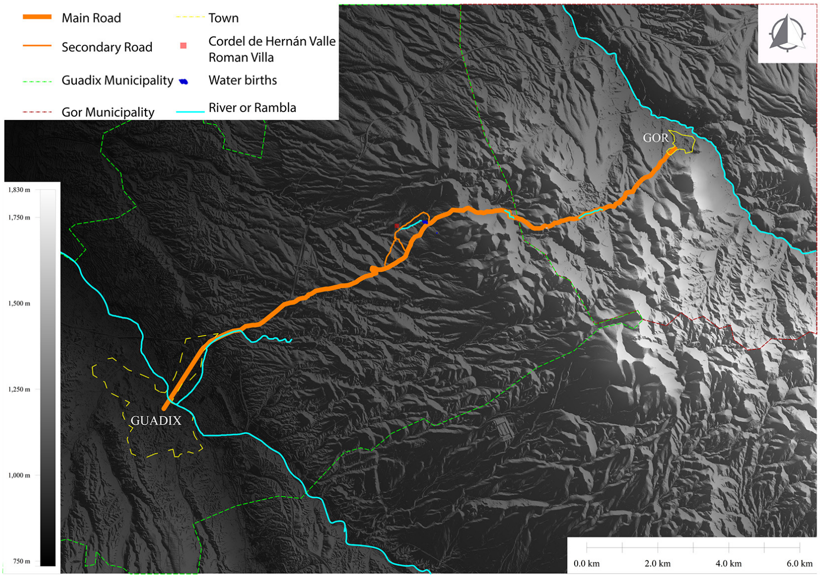


**Figure 1.** The complete layout of the route between Guadix and Gor.

# Chapter Four
# The Discovery of a Roman Road between Carthago Nova (Cartagena) and Iulia Gemella Acci (Guadix), Spain

Antonio Lopez Garcia

The discovery of a new section of a Roman road in the Iberian Peninsula is not very common nowadays. In recent years, important studies have explored the Hispano-Roman road system (de Soto Cañamares 2013, 2019). The discovery of road remains in urban areas is mentioned often in the literature, but the discovery of road sections in mountainous areas is less common. In 2015 the remains of a new section of the Roman road between the colonies of Iulia Gemella Acci (modern Guadix, Province of Granada) and Carthago Nova (modern Cartagena, Province of Murcia) were discovered. This paper aims to clarify the role of this essential route in the terrestrial traffic of goods between the south of Hispania and the Mediterranean basin, the significance of the discovery in the specific context of the southeastern area of the Iberian Peninsula in Roman times, the historical alterations of the route, and the advanced methodologies used for analyzing the land.

The first remains of the paved road were noticed by Dr. José Antonio Garrido García, biologist and zooarchaeologist from the Instituto Geológico y Minero de España, in a remote location between the current municipalities of Guadix (WGS84 UTM Zone 30N, 487895.0 E, 4128353.5 N) and Gor (502747.8 E, 4135879.5 N).[1] The vestiges of the road appeared during a survey to build a gas pipeline in a place called Umbría de Peñas Negras (496498.8 E, 4133974.8 N). The traces of the road were discovered between Umbría de Peñas Negras and another location known as Fuente de San Torcuato (495442.6 E, 4133553.1 N), a water spring located 900 m from the archaeological site of Cordel de Hernán Valle (494522.9 E, 4133348.0 N), where in

[1] Almost simultaneously to this discover Dr. Alejandro Caballero Cobos noted some remains of an ancient road in the surrounding Peñas Negras (Caballero Cobos 2014: 244).

the 1970s the ruins of a second-century CE Roman villa were discovered around the abandoned village of Fuenteálamo (Hernán Valle, Guadix). The villa was probably used as a *mansio* in Roman times because of the existence of a continuous water supply. Through several land surveys, aerial surveys, and LiDAR remote sensing analyses, we have been able to connect the complete route of the Roman road between the municipalities of Guadix and Gor (Figure 1).

## Regional Context: Accitania

Accitania is an area with a mountainous landscape in the foothills of the Sierra Nevada and Sierra de Baza ranges, a vast intramountainous basin with plains, fluvial valleys, and a semi-desert landscape. The area of Accitania extends somewhat into the current districts of Guadix and the Montes Orientales, and in Roman times it was a border area between the provinces of Hispania Baetica and Hispania Carthaginensis (Lopez Garcia and Reyes Martínez 2018:67–69). The center of that territory was the city of Iulia Gemella Acci (modern Guadix; *CIL* 2 3391, 3393, 3394),[2] a Roman colony founded in the first century BCE. In this colony, the roads from the east, west, north, and south converged, making the city a crucial node in the southern Iberian Peninsula (Lopez Garcia 2007:21). Before becoming a locally dominant power in the first century BCE, Acci was under the influence of Basti (modern Baza), an important Iberian city that may have controlled the northern area of the current Province of Granada.

Ptolemy (2.6.60) was the first to record the name and location of Acci when he mentioned it as the last in a list of fifteen cities dominated by the Bastetani Iberians. Later, Pliny (*HN* 3.25) mentioned the colony of Accitana Gemellensis with *ius italicum* as belonging to the *conventus Carthaginensis* within Hispania Tarraconensis. The colony of Acci was the only city with *ius italicum* from the south of the peninsula (Lopez Garcia 2024:166). According to the *Digesta* (50.15.8), in all the Hispanic provinces only the colonies of Pax Iulia and Emerita Augusta in Hispania Lusitania, and Ilici, Valentia, and Acci in Hispania Tarraconensis had this status (España Chamorro 2017:458).

In the third century BCE, several military incursions along the *Via Heraklea* produced a reorganization of the road system in Bastetania. Roman interest in this region was due to the need to control the

[2] *CIL* = T. Mommsen et al., *Corpus Inscriptionum Latinarum* (Berlin, 1863–1936).

production of metals, which was centralized in the city of Castulo, and which was not easy to access from other areas of the peninsula (Corzo Sánchez and Toscano San Gil 1992:25).

In 214 BCE, the Romans tried to penetrate into Bastetania through the *Via Heraklea*—a road that linked the Greek colonies in the northeast of the peninsula with Turdetania in the southwest. The Romans tried to conquer the Bastetani population, but before reaching Bastetania they encountered a strong offensive that forced them to deviate northward through the Baetis Valley (modern Valle del Guadalquivir).

With the progressive conquest of the peninsula, several important colonies were established in southern Hispania. This allowed for greater administrative control over the conquered territory. Between 49 and 45 BCE, the south of the Iberian Peninsula became the scene of several battles between supporters of Caesar and Pompey (Corzo Sánchez and Toscano San Gil 1992:32). In 48 BCE, Quintus Cassius Longinus provoked the anger of several cities by his various extortions and ended up being killed in Corduba (Lopez Garcia and Reyes Martínez 2018:68). In 45 BCE, clashes occurred between the sons of Pompey and Caesar. According to Orosius and Strabo, Caesar crossed the peninsula from the east to Castulo and Obulco and faced the Pompeians in the Battle of Munda (Corzo Sánchez and Toscano San Gil 1992:34). It is very possible that, in this context, a military contingent was established in the Iberian city of Acci. A garrison there would have allowed for control of the passage between the east, north, south, and center of the region. Strabo mentioned the existence of a coastal link with Castulo, which served as a passage for the production of silver from the mountains of Jaén through the largest port in the southeast, at Carthago Nova. Therefore, control of Accitania would have protected access to the mineral resources from Castulo. There were also abundant mining resources in Accitania itself (Garrido-García 2008), such as the Abrucena gold mines on the edge of the territory of ancient Abula (modern Abla), the copper mines in Cogollos de Guadix, and one of the largest iron mineral deposits in Europe at Alquife. There were also small mining deposits in the mountains of Sierra de Baza and Sierra de Gor, near the territory of Basti.

In 209 BCE, Publius Scipio managed to conquer Bastetania by penetrating through Carthago Nova (Polyb. 2.24; Corzo Sánchez and Toscano San Gil 1992:22). During Roman times, land routes were much more abundant in Baetica than in the other provinces of


**Figure 2.** The road from Iulia Gemella Acci to Carthago Nova.

Hispania. In the second century AD, Hispania Tarraconensis and Baetica were linked by the *Via Augusta*, which ran along the Levantine coast from the capital of Tarraco to the main cities of Baetica: Corduba, Gades, Hispalis, and Astigi. The *Via Augusta* had its origin in the oldest road of the Iberian era, the *Via Heraklea* (Polyb. 3.39.2).

There were several cities in the area of Acci in Roman times. To the east were the cities of Basti, Ad Morum, Eliocroca (modern Lorca), and Carthago Nova. To the west was the city of Iliberri (modern Granada), which was mainly accessed via the natural corridor of the Montes Orientales through the foothills of the Sierra Harana, since the natural boundary of the Sierra Nevada forced a long journey through the center of Baetica. Toward the south was the city of Abula, which marked the limit of the territory of Acci (España Chamorro 2017:459). The road to the southeast coast passed through Abula, following the foothills of the Sierra Nevada to Urci, which was the earliest municipality of Baetica on the coast. In the north of Accitania, two roads made it possible to reach the mines of Castulo, each following different routes. The west route followed part of the road to Iliberri through the Sierra Harana, but it eventually turned north, passing through the modern towns of La Guardia, La Cerradura, Cerro Maquiz, Mengíbar, and Magdalena de Castro, and finally reaching the mining area of Castulo (España Chamorro 2018:211; Sillières 1990:280-281). There also may have been an alternative route between Acci and Castulo, but the absence of archaeological remains along the route makes it challenging to reconstruct the path.

The road to Carthago Nova extended into the current provinces of Granada, Almería, and Murcia (Figure 2). This road linked the east side of Baetica with the south of Hispania Carthaginensis. The path is mentioned in the *Itinerarium Antonini* (402.1, 404.6), a compilation of routes dated to the end of the third century. Most of the road layout has been identified thanks to the appearance of several milestones in the sections between Carthago Nova and Basti, the closest *mansio* to the Roman colony of Acci. Roman milestones appear in the modern towns of Mazarrón (*CIL* 2 4944), Totana (*CIL* 2 4936), La Tova (*HEp* 8, 2002, 371),[3] El Hinojar, La Hoya (*HEp* 4 568), Lorca (*CIL* 2 4937), La Fuensanta, and El Hornillo (Martínez Rodríguez and Ponce García 2013) in the Province of Murcia; Los Alamicos (*CIL* 2 4939), Vélez Rubio, and Chirivel (*CIL* 2 4938, 4940, 4942) in the Province of Almería; and Cúllar (*CIL* 2 4941) and Guadix (*CIL* 2 4943) in the Province of Granada. Nevertheless, in the west section of the road between the territories of ancient Basti and Acci, no archaeological remains had been found until recent years.

## The Road Between Guadix and Gor in Early Modern and Modern Sources

Investigating old itineraries such as the journeys of Christopher Columbus' son Ferdinand (1547), Simón de Rojas Clemente y Rubio (1804), and Heinrich Moritz Willkomm (1847), we realized that this route still connected Guadix with Gor in early modern times. One of the maps made by the Spanish Army during the Spanish War of Independence shows a visible detour in the track from Guadix to Gor around the foothills of the Sierra de Gor (Luis Osete and Francisco José Arenas, Mapa de la parte del Reyno de Granada por levante, 1809, Archivo Cartográfico de Estudios Geográficos del Centro Geográfico del Ejército, SG, Ar.G-T.6-C.2-193[1]). In the *Atlas del Itinerario Descriptivo de España* (Laborde 1826), the main path between Guadix and Gor follows the same track around the Sierra de Gor. The location of the road is clearly visible in the *Mapa Itinerario del Distrito Militar de Granada* (Depósito de la Guerra, 1881, 47-B-9), which additionally shows the location of Venta del Álamo (modern Fuenteálamo), where

3 *HEp* = J. Gómez-Pantoja, *Hispania Epigraphica* (Madrid, 1989–).

the Roman villa known as Cordel de Hernán Valle was discovered. In the 1920s, the Junta Superior de Excavaciones y Antigüedades surveyed the area between Baza and Guadix looking for remains of the Roman road that connected ancient Basti and Acci, but there are no references concerning the exact position of the archaeological remains (Blázquez Delgado Aguilera and Blázquez Jiménez 1922/23:12). The directors of the Junta mention two possible itineraries: one direct route of about 4 Roman miles, and one longer detour known as La Arrodea. However, the description is quite confusing, and after its publication it was quite possibly forgotten by scholars until the 1990s (Jiménez Cobo 1993).

## Methodology

The initial phase of this research was a land survey. The land survey started in 2016, after the discovery of the first remains in the area of Fuente de San Torcuato and Umbría de Peñas Negras. Afterward, in several campaigns, we explored the surrounding areas looking for vestiges of the road in other places, such as in the dry watercourse of Rambla Seca—where a possible anepigraphic milestone was located (see "The Route from Peñas Negras to Cortijo del Chato" below)—and in Cortijo del Chato, Barranco del Perú, and Cuesta de Guadix. Simultaneously, we explored other areas to try and locate ruins along the path from Fuente de San Torcuato to the city of Guadix. Aerial surveys have been indispensable in recognizing some sectors of the track, especially where the road was damaged by agricultural works. It is essential to mention that most of the road was abandoned or had been partially altered by the owners of adjacent pastures and cultivation fields. The section nearest to Guadix was especially altered due to the nature of the ground. The reuse of land, the use of the dry watercourse of Rambla de Baza as a road (489725.6 E, 4130461.2 N; 976 masl), and the construction of modern highways—the N-342 and, later, the A-92N—during the twentieth century all altered the route in its first kilometers. The construction of a complex network of service lanes (A-92N, exit 1) and the Príncipe Felipe Industrial Estate (A-92N, exit 3) made the analysis of the landscape and the search for the oldest road difficult.

Thanks to the US Army Map Service orthophotographs of 1945 and 1956 (known as the "American Flights Series") , the location of the older track has been rediscovered following a nearly straight line from the industrial estate (492131.9 E, 4131727.5 N; 1,099 masl) to the

Cordel de Hernán Valle Roman settlement (494801.2 E, 4132746.4 N; 1,139 masl). Using aerial orthophotographs, it has been possible to define several possible links from the paths of the Roman villa of Cordel de Hernán Valle to the paved road in Fuente de San Torcuato. Aerial surveys with drones have been essential for providing a comprehensive overview of the best-preserved remnants of the track along the two paved road sections of Umbría de Peñas Negras and Cuesta de Guadix.

Finally, we have used LiDAR remote sensing to identify the hidden paths in two important sections of the road: one in Barranco de la Cañada del Gobernador, and the other in Barranco del Perú near the municipality of Gor. The LiDAR PNOA (National Aerial Orthophoto Plan) flights of Andalucía, published by the Spanish National Geographic Institute (IGN) between 2015 and 2016, have been crucial for this research. The utilization of LiDAR PNOA data has become a habitual method for Spanish archaeologists (Carrero-Pazos et al. 2015; Costa-García and Casal García 2015; Monterroso-Checa 2017), because it does not necessarily entail subsequent surface exploration (Monterroso-Checa 2017:15) and, thus, it makes it easier to study archaeological sites on private land. LiDAR PNOA is characterized by low-density values, which makes its application suitable for regions with vegetation (Monterroso-Checa 2017:16; Rodríguez Rico 2015:271).

## Roman Mountain Roads

The information that we have about the construction of Roman roads is very limited, and it is mostly based on the archaeological and epigraphic records. The construction of roads depended absolutely on the nature of the landscape; the builders tried to follow as straight a path as possible, avoiding any natural obstacles presented by the topography. Nevertheless, the construction of a straight road was sometimes impossible, and orography sometimes forced creative solutions to solve problems related to the firmness of the ground or to make the route easier for chariots and horse-drawn vehicles. Likewise, depending on traffic congestion, it was often necessary to enlarge some sections of the road. In the case of mountainous landscapes, congestion was not a significant issue because the roads were not very busy.

Technically, two types of roads existed: the *viae terrenae* and the *viae munitae*. These two types of roads were usually combined, depending on the difficulty of the terrain and the availability of raw material for the pavement. The *viae terrenae* used the simplest technique: instead of true paving, sand was used as the upper layer, and sometimes the sand was even laid directly over the bedrock. This type of paving was frequently used when the conditions of the land were rather good and did not present challenges to creating and maintaining the route. The *viae munitae* or *stratae* were paved roads (*Lex XII Tabularum* 7; Van Tilburg 2007:15). These roads used stone slabs (*viae silice stratae*) or gravel (*viae glarea stratae*; Van Tilburg 2002:193). Most of the paved roads were built with a layer of stone and mortar called *statumen*, which was then covered with a layer of pebbles and mortar (*rudus*). On top of the *rudus,* a thicker stone layer called *nucleus* was placed. Finally, the stone slabs (*pavimentum*) covered the *nucleus*. Drains were also occasionally built on the sides of the road to avoid the action of water and the erosion of the *pavimentum*.

Roman engineers were frequently required to deal with difficult topographies in mountainous lands. Steep slopes, rocky ground, and landslides were common problems in these landscapes. In addition, atmospheric phenomena and their effects on the ground (through erosion and avalanches) could partially or even completely destroy some sections of the roads (Meyer 1861:137). In order to diminish these risks, engineers would build the roads on the sunny side of the mountain slopes, as it was less likely to suffer avalanches (Forbes 1934:146; Meyer 1861:129). The width of Roman roads in mountainous areas was less than that of common roads. Mountain roads were often no wider than 3 m, and could be even narrower. In some cases, narrow sections were not suitable for large wagons, making the route very challenging for transportation (Str. 4.6.7–11; Forbes 1934:146; Meyer 1861:122–139). Occasionally, the arduous nature of a track would make it necessary to carve grooves into the rock to fit the wheels of the vehicles and thus ease their maneuvering on difficult slopes (Bulle 1947:30–38; Chapot 1919:786; Davies 2002:81; Herzig 2002:11–16; Johnston 1979:85; Schneider 2004). The construction of a road always involved looking for the shortest, easiest, and most comfortable path, making it as simple as the terrain allowed and keeping the inclination as shallow as possible (Van Tilburg 2007:17; see also Lewis, this volume, for movement and the least cost path theory, and Crépy et al., this volume, for ancient road networks in a desert context).


**Figure 3.** Remains of the Roman villa of Cordel de Hernán Valle.

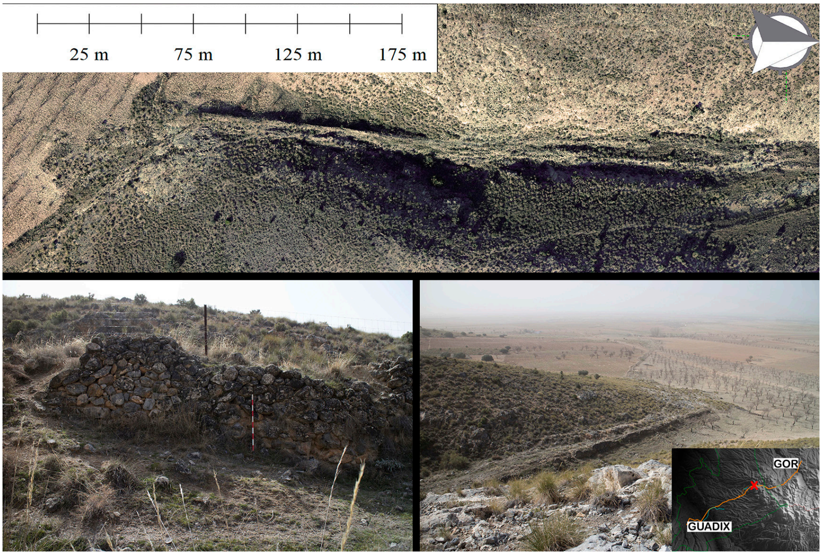


**Figure 4.** Stone-reinforced support slopes in Umbría de Peñas Negras.

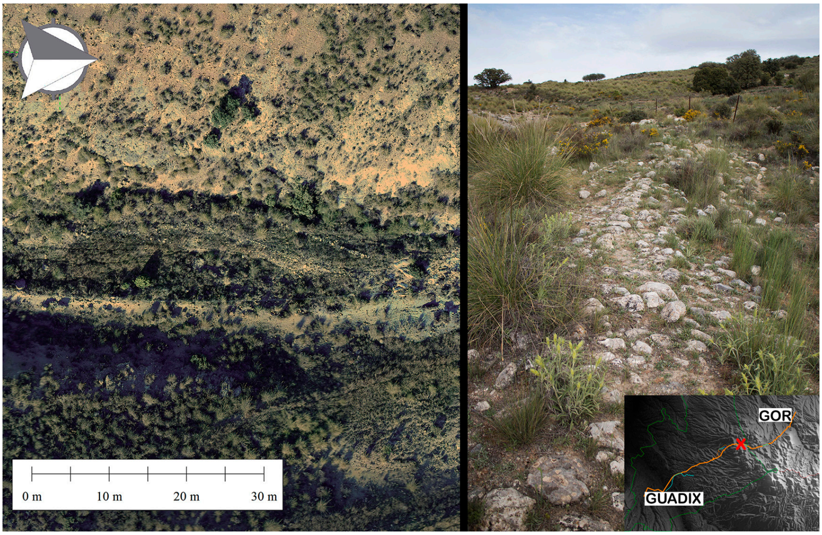


**Figure 5.** Aerial view of the slopes in Umbría de Peñas Negras.

## The Route from Fuente de San Torcuato to Piedras Negras

In the area of Fuente de San Torcuato, some superficial remains of Roman pottery and glass were discovered during our first land surveys in 2016 (495360.3 E, 4133531.3 N; 1,168 masl). The discovery of Roman archaeological remains in this location is not very surprising, because it was undoubtedly a transit area between the Roman villa of Cordel de Hernán Valle and the road (Figure 3). Moreover, the existence of another water spring makes this spot an excellent location to stop and rest during a journey. This water spring is still in use for agricultural purposes.

In the lowest part of Umbría de Peñas Negras, several stone-reinforced support slopes were discovered (496077.4 E, 4133906.6 N; 1,205 masl). In Roman times, when the terrain was unstable or the surface was not sufficiently level, stone-reinforced support slopes were built to hold back the ground. These stone slopes were filled with gravel or mortar, which should have been hard enough to stabilize the ground. There are plenty of examples of large stone slopes in mountainous landscapes ranging from 10 to 30 m high (Esch 1997:76–77, 100, 114; Laurence 1999:198). In the case of Umbría de Peñas Negras, however, the structures were only around 2 m high (Figure 4).

Following the path toward the east, the first clear remains of a paved road appear at the top of the Umbría de Peñas Negras (496498.8 E,


**Figure 6.** Paving of the road and stone-reinforced support slopes on the hill-side of Cerro de Peñas Negras.

4133974.8 N). The paving of the road is noticeable in several areas of the slope (Figure 5). The paved sections are partially preserved, and they are always in the trickiest parts of the valley. The difficult ground forced the builders to modify the path to avoid some obstacles and to carve the rock around the track in some places, making it more accessible. At the top of the slope (1,259 masl), the paved road disappears due to the removal of soil for cultivation in modern times (Figure 6). However, the road is still visible in the hillside area around Cerro Peñas Negras, as are vestiges of the stone-reinforced support slopes and accumulations of stones destroyed by cultivation machinery.

## The Route from Peñas Negras to Cortijo del Chato

Following the path to the east, all the remains of the road disappear when it encounters the watercourse of Rambla Seca (497562.6 E, 4133931.8 N; 1,271 masl), which is still completely dry and is passable throughout the entire year. For approximately 500 m, the road travels over the Rambla Seca. Along this section of the road, one can see the vestiges of a limestone furnace. The remains of the furnace are possibly medieval, but the effects of the watercourse and its lengthy abandonment have almost completely destroyed the structure.

At the end of the Rambla Seca, near the boundary between the municipalities of Guadix and Gor (497860.5 E, 4133725.6 N; 1,289 masl), the remains of an anepigraphic milestone were located by Antonio López Córcoles in 2017 (Figure 7). This milestone is mentioned in the late nineteenth-century and early twentieth-century municipal demarcation documents (Instituto Geográfico y Catastral 1929a:7, M.15; 1929b:8. M.15; Instituto Geográfico y Estadístico de España 1895:8, M.16). The milestone, formerly known as Mojón de la Legua, was reutilized by topographers in the nineteenth century to mark the boundary between the municipalities. The stone is semi-buried and, thus, has only been measured partially. It is 1.21 m tall and has a diameter of 81.8 cm. Roman milestones typically had a maximum height of 3 m and were placed about 2–3 m from the paved surface, sometimes on a square-shaped base (Schneider 1982:106). Generally, on the side facing the paved surface, the milestone was inscribed with the distance in miles or *leugae* and sometimes also with the name of the builder or restorer of the road (Amm. Marc. 16.12.8; Schneider 1982:102; Schulzki 1996:99). Occasionally, detours were also marked with poor-quality milestones. Anepigraphic milestones are those that are not inscribed, and they were sometimes simply carved rocks big


**Figure 7.** The anepigraphic milestone in Rambla Seca.

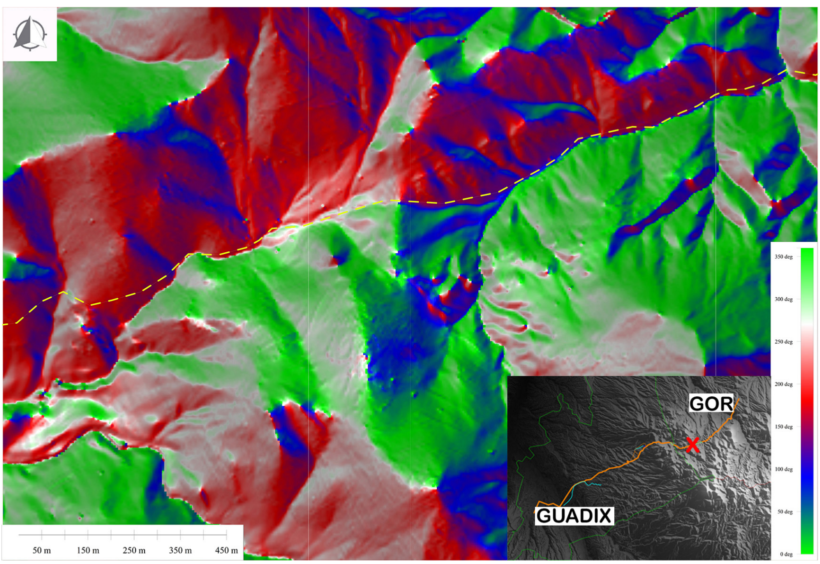


**Figure 8.** Hidden paths in Barranco de la Cañada del Gobernador.

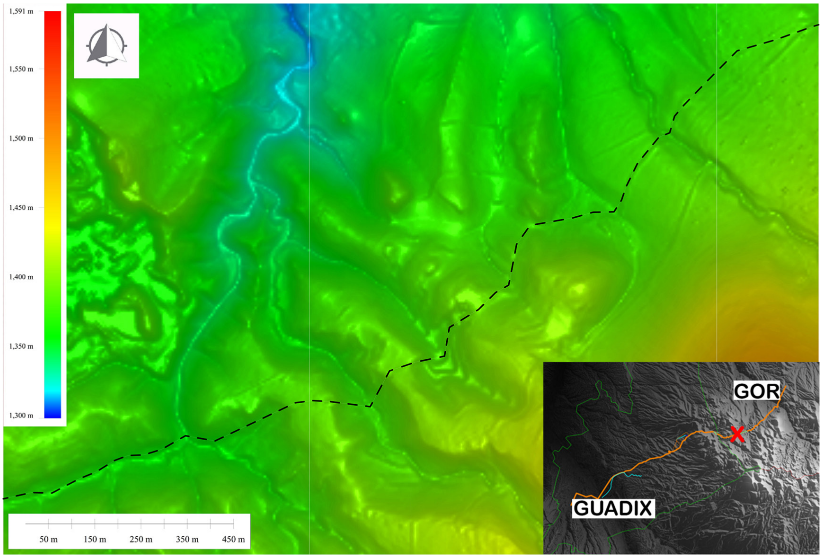


**Figure 9.** Hidden paths in Barranco del Perú.

enough to be seen in the mountainous landscapes. Some examples of this kind of milestone in Hispania are located in Santo Estevo and A Proba (Province of Orense), Santa Eulalia de Esperante (Province of Lugo), Palazuelos (Province of Guadalajara), and Fuentelespino de Haro (Province of Cuenca).

The next stop along this track is a semi-abandoned ranch known as Cortijo del Chato (498796.2 E, 4133455.1 N; 1,366 masl). In this area, several fragments of Roman pottery—amphorae and tegulae, as well as kitchenware—were discovered. No remains of paved surfaces were located in this area, but it is quite possible that during the last century farm machinery and automobiles have destroyed the paving.

## Hidden Paths

The road then turns northwest and disappears when it encounters the plain between Cerro de las Indias, Cerro de los Cocones, and Cerro del Colmenarillo. A detour in the plain marks two modern dirt roads that lead north and south (499436.2 E, 4133740.1 N; 1,391 masl). The "natural" direction of the road towards Gor would be northeast, but no remains of the ancient road are visible. Thanks to LiDAR remote sensing and Global Mapper's Slope Direction Shader, it has been possible to discover the hidden road to Gor in the Barranco de la Cañada del Gobernador (Figure 8). The alterations in the path are

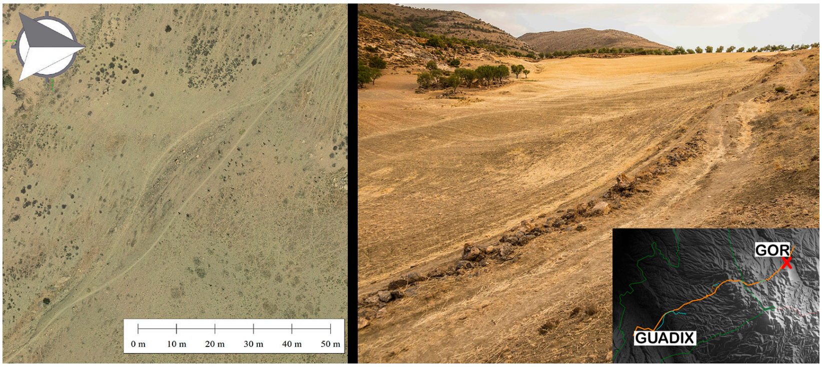


**Figure 10.** Aerial survey of Cuesta de Guadix (Gor).

due to the reuse of the soil for cultivation. Following a straight line from Cortijo del Chato to the watercourse of Barranco de la Cañada del Gobernador, the road detours slightly to the east, entering another watercourse known as the Barranco del Perú (Figure 9). Along this detour, we discovered a large standing stone that possibly may have marked the route's deviation (500300.6 E, 4133972.6 N; 1,361 masl). The road disappears for a stretch of about 1 km in the surroundings of Cortijo del Estraperlo (500876.6 E, 4134239.8 N; 1,414 masl). Using Global Mapper's Atlas Shader, we were able to identify the micro-alterations in the landscape and could reconstruct the original route up until the intersection of Barranco de la Loma Larga and Cañada del Camino Real de Lorca, the modern dirt road (501546.4 E, 4134753.2 N; 1,400 masl).

## The Paved Road in Cuesta de Guadix (Gor)

The ancient road may have followed the same route as the modern dirt road. The name of the current road—Cañada del Camino Real de Lorca—denotes its connection with the city of Lorca (Roman Eliocroca), which has survived in the toponymy because the Spanish crown commissioned the repair of older roads in the sixteenth to the eighteenth centuries (Baños Oliver 2016:123; Costa Oller 2018:49; Molina Molina 2006:13; Morote Pérez 1741:101; Villuga 1950 [1543]). In some cases, the old roads were the remnants of Roman roads, as is more than obvious in this case. The Roman city of Eliocroca was one of the *mansiones* mentioned in the *Itinerarium Antonini* (401.6) as part of the route between Acci and Carthago Nova.

The route follows a parallel path along the Camino Real de Lorca for about 550 m. In this section, we discovered remnants of cobblestone that had been severely damaged by cultivation work (501461.9 E, 4134783.1 N; 1,373 masl). There is a detour with a modern dirt road to the northwest and an abandoned path close to a small rock-cut cave known as Cueva de la Cuesta de Guadix. This location faces Gor, and it is the most direct route toward the town center. Here, we have identified the remains of a paved road in a location known as Cuesta de Guadix (501745.7 E, 4134938.6 N; 1,369 masl), previously explored by Jiménez Cobo (1990:4, 1993:362–365) and mentioned by Díez de Velasco (1992:Note 48). Cobblestones are visible in several places in the area of Cuesta de Guadix (Figure 10). They have been visibly damaged by agricultural activities, but the progressive abandonment of cultivation in this area has left some remains of the original road. The slope is about 700 m long, and again it joins the Camino Real de Lorca in the last 100 m before entering the town of Gor (502248.4 E, 4135545.9 N; 1,265 masl).

In Roman times, a settlement may have existed around the Gor River, and the route crosses the river and leads northeast for another 27 km until the *municipium* of Basti, ascending the plain via the modern Cuesta de Baza, circling the Sierra de Baza Mountains, and then descending into the basin in which the city was located. Then, the road comes to Lorca and Cartagena.

## Conclusion

Considering the archaeological remains of the road that have been discovered, those that stand out include several paved sections in Umbría de Peñas Negras (Guadix) and Cuesta de Guadix (Gor); a possible anepigraphic milestone; some stone infrastructure built to support the road; remains of Roman pottery, tiles, and fragments of carved glass; and the ruins of Cordel de Hernán Valle—all of which support the possibility that a road built in Roman times existed along this route. This road was perhaps maintained and rebuilt throughout the Middle Ages and in the modern era until its abandonment in the late nineteenth or early twentieth century. The extensive use of the surrounding land for cultivation in some areas and the construction of the later public road modified the original route and eventually made some sections disappear: for example, in the area between Fuente de San Torcuato and Rambla Seca, or in the area between Cortijo del Chato and Barranco de la Cañada del Gobernador. Aerial surveys and remote sensing technologies have been especially useful in filling in the gaps of the original route (see Burigana et al., this volume, for a similar methodological approach). Further investigations are still necessary in order to explore the landscape between Guadix and Fuenteálamo and to search for other archaeological remains.

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# Chapter Five
# Road Networks in the Formation of Ancient Greek City-States: the Case of Athens

Adèle Vorsanger

Though historically the land roads of ancient Greece were presumed to have been rudimentary and inconvenient, archaeological research over the last decades has shown that in antiquity all of Greece was crisscrossed with perfectly well-built carriage roads and mule paths (Pikoulas 2012; Tausend 2006). Ancient Greece thus would have possessed dense, organized, and technically complex road networks. However, the remains of ancient Greek roads are extremely hard to date accurately. In this situation, how can we assess the period of emergence of the ancient Greek road networks?

The road networks were probably mostly organized at the scale of the city-state, which was the fundamental territorial unit of Greek antiquity. It was of great importance for a city-state to guarantee circulation between the different parts of its territory and city, where most of the political, judiciary, and commercial activities were conducted. In particular, roads would have been crucial for allowing the population of the countryside to access civic activities.

The structure of the city-state gradually developed between the (ca.) eighth to sixth centuries BCE. The progressive shaping of the civic territories during this period necessarily implied a new spatial organization. We can assume, therefore, that the formation of city-states during the Archaic period was intertwined with the creation of road networks. In order to corroborate this assumption, what are the indications, in the Archaic period, that civic institutions took charge of the construction, maintenance, or equipment of the roads?

In this paper, we will seek to answer this question through a case study of Archaic Athens and Attica, the best documented example in both archaeological and written sources.

## Roads and the Politicization of the Athenian *Chora*

The archeological exploration of Attica, and especially rescue excavations conducted in the 2000s, have uncovered a large number of ancient roads. Some of them can be dated on a stratigraphical basis to the Archaic period (Kakavogianni 2009:184; Steinhauer 2009:39). The technical characteristics of the roads change little over the centuries: the surfaces are usually of beaten earth and gravel, and in many places, the use of wheeled vehicles can be deduced from the width of the roads (Kakavogianni 2009:188). What is more, artificial wheel ruts carved into the bedrock are a remarkable feature of ancient Greek roads and have been found throughout Attica (Kaza-Papageorgiou et al. 2009:208). Unfortunately, they cannot, in most cases, be dated with accuracy. These arteries constitute a coherent network across Attica. But to which historical and political dynamics can the creation of this road network be related?

The sixth century, in particular, was a decisive period in Athenian history. At the beginning of the century, the (almost) definitive borders of the city were set: Athens was the political center of a city-state whose territory covered all of Attica. The Athenian territory was remarkably large compared to the average size of the Greek city-states. Yet, ancient rivalries between regionally anchored factions persisted; the unity of the city was still in the making. The political significance of the road networks is striking, especially in this period when the relation between the urban center and the rural territory, the *chora* (χώρα), was going through important mutations.

Alongside these political evolutions, we can see signs of institutional interest in roads, especially under the tyrannic dynasty of the Pisistratids. Many tyrannic regimes of Greece are known for their ambitious construction programs, and the Athenian Pisistratids were no exception (de Libero 1996). This context seems to have been favorable for a large road-construction program. Indeed, road-building could be a suitable way for tyrants to express their power, but it was also necessary in order to convey workers and materials, particularly in a period of architectural effervescence. The implementation of taxes under the tyrants also may have increased movements between the rural areas and the political center (Zurbach 2017:422).

We will comment on three historical testimonies that show the early action of the city on the road network: the hermaic pillars of Hipparchus, son of Pisistratus; the altar of the Twelve Gods erected by Pisistratus the Younger in the Athenian Agora; and the development of the procession toward Eleusis along the so-called "Sacred Way" (ἱερὰ ὁδός). This will allow us to investigate the chronology of the formation of road networks in ancient mainland Greece and analyze the different levels of significance of roads in the organization of civic territories.

## The Herms of Hipparchus

The earliest attestation of a political will to organize the road network is the installation of a series of milestones by Hipparchus, son of Pisistratus. In the last quarter of the sixth century BCE, between the death of his father Pisistratus in 527 BCE and his own in 514 BCE, Hipparchus set hermaic pillars as milestones along the roads leading from Athens to each one of the demes, the subdivisions of the territory. This could represent more than a hundred herms, if we assume that the demes implicated in this measure were roughly equivalent to the 139 demes officially established as administrative units by the reforms of Cleisthenes in 508/7 BCE. This initiative is documented by several concordant testimonies. Pseudo-Plato's *Hipparchus* (228c–229b) gives the most comprehensive account of this measure:

> Ἐπειδὴ δὲ αὐτῷ οἱ περὶ τὸ ἄστυ τῶν πολιτῶν πεπαιδευμένοι ἦσαν καὶ [228d] ἐθαύμαζον αὐτὸν ἐπὶ σοφίᾳ, ἐπιβουλεύων αὖ τοὺς ἐν τοῖς ἀγροῖς παιδεῦσαι ἔστησεν αὐτοῖς Ἑρμᾶς κατὰ τὰς ὁδοὺς ἐν μέσῳ τοῦ ἄστεος καὶ τῶν δήμων ἑκάστων, κἄπειτα τῆς σοφίας τῆς αὑτοῦ, ἥν τ' ἔμαθεν καὶ ἣν αὐτὸς ἐξηῦρεν, ἐκλεξάμενος ἃ ἡγεῖτο σοφώτατα εἶναι, ταῦτα αὐτὸς ἐντείνας εἰς ἐλεγεῖον αὑτοῦ ποιήματα καὶ ἐπιδείγματα τῆς σοφίας ἐπέγραψεν, [228e] ἵνα πρῶτον μὲν τὰ ἐν Δελφοῖς γράμματα τὰ σοφὰ ταῦτα μὴ θαυμάζοιεν οἱ πολῖται αὐτοῦ, τό τε «γνῶθι σαυτόν» καὶ τὸ «μηδὲν ἄγαν» καὶ τἆλλα τὰ τοιαῦτα, ἀλλὰ τὰ Ἱππάρχου ῥήματα μᾶλλον σοφὰ ἡγοῖντο, ἔπειτα παριόντες ἄνω καὶ κάτω καὶ ἀναγιγνώσκοντες καὶ γεῦμα λαμβάνοντες αὐτοῦ τῆς σοφίας φοιτῷεν ἐκ τῶν ἀγρῶν καὶ ἐπὶ τὰ λοιπὰ παιδευθησόμενοι. Ἐστὸν δὲ δύο τὠπιγράμματε· ἐν μὲν τοῖς [229a] ἐπ' ἀριστερὰ τοῦ Ἑρμοῦ ἑκάστου ἐπιγέγραπται λέγων ὁ Ἑρμῆς ὅτι ἐν μέσῳ τοῦ ἄστεος καὶ τοῦ δήμου ἕστηκεν, ἐν δὲ τοῖς ἐπὶ δεξιά· «μνῆμα τόδ' Ἱππάρχου· στεῖχε δίκαια φρονῶν» φησίν. Ἔστι δὲ τῶν ποιημάτων καὶ ἄλλα ἐν ἄλλοις

> Ἑρμαῖς πολλὰ καὶ καλὰ ἐπιγεγραμμένα· ἔστι δὲ δὴ καὶ τοῦτο ἐπὶ τῇ Στειριακῇ ὁδῷ, ἐν ᾧ λέγει· [229b] «μνῆμα τόδ' Ἱππάρχου· μὴ φίλον ἐξαπάτα».
>
> And when his people in the city had been educated and were admiring him for his wisdom, [228d] he proceeded next, with the design of educating those of the countryside, to set up figures of Hermes for them along the roads in the midst of the city and every district town; and then, after selecting from his own wise lore, both learnt from others and discovered for himself, the things that he considered the wisest, he threw these into elegiac form and inscribed them on the figures as verses of his own and testimonies of his wisdom, so that in the first place [228e] his people should not admire those wise Delphic legends of "Know thyself" and "Nothing overmuch," and the other sayings of the sort, but should rather regard as wise the utterances of Hipparchus; and that in the second place, through passing up and down and reading his words and acquiring a taste for his wisdom, they might resort hither from the country for the completion of their education. There are two such inscriptions of his: on the left side [229a] of each Hermes there is one in which the god says that he stands in the midst of the city or the township, while on the right side he says: "The memorial of Hipparchus: walk with just intent." There are many other fine inscriptions from his poems on other figures of Hermes, and this one in particular, on the Steiria road, in which he says: [229b] "The memorial of Hipparchus: deceive not a friend." [Translation by W. R. M. Lamb]

The herms of Hipparchus were steles whose top part was carved in the shape of a bearded Hermes. On each stele was carved an elegiac couplet: the hexameter indicated the midpoint between the city and the deme and the pentameter was a moral sentence. In this respect, the Platonic dialog considers the herms of Hipparchus as a measure of popular education.

Two passages of lexicographic works mention the herms of Hipparchus. Hesychius (s.v. ἱππάρχειος Ἑρμῆς [Herm of Hipparchus]) is clearly referring to the Platonic text. The Byzantine dictionary *Souda* mentions the herms of Hipparchus (s.v. ἑρμαῖ [herms]), but without giving any more detail.

The literary testimonies are corroborated by an inscribed fragment from a herm of Hipparchus that was found in the town of Koropi, south of Mount Hymettos (*IG* I$^3$ 1023; author's translation):

> [ἐ]ν μhέσοι Κεφαλε͂ς τε καὶ ἄστεος ἀγλαὸς hερμε͂ς
> [μνε͂μα τόδε hιπ(π)άρχο·] [–⏑⏑ –⏑⏑ –]
>
> In the middle between Kephale and the city, a sumptuous hermes,
> Monument of Hipparchus […]

The monument is not well preserved, but the hexameter of the elegiac couplet on the right side of the stone can be read: it indicates the halfway point between Athens and Kephale. It is very interesting that Plato's text and the verses on the herm from Koropi converge. Reading *Hipparchus*, we have the feeling that Socrates saw, with his own eyes, some of the tyrant's herms. In 229a, the present tense is used to refer to the herm of the Steiria road. Socrates is obviously quoting from memory the moral sentence of this herm. Moreover, the inscription of Koropi confirms the Platonic text. For example, in 228d and 229a, Socrates says that the herms stand "in the midst of the city and every district town" (ἐν μέσῳ τοῦ ἄστεος καὶ τῶν δήμων ἑκάστων), then "in the midst of the city or the township" (ἐν μέσῳ τοῦ ἄστεος καὶ τοῦ δήμου). The exact same expression appears in the inscription *IG* I$^3$ 1023: "in the middle between Kephale and the city" ([ἐ]ν μhέσοι Κεφαλε͂ς τε καὶ ἄστεος). In the fifth century, at least some of Hipparchus' herms still may have been standing.

The herms of Hipparchus represent the first systematic road-marking known in Greece. They had practical value: there is a gap between the mere cairns—sporadically erected by passersby—that are known throughout antiquity and the more elaborate information given by the herms of Hipparchus. By indicating the midpoint on the road to a deme, they became indicators of direction and distance, if only a relative distance. B. M. Lavelle (1985) denies all practical value of the herms for the road users, arguing that they would have already known their way perfectly well and would not have needed directional assistance. Nevertheless, it is a common experience to rely on landmarks in familiar surroundings in order to estimate the distance travelled and the distance still to be covered. By indicating the halfway point, the herms of Hipparchus represented fixed and predictable markers

(Salviat and Servais 1964:272). Furthermore, it is probable that Athenian peasants in the late sixth century would have found it more helpful to know they had walked half the distance than to be given a number of stades. Even though no precise distances were given on the herms of Hipparchus, a measurement of the roads must have been performed in order to determine the midpoint of each road. The calculation may also have been based on an evaluation of travel time. In this respect, the herms of Hipparchus could have encouraged mobility in Attica, especially between the city and the towns of the *chora*.

In addition to this practical value, those road markers are also given a political significance: Hipparchus' herms are a coherent series issuing from state authority. The name of Hipparchus is clearly indicated in the inscriptions carved on the stones. The herms stress the connection between the city of Athens and the demes. In the spatial conception conveyed by this road-marking, the centrality of Athens is highlighted. The city appears as the central node of Attica, toward which all roads lead. It is unclear whether Pisistratus or Hipparchus had new roads constructed and installed herms along them; rather, they probably used the herms to give the existing roads and path network a hierarchical structure that emphasized the centrality of the city. Thus, the connection between the different parts of the Attic territory and the city of Athens was enhanced.

In a historical context in which competing territorial factions still vied for control, this relative standardization of the roads may have been of some political significance. In this regard, the installation of the herms of Hipparchus was a tool toward territorial unification and centralization. It also distinguished, to some extent, major roads from secondary roads and imposed the mark of the city and its leaders over all the territory.

Were the herms part of a wider program of road construction? The erection of the herms is, by itself, evidence of an important evolution in the Attic road network, since it implies a program of measuring the network before the herms could be placed. It is also possible that the erection of the herms went with new road construction, although the written sources do not explicitly mention this kind of work under the governance of the tyrants. However, archaeological research has uncovered evidence that several roads in Attica date to the Archaic period (Kakavogianni 2009:184; Kakavogianni et al. 2009; Kaza-Papageorgiou et al. 2009:207, 208, 211; Steinhauer 2009:37). It is thus possible to consider that, when Hipparchus set herms along the roads of Attica, a dynamic of road improvement was already underway. Yet, we cannot assert whether the Pisistratids initiated this improvement or whether it predated the tyrants. The herms of Hipparchus could have been just one step in a long-term process.

The setting of Hipparchus' herms proves the interest of the tyrants in the Athenian road network and in mobilities between Athens and the rest of the territory. What is more, this road-marking demonstrates a will for unification of the Athenian territory. The point of the herms is to indicate, through the uniformization of the roadside equipment, that a road is part of the civic territory. The herms of Hipparchus also underline the connection between Athens and the territorial subdivisions, operating a clear hierarchy between center and periphery. In the conception of space conveyed by the herms, the city of Athens is the center and the nodal point of Attica, the place where all roads meet. On a political level, marking the roads is almost as important as building them.

## The Altar of the Twelve Gods

Several authors see a connection between the setting of Hipparchus' herms and the construction of the altar of the Twelve Gods (Crome 1935/36; Wrede 1986), an open-air sanctuary in the middle of the Athenian Agora that was used as the reference point for the measurement of the roads of Attica. M. Crosby (1949), in the publication of the excavations of the altar that took place in 1934 and 1946, dates its construction to 522/1 BCE, the year when Pisistratus the Younger was archon. This Pisistratus was the son of Hippias, and we know from Thucydides (6.54.6–7) that he commissioned the monument's construction (Crosby 1949:103).

Even though we cannot be certain that the date 522/1 BCE is accurate—since Pisistratus did not necessarily need to be archon in order to erect the monument—it is plausible to date the altar to Pisistratus the Younger's floruit, around the second-third of the sixth century BCE. The construction of the altar thus belongs to the same chronological range as the herms of Hipparchus. Like J. F. Crome (1935/36:307), Crosby (1949:81) describes the altar as the "central milestone" of Attica—that is, "point zero" from which distances were measured.

Two texts certify the relation between this altar and the measurement and milestone-setting in Attica. The first is an inscribed milestone (*IG* I$^3$ 1092 bis) dated to the end of the fifth century BCE and written in elegiac couplets. It was erected halfway between the altar of the Twelve Gods and the harbor of Piraeus. It also indicates the total distance between the harbor and the altar of the Twelve Gods. The stone is now lost, but the inscription was noted by R. Chandler (1774: no. 24) in the eighteenth century (author's translation):

> [ἡ πόλις] ἔστ<η>σ[έμ με β]ροτ[οῖς] μνημεῖον ἀληθὲς
> [–⏑⏑]σημαίνε[ν μ]<έ>τρ̣[ον] ὁδοιπορίας·
> [–⏑⏑ – τ]ὸ μεταχσὺ θεῶμ πρὸς δώδεκα βωμόν
> [ἓξ καὶ τ]εσσαράκοντ' ἐγ λιμένος στάδιοι.
>
> The city erected me, truthful sign indicating to mortals […] the measure of the way. […] the halfway point from the harbor to the altar of the Twelve Gods, forty-six stades.

Herodotus (2.7) also gives distances measured from this altar. In this case, it extends beyond the borders of Attica:

> Ἔστι δὲ ὁδὸς ἐς Ἡλίου πόλιν ἀπὸ θαλάσσης ἄνω ἰόντι παραπλησίη τὸ μῆκος τῇ ἐξ Ἀθηνέων ὁδῷ τῇ ἀπὸ τῶν δυώδεκα θεῶν τοῦ βωμοῦ φερούσῃ ἔς τε Πῖσαν καὶ ἐπὶ τὸν νηὸν τοῦ Διὸς τοῦ Ὀλυμπίου.
>
> From the sea up to Heliopolis it is a journey about as long as the way from the altar of the Twelve Gods at Athens to the temple of Olympian Zeus at Pisa. [Translation by A. D. Dodley]

These two texts show the relation between the altar and the road network of Athens in the fifth century BCE. Yet, is it possible to assert that the altar was conceived, from its very construction in the sixth century, as the central milestone of Athens? The ancient sources establish no explicit link between the altar and the herms. However, it is more rational to imagine that both were part of the same dynamic. Crosby suggests there was a link between this monument and the herms of Hipparchus, and she assumes that the altar and the herms were part of a larger program of road improvement: "First, the Altar of the Twelve Gods, as central milestone of Attica, should be associated, it would seem, with the road improvements of the Peisistratids and especially with the herms set up as road markers by Hipparchos"

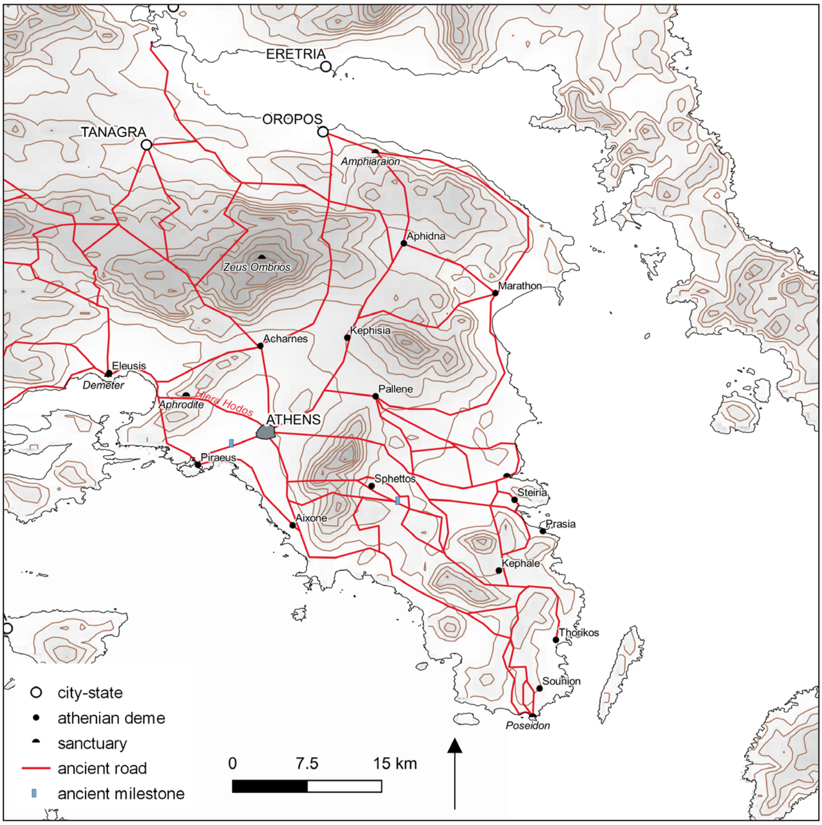


**Figure 1.** Northwest Attica in the fifth century BCE (after Fachard 2013; Kakavogianni 2009; Talbert 2000). Map by Adèle Vorsanger.

(Crosby 1949:100). She also notices that the altar is situated in a region of the Agora where the territory's important road axes cross: the Sacred Way heading toward the northwest, the road to Acharnai toward the east, and the road to Piraeus toward the west. This would mean, according to her, that from the beginning the altar was set in a place befitting the purpose of a central milestone. It is thus plausible to see, like Crome and Crosby, the altar of the Twelve Gods and the herms of Hipparchus as two different sides of a vast road-building program by the Pisistratids. At the very least, we can assert that both were connected with a program of land measurement in Attica, if not with road planification and construction.

The centrality of Athens is once again brought to light. The Agora, the center of the city, was the nodal point where all the Attic roads

**Figure 2.** The ancient road near the Egaleo subway station. Photograph by Adèle Vorsanger.

met. The central milestone, like the hermaic milestones, embodied the radiation of the roads from Athens outward to every part of the territory.

## The Sacred Way to Eleusis

We will now look into one of the main axes of Attica: the road from Athens to Eleusis. It is one of the best known ancient roads in Greece. The plain of Eleusis was the westernmost part of the Athenian territory, and it was separated from the territory of Megara by a sacred land called the *hiera orgas* (ἱερὰ ὀργάς [sacred meadow]; Daverio Rocchi 1987). In the Archaic period, the region of Eleusis was the source of border conflicts between the two city-states, and we know that the sacred land was still disputed in the Classical period (Robu 2014:62). It is possible to connect the development of the sanctuary—and the road connecting it to Athens—to the political will to assert Athenian authority over the plain of Eleusis.

The road to Eleusis connected Athens to the plains of northwestern Attica and continued on, either west toward Megara and the Isthmus of Corinth or northwest toward Boeotia (Figure 1). This gave this axis great strategic, political, and economic significance. Eleusis was also an important sanctuary of Demeter and Kore, and the road was used every year by the procession of the mysteries that departed from Athens. Due to this ritual value, the sources sometimes use the expression "Sacred Way", especially Pausanias (1.36.3) or, in a *rasura* (i.e. a deletion or erasure), the milestone *IG* I³ 1096.

The total length of the road was 20 km, and it was 3–5 m wide. Its route was already well determined by the travelers of the nineteenth century. The road was the subject of early excavations by D. Kampouroglou in 1891 and 1892 and by K. Kourouniotis and I. Travlos between 1932 and 1939. More recently, rescue excavations related to the construction of the Athenian subway have revealed parts of the ancient roadway. For example, a stretch of the road is visible near the Egaleo subway station (Figure 2). In several places, archaeologists have revealed the stratigraphy of the road between Athens and Eleusis. Thus, it has been proven that some segments of the road date back, in their earliest phases, to the Archaic or even Geometric periods (Drakotou 2009:114, 116, 119). The road departed Athens through the so-called "Sacred Gate" in the Kerameikos area and headed northwest, crossing the Attic Kephisos. It passed by a sanctuary of Aphrodite, the remains of which are located in the modern town of Daphni, situated halfway between Athens and Eleusis. An important stretch of the road was excavated by Kourouniotis and Travlos (1937) in front of the sanctuary; here, the roadway was graveled and delimited by low walls, and several buildings belonging to the sanctuary faced the road (Papangeli 2009:128; Travlos 1988:177). The road then passed through the two summits of the low mountain massif of Mount Aigaleos and followed the coastline until Eleusis. This coastal section was a lagoon area known as Rheitoi. Afterward, the road crossed the Eleusinian Kephisos and finally reached the sanctuary of Demeter and Kore in Eleusis.

The sanctuary of Eleusis grew significantly from the beginning of the sixth century (Travlos 1988), and the first monumental Telesterion (i.e. the large covered hall where rituals related to the mysteries took place) dates back to this period. However, it appears that the Eleusinian cult gained its panhellenic influence during the tyranny of Pisistratus. In this period, the Telesterion was remarkably enlarged and adorned, and the sanctuary was given a strong fortification wall of mudbrick. Therefore, it is plausible that the road acquired its function as a processional road—and the qualification of "Sacred Way"—over the course of the sixth century due to the development of the sanctuary. To define this road as a Sacred Way was politically significant: this notion contributed to the assertion of Athenian authority over the plain of Eleusis.

The road between Eleusis and Athens also played a particular role in the mythic cycle of Theseus' adventures during his travel from Troezen to Athens. This heroic cycle is mostly known through Diodorus Siculus' *Bibliotheca historica* (4.59) and Plutarch's *Theseus* (11–12). Moreover, it is frequently depicted on Attic ceramics of the late sixth century BCE. This led to the conclusion that Theseus had become a national hero in Athens in this period. The myth attributes to him the unification and pacification of the territory during his journey to Athens (Calame 1990:421–422; Cornet 2000:28).

The part of the journey that takes place between Eleusis and Athens seems to follow the Sacred Way, since the hero's great deeds on this stretch of his route are situated in significant places along this axis. In Eleusis, Theseus defeats Cercyon, and then he overcomes the abominable Procrustes. Plutarch situates this event vaguely: "a little further" (μικρὸν προελθών) after Eleusis. Diodorus, on the other hand, locates this episode "in a place called Korydallos in Attica" (ἐν τῷ λεγομένῳ Κορυδαλλῷ τῆς Ἀττικης). This toponym could refer to the name of the southern summit of the Aigaleos, Mount Korydallos. The pass through Aigaleos constitutes the limit between the Athenian and Eleusinian plains, and as mentioned above, it lies halfway between Athens and Eleusis. Lastly, at the Attic Kephisos, the river that delimits Athens' immediate surroundings, Theseus is welcomed by the Phytalidai, who submit him to purification rituals. Thus, we see three notable spots along the road that are involved in Theseus' quest. What is more, Apollodorus (*Epit.* 1.4) explicitly says that Theseus purifies the road: "So, having cleared the road, Theseus came to Athens" (καθάρας οὖν Θησεὺς τὴν ὁδὸν ἧκεν εἰς Ἀθήνας; translation by J. Frazer).

The Sacred Way seemed to acquire a certain prestige over the course of the sixth century BCE. It was not only a main axis through the Athenian territory, but also an artery that connected Attica to the neighboring Megarid and Boeotia. Furthermore, the Sacred Way was laden with a strong mythological and ritual aura. In conclusion, it is plausible that the Athens–Eleusis road became such an important artery because of the action of the city, if not the tyrant Pisistratus. The Sacred Way established a particular link between Athens and Eleusis, its westernmost sanctuary and entranceway to the Athenian territory. This road demonstrated the different ways in which Athens asserted its domination over Attica as the hegemonic center of the peninsula.

## Conclusion

In the Archaic period, the formation of the city-states—characterized schematically by the complementarity between urban center and rural territory—probably implied new needs in terms of transport, communication, and control over land and borders. In this respect, the road networks were essential. They were a way for city-states to unify and control their territory. It can be assumed, therefore, that the shaping of the ancient Greek road networks dates back, for the most part, to the Archaic period, a time when the city-states themselves were taking on their definitive form.

The link between the development and structuration of the city-states and the implementation of road networks appears in the early history of Athens. According to archeological and epigraphical sources, it seems that the Archaic period was an important moment for the layout of the road system in Athens and Attica. In Athens especially, the first evidence of public action regarding the road network occurred in a period when the political and territorial structure of the city-state had just stabilized. At the end of the Archaic period, uniting Attica through roads and highlighting the centrality of Athens were major political stakes. The seventh and sixth centuries BCE were characterized by rivalries between factions or clans that were partly defined by common geographic territorial anchoring. At the end of the sixth and beginning of the fifth century, those ancient links were weakened, and power was concentrated in Athens. The development of the road networks was key to the process of unifying Attica politically and economically around the city of Athens. Based on the sources, we can assume that the Pisistratids played a major role in this evolution, even if the scarce documentation prevents us from formulating much more precise hypotheses. Despite the lack of sources and the difficulty of dating ancient roads, we hope to have shown that a reflection on the political significance of specific axes and networks in a given historical context can open up interesting perspectives.

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# Chapter Six
# The Street System and Design Module of Mantineia: A Statistical Analysis of an Ancient Greek City Using Remote Sensing Datasets

Jari Pakkanen and Jamieson C. Donati

Town planning—or the organization of urban space with a network of interconnected roadways, often orthogonal in form—was widely adopted in ancient Greek cities as early as the eighth and seventh centuries BCE. The earliest forms appeared in the Greek colonial foundations in southern Italy and Sicily and included cities such as Naxos, Syracuse, Kroton, and Selinous (Cerchiai et al. 2004; Greco and Torelli 1983; Mertens 2006; Shipley 2005). By the fifth century BCE, the practice had become widespread throughout the eastern Mediterranean and Black Sea wherever there was a Greek presence (Hoepfner and Schwandner 1994). Town planning was not limited to new cities but also stemmed from urban renewal, perhaps following destruction, urban expansion, or the coalescence of surrounding towns into a centralized urban center, known as a *synoicism*. In some cases, there is evidence that settlements structured the rural territory into farming plots as a means for allocating agricultural land (Carter 2006; Smekalova and Smekalov 2006). Among other aspects, the purposes of urban planning were to regulate the distribution of property to the citizen body in a logical manner and to better manage intraurban traffic. Furthermore, the application of uniform dimensions reflected the wider participation of different social classes in the community (Bintliff 2012; Whitley 2001).

While much is known about the characteristics and developments of town planning in the ancient Greek world, we know relatively little about the interests of the ancient town planners themselves. For example, how did they design the road network and housing blocks? What were their practical methods and approaches to urban design? Ancient authors—notably Aristotle—provide some insights into these processes, but the overall evidence is fragmentary. Treatises on Greek

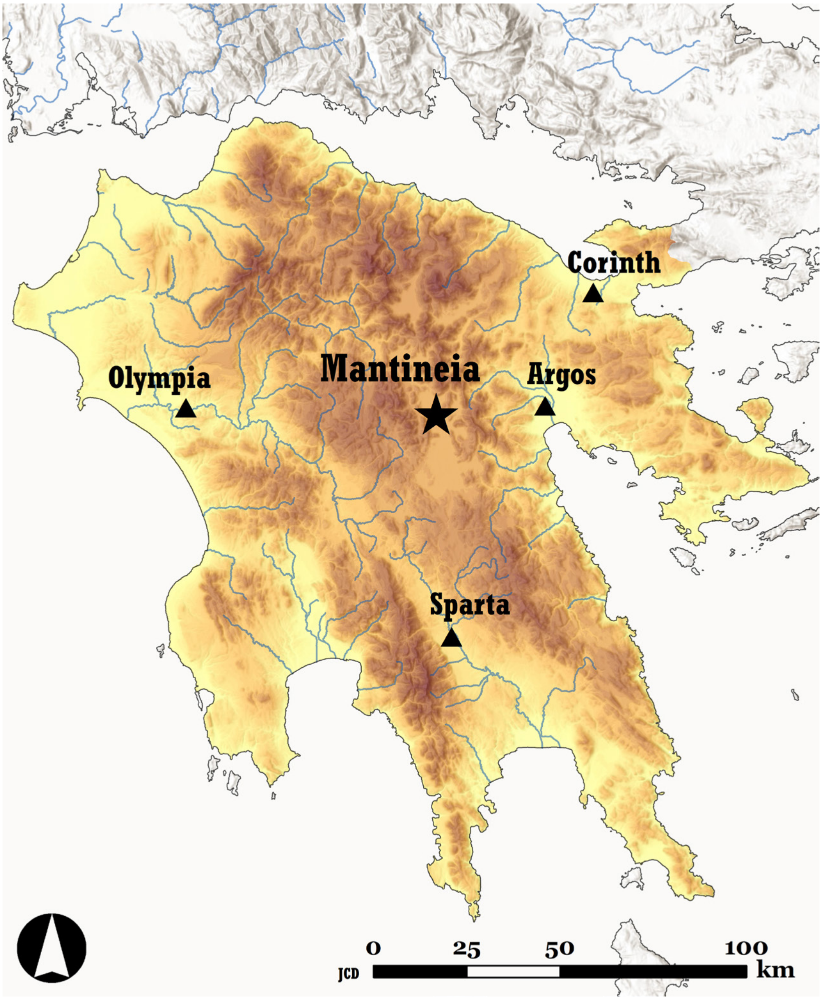


**Figure 1.** Map of the Peloponnese showing the location of Mantineia.

town planning, such as those by the fifth-century BCE urban planner Hippodamos of Miletos, do not survive (Hellmann 2010; McCredie 1971; Shipley 2005). Our study attempts to confront the matter from a new perspective: to understand the metrology and ancient design principles used by town planners through a quantitative analysis of big archaeological datasets. Quantitative approaches have already resulted in a better understanding of ancient Greek architectural design, even though the combination of proportional non-modular design systems, rounding of dimensions, and ancient building practices have created highly opaque sets of measurement data (Pakkanen 2013). As a case study, we base our chapter on the results of a large-scale geophysical survey undertaken at Mantineia, an ancient Greek city in the Peloponnese with good evidence for town planning.

## Mantineia: The Survey

Mantineia was an important city in Arkadia, the mountainous central region of the Peloponnese and a northern neighbor of Sparta (Figure 1). The city was built sometime before the middle of the fifth century BCE, and, subsequently, it was twice destroyed and rebuilt: first by a Spartan invasion in 385 BCE and later by the Macedonians in 222 BCE (Hodkinson and Hodkinson 1981; Tsiolis 2002). The Spartan destruction instigated a forced depopulation of Mantineia and relocation of its citizens to surrounding villages. Mantineia was reestablished in a *synoicism* 15 years later, after the Battle of Leuctra. The French School at Athens conducted the first and only extensive archaeological investigations at the site from 1887 to 1889 (Fougères 1898). The French focused on the agora and its public monuments at the center of the city, including the theater. They discovered civic and religious buildings and porticos arranged around a rectangular square, with phases spanning the fifth century BCE to the Roman period. More recently, the Ephorate of Antiquities of Arkadia has completed a reexamination of the agora that should shed light on the diachronic development of the venue (Karapanagiotou 2015). Outside the agora, the most significant architectural feature at Mantineia is the elliptical fortification walls, approximately 4 km in circumference (Maher 2017; Winter 1987). The urban boundaries of Mantineia are well defined and comprise an area of 119 ha. In addition to the fortification circuit, a series of 10 gates provide access into the city. Not all of the gates survive nowadays, but their locations are known from nineteenth-century descriptions and plans of the site.

Beyond the agora—excluding a handful of structures and a road that were excavated in brief rescue operations (Steinhauer 1979)—almost nothing of the urban zone was known prior to satellite remote sensing and a geophysical survey conducted in 2014 by the Institute for Mediterranean Studies in collaboration with the Ephorate of Antiquities of Arkadia (Figure 2). Initially, analysis of satellite imagery and accompanying feature enhancements proved valuable in identifying an extensive system of orthogonal streets, showing for the first time that Mantineia was a planned settlement (Donati and Sarris 2016). South

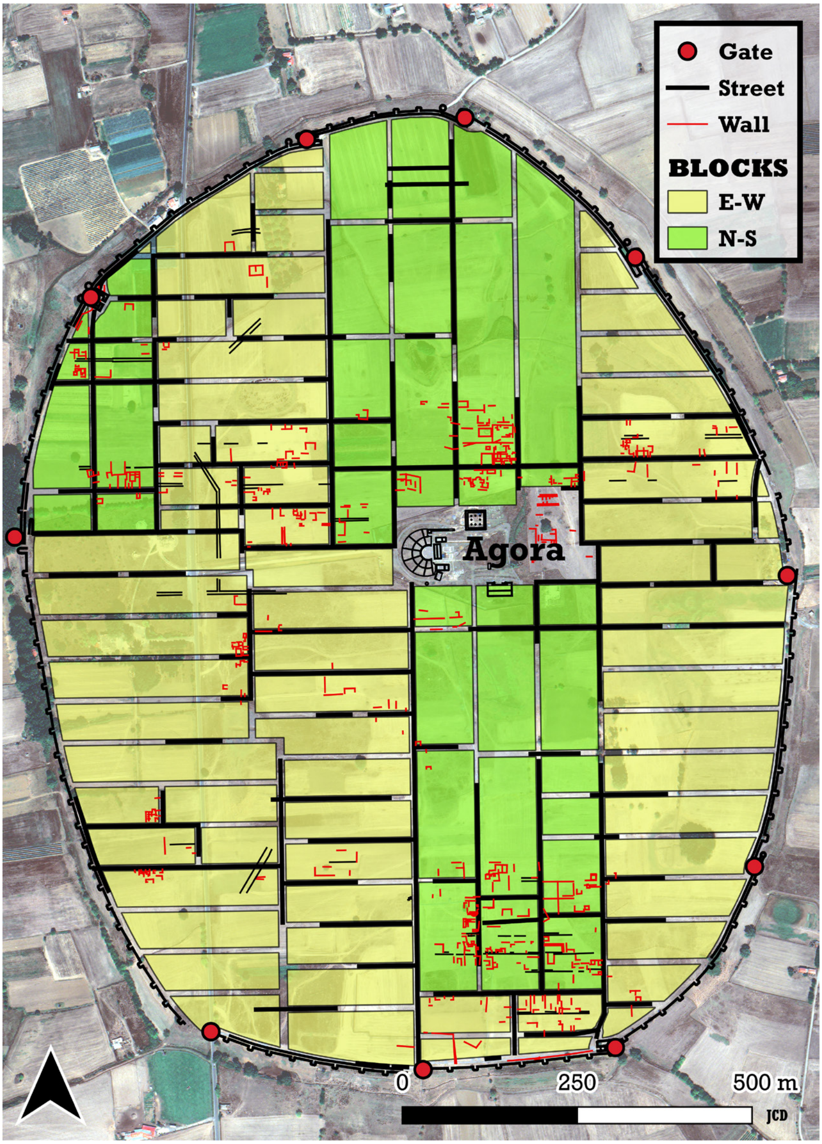


**Figure 2.** Town plan at Mantineia based on the results of remote sensing and geophysics.

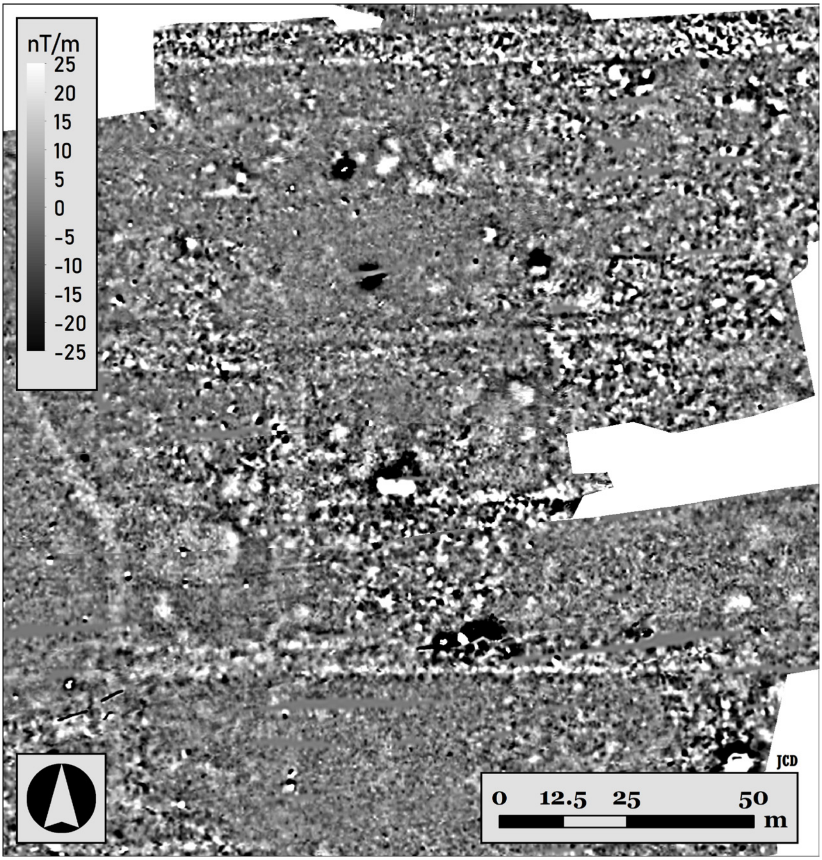


**Figure 3.** Detail of the magnetics survey in the northwest region of the city. Note the linear anomalies from the street system and the rectangular city blocks.


**Figure 4.** Detail of the GPR survey in the agora. Note the colonnaded porticos and structures with internal rooms.

of the agora, remote sensing found evidence for four parallel streets of prolonged dimensions with north–south orientations. The westernmost can be traced in the satellite imagery for almost 700 m from a gate to the theater. A similar arrangement of north–south parallel streets appears in the northern half of the city. East–west anomalies that mark buried streets are also evident, with many intersecting the north–south anomalies at right angles.

Afterward, a geophysical survey mapped the subsurface of approximately 30 ha (or 25%) of the walled city through a combination of magnetics, electromagnetics, ground-penetrating radar (GPR), and electrical ground resistance (Donati et al. 2017). Magnetics and electromagnetics were particularly effective in mapping the buried street system because of the rapid area coverage of these techniques and the good contrast between the street surfaces (probably of hard-packed dirt) / stone curbings and the surrounding soil matrix (Figure 3). Buried structures—likely from domestic and public buildings—were identified in the survey as well. In the agora, for example, the GPR results revealed two connecting porticos along the northeast side of the agora, where the colonnades of the structures are clearly defined (Figure 4).

The surveys, both geophysical and satellite remote sensing, allow for a partial reconstruction of the town plan at Mantineia (see Figure 2). The chronology is not certain, but based upon historical considerations and the Classical date of some buildings in the agora, whose orientations conform to the town plan, a date in the fifth or fourth century BCE is a reasonable suggestion. Based on architectural considerations, the fortification walls are also thought to be Classical in date and are remarkably similar to, for example, the fourth-century BCE elliptical walls at Stymphalos, another city in Arkadia. Major avenues set at the cardinal points are positioned to funnel traffic from the city gates into the center toward the agora. The whole urban area is characterized by a network of rectangular city blocks and orthogonally aligned streets. Also evident is a transition from long east–west blocks at the peripheral areas to long north–south blocks primarily in the central region. The combination of the two systems, side-by-side, is not common in Greek urban planning. The metrology of city blocks at Mantineia is diverse, but there is a consistent spacing sequence. Measuring from the street corners, city blocks are rectangular, with uniform widths of about 51 m on average. However, block lengths vary greatly, often expanding or contracting by factors of 20 m within a range of about 80–180 m. In some instances, the lengths do not conform to the 20-m standard. In the northwest region, for example, the survey found evidence for city block lengths of about 75 m and 113 m bordering blocks of approximately 160 m and 120 m. The variety of lengths relates to the placement of offset streets at various locations. So, instead of a street system of continuous thoroughfares spanning the entire city, the town planners at Mantineia created a non-uniform composition, with streets and city blocks broken up into smaller units.

The town plan of Mantineia is not entirely rectilinear. In a few instances, the survey identified anomalies that are likely the signatures of streets with diagonal orientations. These putative diagonal roads are probably restricted to specific areas because the survey did not find the projection of the anomalies in adjacent fields. Elsewhere, there is good evidence that a ring road encircles the interior of the fortification walls, apparently to optimize the circulation of traffic. The French excavators proposed this as a hypothesis in the nineteenth century, but now there is confirmation: city blocks along the ring road have curvilinear ends on the sides bordering the fortification walls. It is not known for certain whether the town plan stops at the fortification walls, as the geophysical research was restricted to the intramural city. Satellite remote sensing identified rectilinear anomalies, possibly related to streets, at a distance of 750 m southeast of the fortification walls.

## Measurements

In preparation for a quantitative analysis of the road system, we extracted several measurements from the magnetics data. This was a practical decision, since the magnetics survey achieved the widest coverage at the site and since the signature of the roads is well defined in the data. We took 34 measurements of the widths and lengths of different city blocks and an additional 37 measurements of the city block dimensions plus the span of one adjoining street. The discrepancies in the geophysical data are too large for the street widths as such to be included in the quantitative analysis. However, if the widths of the streets were designed as a multiple of the same design module, as is reasonable to assume, it is possible to include the street widths in the analysis by taking the combined city block and street width dimensions as part of the analyzed data (for fifth-century BCE city grids in the Piraeus and at Naxos in Sicily, where street widths and block dimensions were based on the same design unit, see Pakkanen

**Table 1.** Summary of City Block Dimensions at Mantineia

| | Sample Count | Average Value (m) | Maximum Value (m) | Minimum Value (m) | Standard Deviation (m) |
|---|---|---|---|---|---|
| Block width | 18 | 51.15 | 52.74 | 48.08 | 1.00 |
| Block width + street | 22 | 59.57 | 60.59 | 56.89 | 0.87 |
| Block length (80m) | 9 | 80.82 | 82.64 | 79.46 | 0.99 |
| Block length (80m) + street | 8 | 89.36 | 91.46 | 86.87 | 1.43 |
| Block length (120m) | 3 | 122.47 | 125.08 | 120.98 | 2.27 |
| Block length (120m) + street | 3 | 131.13 | 135.19 | 129.02 | 3.51 |
| Block length (160m) | 1 | 162.41 | 162.41 | 162.41 | – |
| Block length (160m) + street | 0 | – | – | – | – |
| Block length (180m) | 1 | 184.34 | 184.34 | 184.34 | – |
| Block length (180m) + street | 1 | 192.62 | 192.62 | 192.62 | – |

**Table 2.** Dimensions Used in the Statistical Analysis of the City Design and Their Fit to the Design Module of 2.499 (±0.024) m

| | Dimensions (m) | Modules | Discrepancy (m) |
|---|---|---|---|
| EW-1 | 50.33 | 20 | 0.35 |
| EW-2 | 48.09 | 19 | 0.60 |
| EW-3 | 50.56 | 20 | 0.58 |
| EW-4 | 51.77 | 21 | –0.71 |
| EW-5 | 51.81 | 21 | –0.66 |
| EW-6 | 51.95 | 21 | –0.53 |
| EW-7 | 51.06 | 20 | 1.08 |
| EW-8 | 50.62 | 20 | 0.64 |
| EW-9 | 51.59 | 21 | –0.89 |
| EW-10 | 51.33 | 21 | –1.15 |
| EW-11 | 51.86 | 21 | –0.62 |
| EW-12 | 50.80 | 20 | 0.82 |
| EW-13 | 51.06 | 20 | 1.08 |
| EW-14 | 52.74 | 21 | 0.26 |
| EW-15 | 52.03 | 21 | –0.44 |
| EW-16 | 51.68 | 21 | –0.80 |
| EW-17 | 50.98 | 20 | 1.00 |
| EW-18 | 50.45 | 20 | 0.47 |
| EW-1N | 59.87 | 24 | –0.10 |
| EW-1S | 58.72 | 23 | 1.24 |
| EW-2S | 58.24 | 23 | 0.76 |
| EW-3S | 59.13 | 24 | –0.85 |
| EW-4S | 59.80 | 24 | –0.17 |
| EW-5S | 60.20 | 24 | 0.23 |
| EW-6S | 60.51 | 24 | 0.53 |
| EW-7N | 59.96 | 24 | –0.01 |
| EW-7S | 59.36 | 24 | –0.61 |
| EW-9N | 60.05 | 24 | 0.08 |
| EW-10N | 59.79 | 24 | –0.19 |
| EW-11N | 59.96 | 24 | –0.01 |

**Table 2.** Dimensions Used in the Statistical Analysis of the City Design and Their Fit to the Design Module of 2.499 (±0.024) m

| | Dimensions (m) | Modules | Discrepancy (m) |
|---|---|---|---|
| EW-11S | 59.45 | 24 | –0.52 |
| EW-13N | 59.52 | 24 | –0.45 |
| EW-14N | 58.46 | 23 | 0.99 |
| EW-14S | 60.42 | 24 | 0.45 |
| EW-15N | 60.05 | 24 | 0.08 |
| EW-15S | 60.60 | 24 | 0.62 |
| EW-16N | 60.23 | 24 | 0.25 |
| EW-16S | 60.25 | 24 | 0.27 |
| EW-18N | 59.17 | 24 | –0.81 |
| EW-18S | 56.89 | 23 | –0.58 |
| NS-1 | 162.41 | 65 | –0.02 |
| NS-2 | 74.98 | 30 | 0.01 |
| NS-3 | 113.24 | 45 | 0.78 |
| NS-4 | 81.00 | 32 | 1.03 |
| NS-5 | 121.34 | 49 | –1.11 |
| NS-6 | 79.90 | 32 | –0.07 |
| NS-7 | 79.47 | 32 | –0.50 |
| NS-8 | 80.48 | 32 | 0.51 |
| NS-9 | 80.03 | 32 | 0.06 |
| NS-10 | 184.34 | 74 | –0.59 |
| NS-11 | 80.79 | 32 | 0.82 |
| NS-12 | 125.09 | 50 | 0.14 |
| NS-13 | 81.69 | 33 | –0.77 |
| NS-14 | 82.65 | 33 | 0.18 |
| NS-15 | 81.39 | 33 | –1.08 |
| NS-16 | 120.98 | 48 | 1.03 |
| NS-2E | 81.39 | 33 | –1.07 |
| NS-3E | 121.52 | 49 | –0.93 |
| NS-3W | 121.72 | 49 | –0.73 |
| NS-4W | 89.41 | 36 | –0.55 |

**Table 2.** Dimensions Used in the Statistical Analysis of the City Design and Their Fit to the Design Module of 2.499 (±0.024) m

| | Dimensions (m) | Modules | Discrepancy (m) |
|---|---|---|---|
| NS-5E | 129.19 | 52 | –0.76 |
| NS-6E | 89.28 | 36 | –0.69 |
| NS-9E | 86.88 | 35 | –0.59 |
| NS-9W | 88.19 | 35 | 0.73 |
| NS-10W | 192.62 | 77 | 0.20 |
| NS-12E | 135.20 | 54 | 0.25 |
| NS-13W | 90.61 | 36 | 0.64 |
| NS-14W | 91.46 | 37 | –1.00 |
| NS-15E | 88.90 | 36 | –1.06 |
| NS-15W | 90.21 | 36 | 0.25 |
| NS-16E | 129.03 | 52 | –0.92 |
| | | | $\bar{x}$ 0.59 |

2013:52–59). In total, 71 measurements were obtained at Mantineia. One of the challenges in using geophysical data for a quantitative analysis is that its resolution is not high enough to know exactly where features are located below the surface. Unlike the sub-centimeter accuracy of a total station, the eight fluxgate gradiometers used for the magnetics survey were spaced 50 cm from each other. Beyond probe separation, other factors can affect the interpolation of the magnetic signatures, such as shifts between the actual location of the subsurface anomaly and where its magnetic signature is recorded. Therefore, as we interpret the data, our calculations for the dimensions of the streets and city blocks will have an error factor of around 50 cm.

The general dimensions of the town plan are summarized in Table 1, and the 71 measurements and their fit to the proposed design unit are presented in Table 2. The abbreviations and locations of the dimensions are shown in Figure 5. The average width of a city block at Mantineia is 51.15 m, while the average width of a city block plus the bordering north or south street is 59.57 m. Thus, a typical east–west street is 8.42 m wide. As previously mentioned, there is diversity in the lengths of the city blocks. Nevertheless, the general trend is an expansion or contraction of block lengths by approximately 20 m. The average length of the 80-m group of blocks, where the greatest number of measurements could be extracted, is 80.82 m, whereas the average

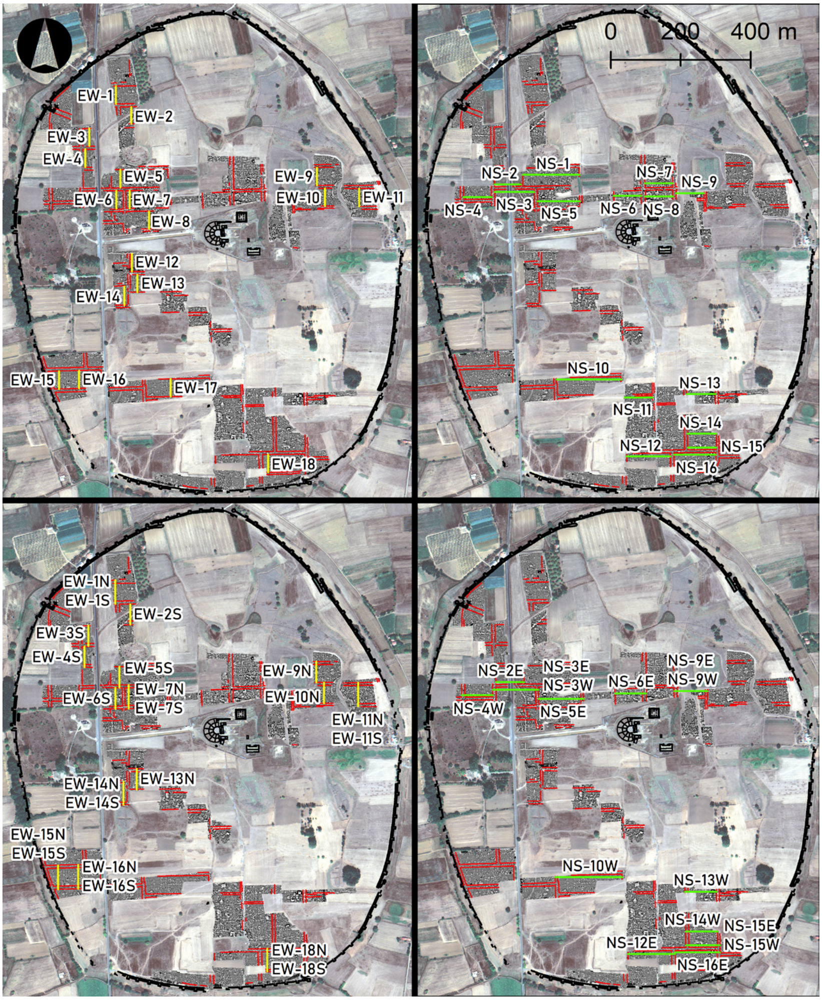


**Figure 5.** Locations and abbreviations of the dimensions listed in Table 2.

length plus the adjoining east or west street is 89.36 m. Thus, a typical north–south street passing along the 80-m group of blocks is 8.54 m wide—nearly identical to the width of an average east–west street (8.42 m). The data from the other group of blocks (i.e. 120 m, 160 m, and 180 m) provide analogous results, albeit from a smaller sample set. Overall, streets at Mantineia are about 8.50 m wide. There is no evidence from the survey that the town plan differentiates between major avenues (*plateiai*) and smaller side streets (*stenopoi*) via a gradation of widths, as in the Greek town-planning initiatives in Sicily and southern Italy.

## Cosine Quantogram Analysis

Studies of the design of Greek city layouts typically start with a preconceived notion of standard units of measurement, and this results in the major dimensions of the blocks and street widths being expressed in terms of, for example, a "Doric" or an "Ionic" foot. However, detecting a possible design unit in a set of measurements is a statistical problem, so a robust quantitative approach should be employed in the analysis. Kendall's cosine quantogram (CQG) method is an efficient way of detecting design patterns in Greek architecture and city planning (Kendall 1974; Pakkanen 2004, 2013, 2018) and it is fast becoming the standard approach in the analysis of ancient units of mass (Ialongo and Rahmstorf 2019; Pakkanen 2011; Peyronel 2019). CQG analysis makes no a priori assumption about the size of a design unit or even if such a unit is the cause of the properties observed in the analyzed dataset.

In the case of the Mantineia grid measurements (Table 2), the quantum hypothesis is that a city block dimension $X$ can be given in terms of an integral multiple $M$ times an underlying fixed unit $q$ plus a small error component $\varepsilon$. The mathematical formula (Formula 1) is:

$$X = Mq + \varepsilon$$

In city design analyses, quantum $q$ is best thought of as the basic fixed dimension the architect potentially used as the starting point of the town layout. If the implementation of the initial design is only approximate or if it is not currently feasible to measure enough relevant dimensions, it is possible that no statistically significant candidate for $q$ will emerge in the analysis. The reason behind the error component $\varepsilon$ is not important for the analysis; it can equally be the result of execution of the original design or, as is our case, the uncertainty of the modern measurements due to the 50-cm spacing of the fluxgate gradiometers. The relative size of the two components in Formula 1 is significant: the first term $Mq$ must be significantly larger than the error $\varepsilon$. This also means that it is not possible to detect, in this particular case, a design unit which is smaller than several times the expected error of 50 cm.

In order to determine how accurately the dimension $X$ can be expressed in terms of quantum $q$, $X$ is divided by $q$ and the remainder (or error) $\varepsilon$ is analyzed. The result of the division is between 0 and $q$: the tested $q$ is a better candidate for the quantum the closer the result is to either 0 or $q$, and in the poorest fitting cases, $\varepsilon$ will be halfway

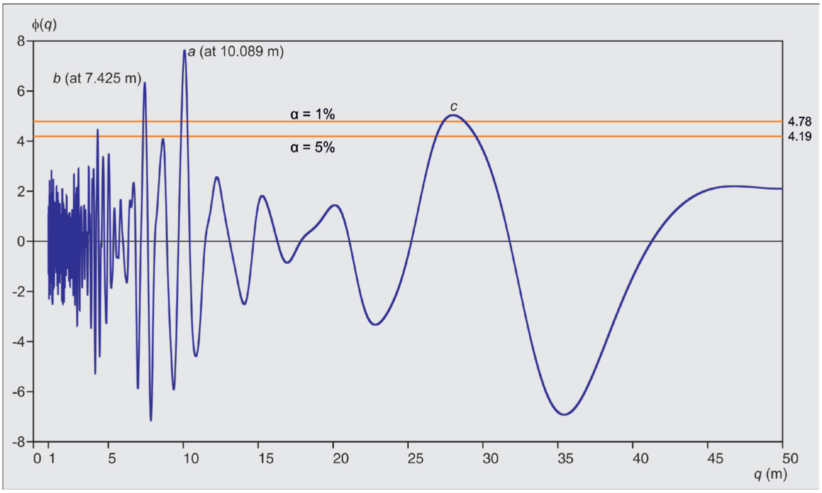


**Figure 6.** CQG plot of the Mantineia city block dimensions listed in Table 2.

between 0 and $q$ (i.e. $\varepsilon = q/2$). By taking the cosine of $\varepsilon / q$ it is possible to assess how accurately $X$ can be expressed in terms of $q$: for the well-fitting measurements, the cosine will be close to +1, and for the opposite cases, −1. In order to determine which value of $q$ gives the best overall result, it is necessary to calculate the cosine values for the full set of measurements and the complete range of possible quanta. The fit of each value of $q$ to the dataset can be most easily assessed on the basis of the cosine quantogram plot, the graph of the sum of cosine values (Figure 6). The higher the peak value, the greater the probability that the tested $q$ is a good candidate for the design unit. Expressed in mathematical terms, the formula for calculating how well the set of dimensions cluster around $q$ (Formula 2) is:

$$\varphi(q) = \sqrt{2/N}\sum_{i=1}^{n}\cos\left(\frac{2\pi\varepsilon_i}{q}\right)$$

where $N$ is the number of observations. The first term in Formula 2, $\sqrt{2/N}$, scales the total sum based on the number of measurements—without this factor, the introduction of additional measurements would always result in a higher value for the score $\varphi(q)$. In Figure 6, the score

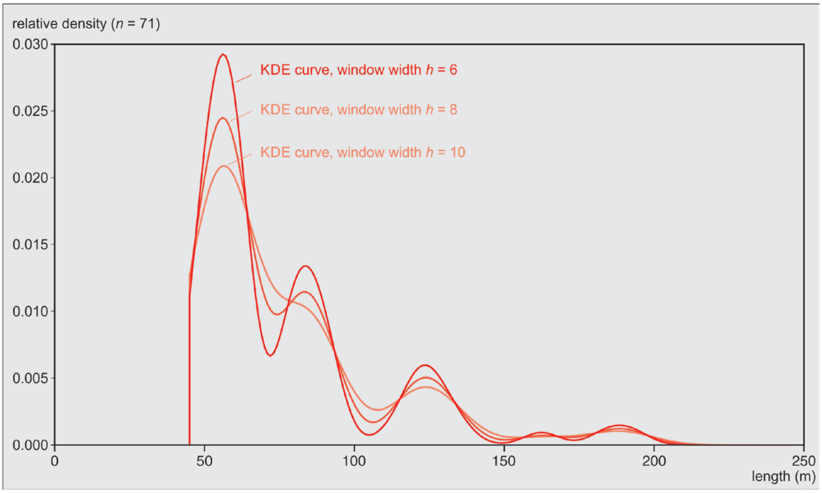


**Figure 7.** KDE distributions used to produce the simulation datasets. The curves are based on the dimensions in Table 2.

$\varphi(q)$ is plotted against $q$, and the Mantineia data gives rise to two very prominent CQG peaks located at 10.089 m (peak *a*, with a quantum score $\varphi(q)$ of 7.63) and at 7.425 m (peak *b*, score 6.33).

In order to find out whether the highest detected peaks in the CQG plot in Figure 6 are high enough to be statistically significant, it is necessary to produce random non-quantal simulation datasets and analyze these using the same method as the initial dataset. The replica datasets should have the same statistical properties as the original data, but without an underlying quantum. If the simulated data produce systematically lower peaks than what was detected in the analysis of the measurement data, the quantum hypothesis can be accepted and, therefore, the highest peak can be considered as a valid candidate for the quantum. It is also possible that the analysis would reveal multiple statistically significant peaks directly related to the size of the design unit. The method for evaluating the significance of the peaks is often called Monte Carlo analysis due to the random nature of the simulations.

Kernel density estimation (KDE) distributions are an effective approach to producing the non-quantal replica datasets needed in the simulations (Pakkanen 2002, 2004, 2013; for archaeological analyses and KDE, see Baxter 2003; Baxter and Beardah 1996; Beardah and Baxter 1999). In KDE, each observation of the original dataset is replaced by a small continuous distribution in order to create a smooth curve when these "bumps" are added together. In a histogram, the observations are classified into ranges; the concept behind the KDE distributions is quite similar, but without the abrupt class boundaries of a histogram. Employment of KDE stresses the idea that the original set of dimensions is the best guide for creating the non-quantal simulation datasets. Larger values for the window or bandwidth *h* (corresponding to the class width in a histogram) produce very smooth KDE distributions, and smaller values result in a more pronounced curve profile (Figure 7). A simulation run of 1,000 is usually enough to determine significance at the 5% level and 5,000 at the 1% level (Pakkanen 2004, 2013).

In this study, a KDE distribution was used to randomly produce a replica dataset of 71 dimensions in order to run a single simulation. This was analyzed using the CQG method in the same way as the original data, and the score of the highest peak was recorded. The procedure was repeated 5,000 times using different bandwidths *h* to produce the KDE distributions (two sets of 1,000 with $h = 6.0$, two with $h = 8.0$, and one with $h = 10.0$). Based on the simulations, the CQG score for the 1% significance level was 4.78 and the 5% significance level was 4.19. These significance level scores are unique for this dataset, and any changes to the original measurement dataset would require running a new set of computer simulations.

From the analysis, peaks *a* and *b* both emerged as clearly statistically significant (Figure 6), and both were even higher than the maximum recorded simulation peak score of 5.95. Peak *c*, at about 28 m, was also prominent, but this value is difficult to link with the design of the city grid. It is most likely a result of the large cluster of dimensions in the range 48–60 m (approximately half of block widths and block widths with the adjacent street fall inside this range). Therefore, this peak was not analyzed further. Examination of peaks *a* and *b* showed that they both can be expressed as a simple multiple of approximately the same dimension: peak *a* is four times 2.522 m and peak *b* is three times 2.475 m. The reason why this design unit, or the corresponding cubit, does not itself emerge from the CQG analysis is that the geophysical data contain large expected errors. The combination of the 50-cm spacing of the fluxgate gradiometers used in the magnetics survey, the patterns created by the collapse of the walls and the roof tiles, and the possible differences between the design and execution of the grid in antiquity have a joint effect of masking the basic dimension used in the city layout. Based on the errors in the Mantineia data, it is unlikely that any unit smaller than ca. 5 m could be detected in the set of measurements; the errors are able to mask the original design, or, in other words, the differences between the two terms *Mq* and *ε* in Formula 1 are not substantial enough for unit detection in the left part of the CQG curve in Figure 6. It is quite probable that the range 2.475–2.522 m for the module corresponds to a five-multiple of an ancient cubit of 0.495–0.504 m, and this is the best candidate for the basic design unit of the city grid at Mantineia.

In an ideal scenario, it would be possible to analyze separately the two different subsets consisting of city block and "block plus street" dimensions. Due to the limited number of measurements and large errors in the geophysical data, this is not a feasible approach for Mantineia. However, inclusion of the two subsets in CQG analysis does not increase the risk of detecting an incorrect design unit. It is possible, though perhaps not very likely, that the street widths and block sizes were not designed following the same principles. This would result in one of the two subsets masking the signal in CQG analysis and lowering the height of the maximum quantogram peak. The emergence of peaks *a* and *b* from the data give strong statistical support that both the city block dimensions and street widths were integral features of the city layout and that they were based on the same underlying module.

CQG analysis is a robust method for detecting a quantum behind a set of measurements, but at Mantineia the error factor is larger than more typical examples of analyzed data (Pakkanen 2013). It is, therefore, warranted to study in more detail the effect of noise on the set of 71 measurements from Mantineia. An indication of the expected noise can be calculated on the basis of east–west block dimensions: for 18 measurements, the standard deviation ($\sigma$) is 1.00 m (Table 1), but excluding the outlier EW-2 (Table 2), the standard deviation of the other 17 dimensions is 0.67 m; this latter result was used as the $\sigma$ value in the following simulations. This value also compares well with the mean discrepancy between the actual measurements and the dimensions expressed in terms of the design module: 0.59 m (Table 2). The size of this error is large enough to mask the signal so that the design unit of 2.499 (±0.024) m was not detected in the CQG analysis. However, since the three- and four-multiples of the unit are repeated often enough in the city grid design (peaks *a* and *b* in Figure 7), the length of the actual design module can be estimated on the basis of the two statistically significant local maxima of the CQG curve.

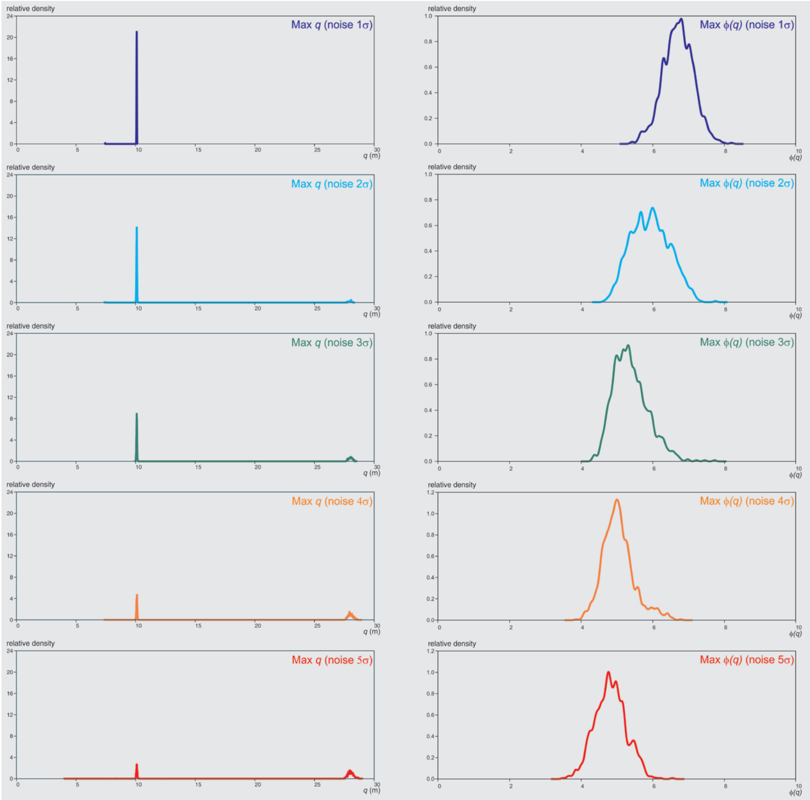


**Figure 8.** KDEs of noise effect on the reliability of CQG analyses ($n$ = 1,000 for each run). Length of maximum quantum (left, bandwidth $h$ = 0.005) and maximum peak score (right, $h$ = 0.050).

Figure 8 presents a summary of the simulations that introduced further noise into the measurement data. Adding one standard deviation of Gaussian noise to the grid dimensions did not have any effect on how CQG analysis detected the design unit: the top two KDE curves in Figure 8 show that all 1,000 simulations still discovered peak *b* (at ca. 10 m) as the best candidate for the quantum (top left), and all had a very high maximum peak score of 5 or more (top right). The second set of simulations with $2\sigma$ noise showed that this level of noise had little effect on the position of the quantum peak, and even though the peak scores were lower than in the first set, all of them still would have been detected as statistically significant. The effect of $3\sigma$ noise is still not critical, and only at the level of $4\sigma$ noise do the disturbances start to make a significant impact by shifting the detected maximum peaks to the right, from about 10 m to about 28 m (left image), and

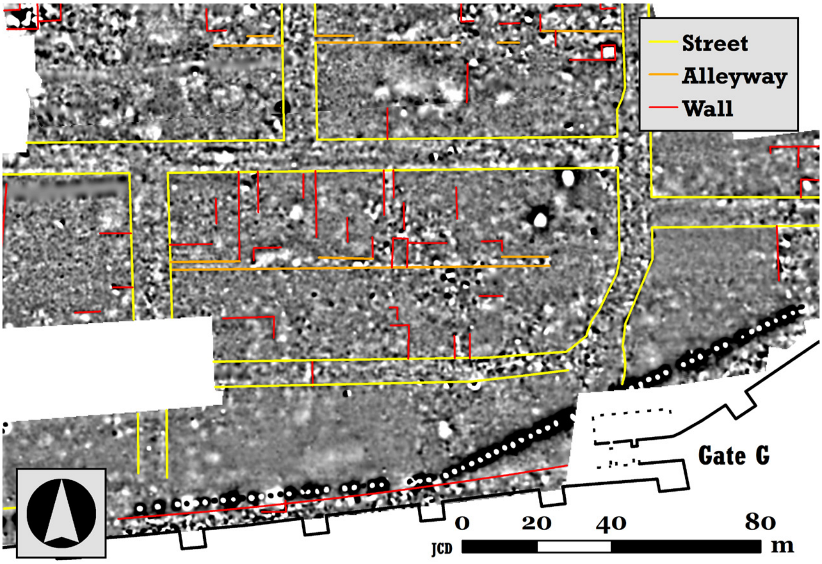


**Figure 9.** Detail of a block identified in the magnetics survey near Gate G. Evenly spaced anomalies indicate the uniform allotment of housing units.

giving rise to further cases of significantly lower maximum peaks. This pattern continues with 5σ noise. The conclusion of the 5,000 simulations is that even if the noise level at Mantineia had been significantly higher than what is expected on the basis of the standard deviation of the city block measurements, CQG analysis would have been able to correctly identify the design module. With a sufficiently large dataset of long dimensions, the CQG method is a highly robust tool for detecting the layout pattern of a Greek city.

## Design Module

The CQG analysis suggests that the ancient town planners at Mantineia used a design unit of 2.499 (±0.024) m, a five-multiple of a cubit standard of 0.495–0.504 m. This may seem like an arbitrary module, but we find that it was applied broadly in the town plan of Mantineia (Table 2). To begin with, architectural features from the magnetics survey are coherent enough in some blocks to expose the uniform subdivision of housing units in the original design. The lengths and widths of housing plots are approximately 20 m x 25 m, which corresponds to 8 modules x 10 modules. One example is a block near Gate G in the city's southeast region with dimensions of 120.98 m x 50.44 m (Figure 9). Here, the block is divided by a central alleyway with evenly

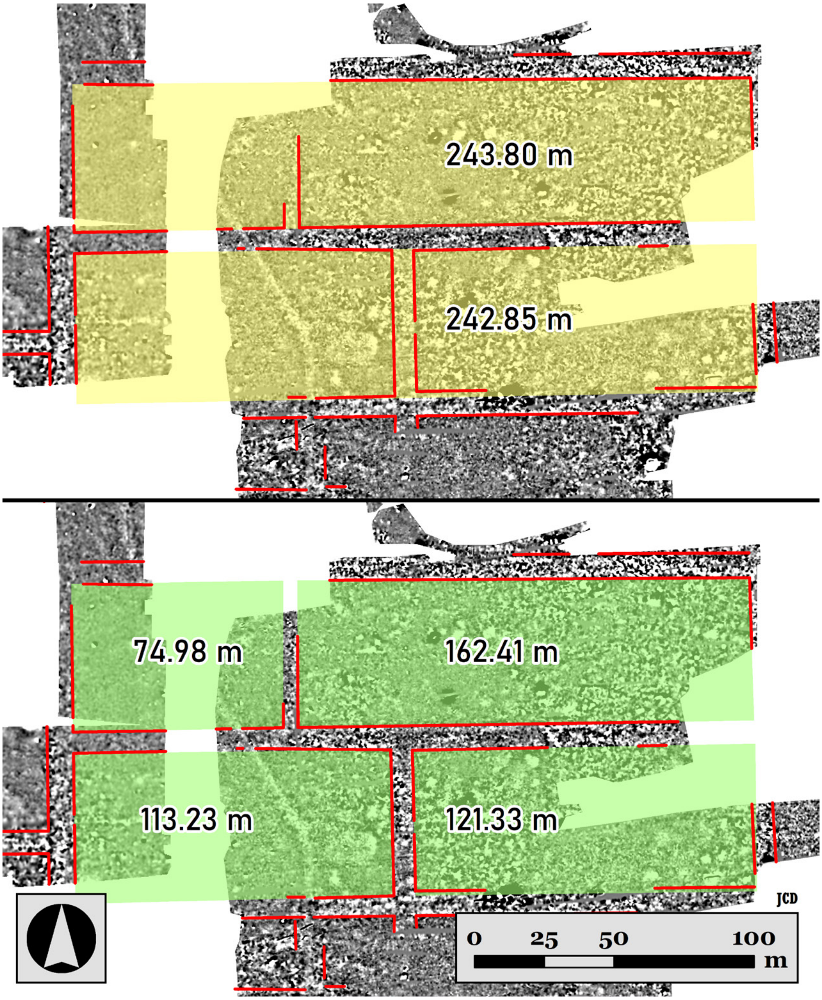


**Figure 10.** Group of blocks northwest of the agora. Top: extra-long blocks of approximately 240 m (96 modules); bottom: the same blocks after being subdivided by offset crossroads.

spaced linear anomalies that appear to divide the housing units. The 8 x 10 modular dimensions are noted in other regions of the city, where block lengths expand and contract by 20-m intervals (or 8 modules). This is significant enough to suggest a pattern, even if the evidence in many blocks is ambiguous because the architectural signatures are not distinct. In terms of the design module, the block near Gate G is 48 modules long. If the area was completely developed, six houses could be accommodated on either side of the alleyway, meaning that a total of 12 housing units could potentially fill this space. The alleyway itself is about 2 m wide, consistent with others at Mantineia that are generally 2–3 m. Accordingly, the typical block width of around 51 m is formed by the widths of two housing units (10 + 10 = 20 modules) plus the alleyway. It is still unclear whether the ancient town planners designed a block with the alleyway counting as 1 module (10 + 10 + 1 = 21 modules). In fact, the geophysical survey identified some rows of houses 23–24 m wide (i.e. slightly less than 25 m). Such examples are normally found on only one side of the alleyway, while the row of houses on the opposite side retains the 25-m standard. This evidence may suggest that the ancient town planners conceptualized the block widths as 20 modules (10 + 10 = 20) and then inserted the alleyway by subtracting a small amount of space from the northern or southern row of houses.

The phenomenon of varying block lengths was puzzling upon first surveying the site, but CQG analysis helped clarify the issue. City blocks expand and contract by multiples of housing units using the 8-module (ca. 20 m) formula. Furthermore, the ancient town planners' preference was to arrange block lengths by factors of 16 modules, or two houses. This is noted throughout the city where lengths of 32 modules (ca. 80 m) provide room for 4 houses on either side of the alleyway, 48 modules (ca. 120 m) for 6 houses, and 64 modules (ca. 160 m) for 8 houses. The largest block, one discovered south of the agora, measures 184.34 m long and corresponds to 72 modules.

Not all city blocks at Mantineia correspond to the 8-module (ca. 20 m) formula. In an area northwest of the agora, a group of blocks deviates from the normal pattern (Figure 10). Here, the lengths of two blocks separated by a crossroad measure 74.98 m and 162.41 m. Immediately to the south there is another pair of blocks divided by a crossroad that measure 113.23 m and 121.33 m. In both cases, the eastern blocks conform to the 8-module (ca. 20 m) formula—that is, around 160 m (64 modules) and 120 m (48 modules)—while the western blocks are decisively smaller than the standard. However, the combined lengths of the block pairings plus the crossroads produce a "mega-block" of approximately 240 m (96 modules), which does conform to the standard and could potentially accommodate two rows of 12 houses. To be exact, the northern pairing is 243.80 m long and the southern is 242.85 m. Yet, blocks of these jumbo proportions never materialized in this area, because the ancient town planners intended to further subdivide the space. They apparently used the crossroad to subtract area from the western blocks, thus creating space for about half of a housing unit. In other words, half of a housing unit (ca. 4 modules) plus the street width (ca. 4 modules) equals one full housing unit. These blocks, therefore, were probably designed to accommodate space for around 3.5 and 5.5 housing units, give or take a few meters depending on the width of the crossroad. To be clear, there is no evidence from the survey that housing plots at Mantineia regularly had dimensions of 10 m x 25 m. The system employed northwest of the agora and elsewhere was a design solution to accommodate the offset placement of crossroads.

What seems likely to us at this point is that the ancient town planners derived the design module from a five-multiple of the cubit standard of 0.495–0.504 m and applied it to the dimensions of a single housing unit. This single unit was then used as a basis for implementing much, if not all, of the orthogonal street system. City blocks of prolonged dimensions and major avenues were first conceptualized, and then blocks were subsequently subdivided into smaller units with the insertion of crossroads. The initial design of the urban layout was an enduring feature of the ancient city. The exterior walls of the houses were not allowed to significantly encroach into the public space of the streets, as is demonstrated by the detection of the design unit in CQG analysis. Houses did not fill every block, even though the ancient town planners devised the scheme to accommodate them. In fact, the geophysical survey found plentiful evidence that the space within many blocks remained undeveloped. As only 25% of the town plan is known, we grasp only the basic concept of the design principles at Mantineia. Future fieldwork at the site leaves open the potential need to recalibrate some of our findings presented in this chapter.

## Conclusion

As this study demonstrates, the traditional metrological method of starting with a predefined notion of possible Greek foot standards is not a valid approach to studying the layout of ancient cities or architecture. The principal reason why merely expressing a set of dimensions in terms of a possibly employed foot-unit without statistical analysis should not be the starting point of research is quite straightforward: almost any metric dimension can be expressed quite precisely in terms of one or several of the proposed ancient units and their suggested ranges (Pakkanen 2013). Quantitative analyses can return some surprising results—such as the non-standard foot-unit of 0.340–0.341 m employed in the foundation blocks of the Hellenistic harbor tower at Kyllene (Pakkanen 2018)—but statistical research and comparison of inscriptional evidence with architectural dimensions are likely to be the most productive ways to take this field of research forward. The foot-unit corresponding to a cubit of 0.495–0.504 m detected at Mantineia is 0.330–0.336 m, and this range also falls outside the typical lengths for the "Doric" foot at 0.325–0.329 m and the "Samian" foot at 0.348–0.350 m (cf. Wilson Jones 2001).

CQG analysis using big archaeological datasets offers significant insights into the nature of ancient town planning at Mantineia. At the same time, it highlights the potential for expanding this line of research more broadly to other examples with comparable datasets, particularly from large-scale geophysical surveys. Mantineia is not an isolated example of ancient town planning in the Peloponnese, but it is part of a broader trend of conceptional city-design principles. In addition to Mantineia, there are six other confirmed cases of rational town plans in Arkadia alone: (i) Asea, (ii) Heraia, (iii) Oresteion, (iv) Stymphalos, (v) Tegea, and (vi) a town of unknown name near the modern village of Kyparissia. Pooling together various datasets, if available, in combination with CQG would likely identify local and regional trends in town planning, suggest similarities and discrepancies in the application of specific design modules, and perhaps even recognize the involvement and contributions of groups of itinerant town planners at cities with chronologically contemporary plans. Regular city grids are ideal test cases for studying the principles behind the design of Greek townscapes. Due to the long dimensions of the *insulae* (city blocks), even large discrepancies between the original layout and current measurement data cannot mask the design patterns. As we have observed at Mantineia, the mean measurement error of 0.59 m conceals the existence of the original module of 2.499 (±0.024) m, but the larger three- and four-multiples of this unit are still clearly exposed by the analysis.

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The first statistical Greek city grid analyses were carried out by the first author as part of a British Academy mid-career fellowship in 2012–2013 (MD120026), and the statistical part of the research presented here is a direct continuation of that project. The computer modules used in the CQG analysis and the Monte Carlo simulations and in producing the KDE distributions were programmed by the first author on top of the freeware statistical package Survo MM. CQG analysis is now a standard feature of Survo MM (via a program module implemented by Seppo Mustonen). We used C. C. Beardah's MATLAB routines to calculate the optimal KDE window widths (Baxter and Beardah 1996).

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# Chapter Seven
# From the *Via Nova Traiana* to the *Strata Diocletiana*: Historical Remote Sensing Documentation for the Study of the *Limes Arabicus*

Paolo Cimadomo, Francesca Di Palma, and Giuseppe Scardozzi

The present study is part of the Cities as Historical and Archaeological Interconnected Networks (CHAIN) project, launched in February 2019 and completed in September 2021. It aimed to investigate human interactions, connections, and clashes in the Roman Near East in the period between the coming of Roman General Pompey the Great (64/63 BCE) and the death of Roman Emperor Diocletian (313 CE). The study area included, in particular, the territory between the Roman provinces of Judaea (then Syria Palaestina), Syria, and Arabia, corresponding to the modern countries of northern Israel, northern Jordan, and southern Syria.

The main goal of the project was to combine the study of the social and historical dynamics of the Roman Near East with new methodologies and techniques. Remote sensing analysis—of both historical and recent aerial photos and satellite images—constituted one of the most innovative parts of this research; it enabled us to understand not only the exchange of things and ideas, but also the human impact on the landscape and the social and economic dynamics of the examined areas. The coming of Rome, with its direct or "filtered" control, implied a renegotiation of the relationships between center and peripheries, leading the Levantine people to live in different degrees of official or semi-official independence. Otherwise, the Roman Empire favored the development of interconnections and exchange, facilitating the improvement of social, cultural, and economic networks. Studying and analyzing connections and linkages and reconstructing past networks are valuable tools for better understanding contemporary events, as well. The integrated evaluation of different data (i.e. recent aerial and satellite documentation, historical and epigraphic sources, and archaeological evidence) provides a necessary tool for reconstructing the ancient topography of this sector of the eastern *limes*—in particular, via the identification of roads, forts, aqueducts, dams, tanks, and milestones.

One of the goals of the research project is to reconstruct the road network between the provinces of Judaea and Arabia Petraea. The focus of this paper is on the northern sector of the route of the *Via Nova Traiana* and the southernmost defensive system of the *Strata Diocletiana* through a detailed analysis of remotely sensed data—including aerial photos from the 1930s, satellite photos from the 1960s–1970s, and more recent imagery—in tandem with historical, epigraphic, and archaeological data. In particular, the paper focuses on the study of three of the fortified settlements along these roads: Umm el-Jimal, Deyr el-Khaf, and Qasr el-Azraq.

## Study Area and Historical Context

The area discussed in this paper comprises the modern territories of northern Jordan and southern Syria. The region was ruled by the Nabataeans before the Roman annexation in 106 CE. The Levant came under Roman influence after 63 BCE, when Pompey annexed Syria as a Roman province and the other regional states (e.g. the kingdoms of the Judaeans and the Nabataeans) became Roman clients.

The Nabataeans were an Arab population whose origins are still obscure. Our knowledge of them strongly depends on the picture drawn by Greek and Roman sources because there is no Nabataean literature, and archaeological and epigraphic evidence cannot totally fill the gap. Literary sources have left no information about the Nabataean occupation of the area, whereas several writers do give us some data about their history. The Nabataeans appeared in Graeco-Roman sources only after the coming of Alexander the Great. They were usually described as nomadic or semi-nomadic shepherds and traders, and they were always free and were proud of their liberty (Diod. Sic. 19.94.1).

At its greatest extent during the first century CE, the Nabataean Kingdom encompassed the Transjordan region, as well as large areas of the southern Levant, the Sinai Peninsula, the northwestern part of the Arabian Peninsula, and sections of the Hauran region in southern Syria. It straddled many of the most important overland routes of the time. This strategic position allowed the Nabataeans to gain control of the rich trade in aromatics and spices from southern Arabia, East Africa, and India, most of which probably traveled by caravan across

Nabataean territory to reach the Mediterranean markets. However, there are few data on these trade routes. Apart from a number of first-century references—especially Book 16 of Strabo and the *Periplus Maris Erythraei*—little is said about the trade routes in ancient texts. Nabataean control of the trade from southern Arabia eventually declined after the collapse of the kingdom and the Roman annexation of Nabataea, especially because advances in maritime technology made sea routes more feasible than the land routes—which Petra controlled—and because much of the trade was usurped by Roman Egypt.

The coming of the Romans led to the construction of the *Via Nova Traiana* between 111 and 114 CE, shortly after the Roman province of Arabia was created in 106 CE. This route ran from Bosra, the capital city, to Ayla (modern Aqaba) on the Red Sea. A series of military structures that constituted the so-called *limes Arabicus* were built east of the road. There was neither a continuous *vallum* (a defensive work consisting of a moat and an embankment) nor a wall, but instead several forts, legionary camps, and watchtowers that were visually interrelated and connected by roads. Despite this defensive system, partially inherited from the Iron Age and Nabataean periods, we have no evidence that the Roman army in Arabia was seriously troubled by security problems caused by nomads. Furthermore, the military presence in the southern part of the province seems to have been very low, if not absent, before Diocletian (Isaac 1989:245–246). Military activity is notably evident in the area east of the route between Bosra and Philadelphia (modern Amman), where military structures lie at the eastern end of the farming area (Arce 2010:456). We can suppose that these buildings were used both to protect the settled farmers to the west and to control access to the desert to the east. There is still debate about the Romans' overall goals: we are not sure if they wanted to control the activities of nomad raiders or protect trade routes and sedentary populations living near the desert margins.

Under Septimius Severus' rule (193–211 CE), there were advances down the Euphrates River and into remote regions of the desert. The area was strengthened with the construction of a route from Bosra to the Azraq Oasis. Several milestones dating to 208–210 CE have been found on the road, together with two Latin building inscriptions dated to 200/202 and 201, respectively, that were found in a small fort at Qasr el-'Uweinid, near the oasis (Kennedy 1982:124–126). It is also evident that at several times during the third century, the Romans controlled the entire Wadi Sirhan up to the site of al-Jawf in Saudi

Arabia, as confirmed by an inscription written by a centurion of the Legio III Cyrenaica (Third Cyrenean Legion) and found at al-Jawf itself (Bowersock 1983:98; Kennedy 1982:190; Speidel 1977:694; Young 2001:110). Most of the forts built during the second and third centuries were small- or medium-sized square structures without watchtowers. This third-century military activity probably developed because the new dynasty in Persia, the Sassanians, represented a dangerous menace to the eastern territories of the Roman Empire. Only after the coming of Diocletian were there important changes that involved the military and administrative spheres: in order to oppose the Persian army, the Roman emperor started to build up a new defensive system, constituted by the creation of several new military structures and the refurbishment of previous forts. In this period, two parallel roads ran from the north to the south: the *Via Nova Traiana* and the new *Strata Diocletiana*, a sort of military road built to move troops along the frontier that stretched from the Arabian Desert to the Euphrates River.

The *Strata Diocletiana* was built in a "buffer zone" between the Roman and Persian Empires, and it can be considered a sort of continuation of Severan policy seen at Azraq (Butcher 2003:416). This new road was scientifically constructed. It was composed of different trunks, which possibly were used by the troops stationed in the cities to move more quickly. The roads linked together a line of forts from Sura on the Euphrates River to the Azraq Oasis, passing through Palmyra. This system probably fell out of use already in the fourth century. The network of forts delimited the space of two different worlds, defined mainly by the rate of rainfall: on one side were sedentary farmers; on the other, the land was inhabited by nomadic or semi-nomadic pastoralists. These two worlds were interrelated for ages, being part of the same economic and social system. During the second century, the Romans' goal was not to protect the sedentary people, because the threat to them from pastoralist tribes was minimal. The situation probably changed in the third and fourth centuries for many reasons, such as pressure from newcomer tribes, famine, or internal disorder among the tribes.

## Methodology

The present work regards the study and reconstruction of the route of the *Via Nova Traiana* and the defensive system of the *Strata Diocletiana* in the northern sector of the ancient Roman province of Arabia Petraea. As in the other investigations carried out within the

CHAIN project, the contribution of remote sensing documentation is very important in this research as well, analyzed in combination with historical, epigraphic, and archaeological data. In particular, within the research project a detailed analysis was performed of the historical remote sensing documentation from both historical aerial photos (taken between the 1910s and 1940s) and satellite pictures (taken by CORONA satellites in the 1960s to 1970s), as well as recent aerial and satellite images. The historical images are very useful for the study of territories that have been profoundly transformed in recent decades. The transformation has been caused by different factors: mainly, the extension of urbanized areas, the building of infrastructure, and the diffusion of mechanized agriculture. Therefore, these images allow us to analyze settlements and territories as they were before modern actions and in a territorial context that was more similar to the ancient landscape. The importance of historical aerial imagery for the study of the investigated area has been highlighted already by Bewley and Kennedy (2013). In this context, CORONA satellite photos played a fundamental role in the reconstruction of historical landscapes, as already attested by numerous research projects (for examples, see Casana 2020, with previous literature; Ur 2013a, 2013b). This historical documentation is analyzed in integration with recent aerial photos from the Aerial Photographic Archive for Archaeology in the Middle East (APAAME) website (http://www.apaame.org/) and high-resolution satellite images from Google Earth. Moreover, it is important to highlight here that, unlike the current trend in archaeological remote sensing analysis to apply machine-learning-based approaches automatically, CHAIN project members carried out the identification of ancient sites and their features through a systematic, intensive, and expert-led visual analysis of both historical and recent aerial and satellite images (see Burigana et al., this volume).

This paper focuses, in particular, on three examples of fortified Roman settlements located along or near the northern stretch of the *Via Nova Traiana* and the southern stretch of the *Strata Diocletiana*. In order to acquire new data about the layout of the settlements and their ancient topographical contexts, we used as historical remote sensing data aerial photos taken by Sir Aurel Stein (1862–1943) in 1939 and satellite images taken by CORONA KH-4B satellites between 1967 and 1970. In particular, Stein's aerial photos of Transjordan, preserved in the British Academy in London, were taken with the help of the Royal Air Force during Stein's aerial survey of the eastern *limes* from Iraqi Jazira to the Gulf of Aqaba between 1938 and 1939 (Stein 1940;

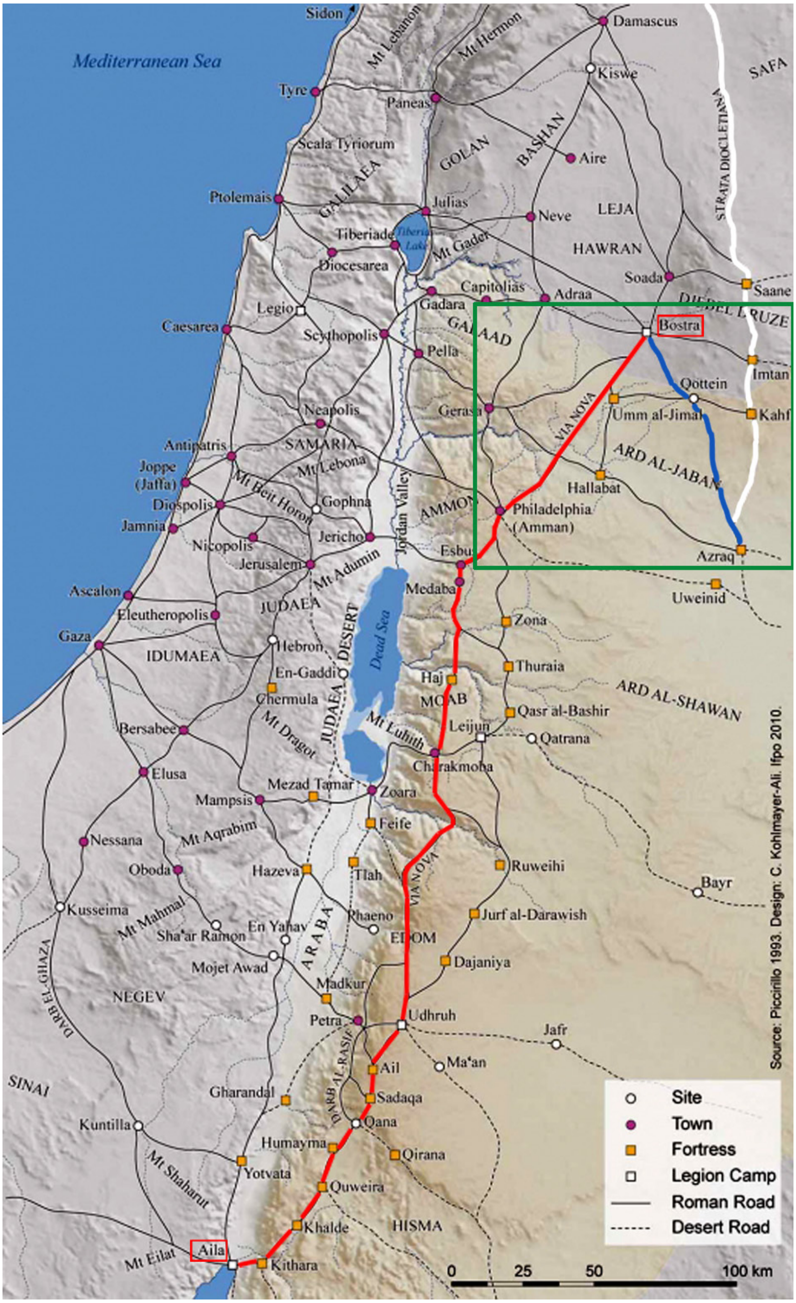


**Figure 1.** General map of Arabia Petraea and Judaea: the *Via Nova Traiana* (in red), the southerly section of the *Strata Diocletiana* (in white), and the road from Bosra to Azraq (in blue). The study area is outlined in green.

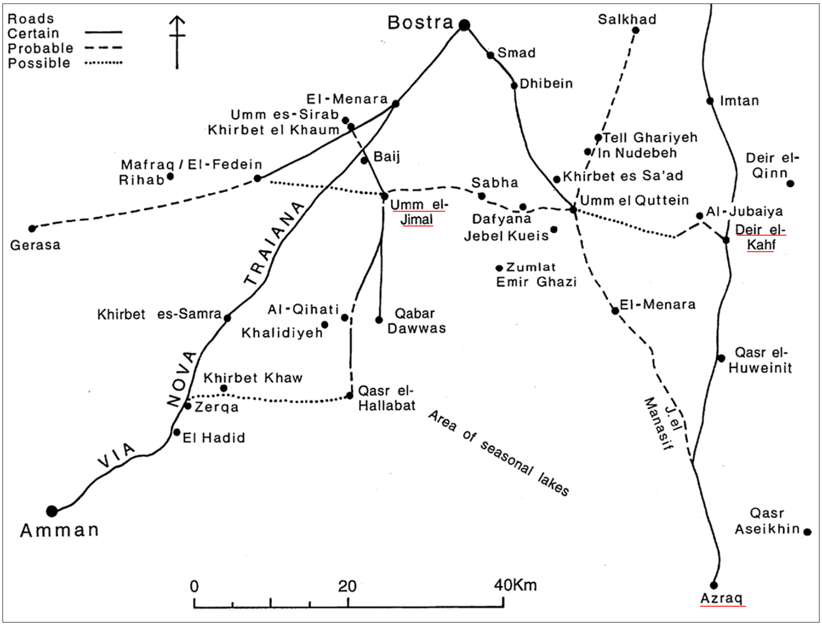


**Figure 2.** Detailed map of the roads and sites in the study area (after Kennedy 1997:Figure 2).

on Stein's aerial surveys, see also Kennedy 1982:199–297; Kennedy and Riley 1990; Scardozzi 2014). Many of these photos are unpublished, as they are not included in the volume synthesizing the results of Stein's studies that was published forty years after his death by Gregory and Kennedy (1985), nor do they appear in subsequent publications (e.g. Kennedy 2000; Kennedy and Riley 1990). However, in recent years they have been made available online through the already-mentioned APAAME website. These aerial photos (both vertical and oblique) regard only some of the archaeological sites within the study area, but they were taken at a low altitude and document the investigated sites with high detail.

Lastly, the CORONA KH-4B satellite images, taken by US spy satellites in the 1960s and 1970s, are available from the archive of the United States Geological Survey (USGS) and the CORONA Atlas of the Middle East (https://CORONA.cast.uark.edu/), an online platform developed by the University of Arkansas (Casana and Cothren 2013). They have a medium spatial resolution (about 1.8 m), showing the sites in their regional context, and they cover the investigated area in its entirety.

## Results: Roads and Fortified Settlements

The study area of the CHAIN project includes the northern stretch of the *Via Nova Traiana* between the territories of Bosra and Philadelphia (modern Amman) and the southernmost sector of the *Strata Diocletiana*, in particular between Imtan and the Azraq Oasis (Figure 1 and Figure 2). The road from Bosra to Philadelphia was built by Trajan starting in 111 CE. It is largely known, and it was reconstructed based on the various remains of the pavement and numerous milestones that have been located (Kennedy 1982:144–151, 1995, 1997:74, with previous bibliography). The roads from the Azraq Oasis to Bosra and to Imtan, both probably built during the Severan period (see below), were quite completely reconstructed by way of fieldwork and aerial surveys (Kennedy 1997:77–78, 88–91). All of these roads seem to have been reorganized later, during the Tetrarchic period (Isaac 2015:45).

### *Umm el-Jimal*

The first case study regards the fort of Umm el-Jimal, located a few kilometers to the east of the *Via Nova Traiana*, at the southern end of the Hauran Plateau. The site was in a very strategic location at the intersection of various routes (Kennedy 1997:80–88). In particular, the site was situated along an east–west road that connected the *Via Nova Traiana* to the road from Bosra to Azraq, probably built in 208–210 CE, reaching Umm el-Quttein (Kennedy 1997:77–78), and to the extension southwards of the *Strata Diocletiana* (see below), which was reached close to Deyr el-Kahf (Kennedy 1997:78–80). Two milestones found along this road, in the stretch between Umm el-Jimal and Umm el-Quttein, are dated to 293–305 CE (Parker 1986).

The fort of Umm el-Jimal is dated to the fourth century CE. It had a trapezoidal shape with sides between 95 m and 112 m long, of which only the north and east walls were orthogonal. Quadrangular towers were built at the four corners and along three sides of the fort, where they flanked the gates. According to a systematic study of its masonry, this fort is identified as a *quadriburgium* (a type of late antique fort) of the Tetrarchic period that probably incorporated a preexisting fort of the Severan period, which had a square shape measuring 42 x 42 m and occupied the northeast sector of the settlement of the Tetrarchic period (Figure 3B; Arce 2015:108–109). Moreover, after the Roman army abandoned it, a church and possibly a monastery were built in

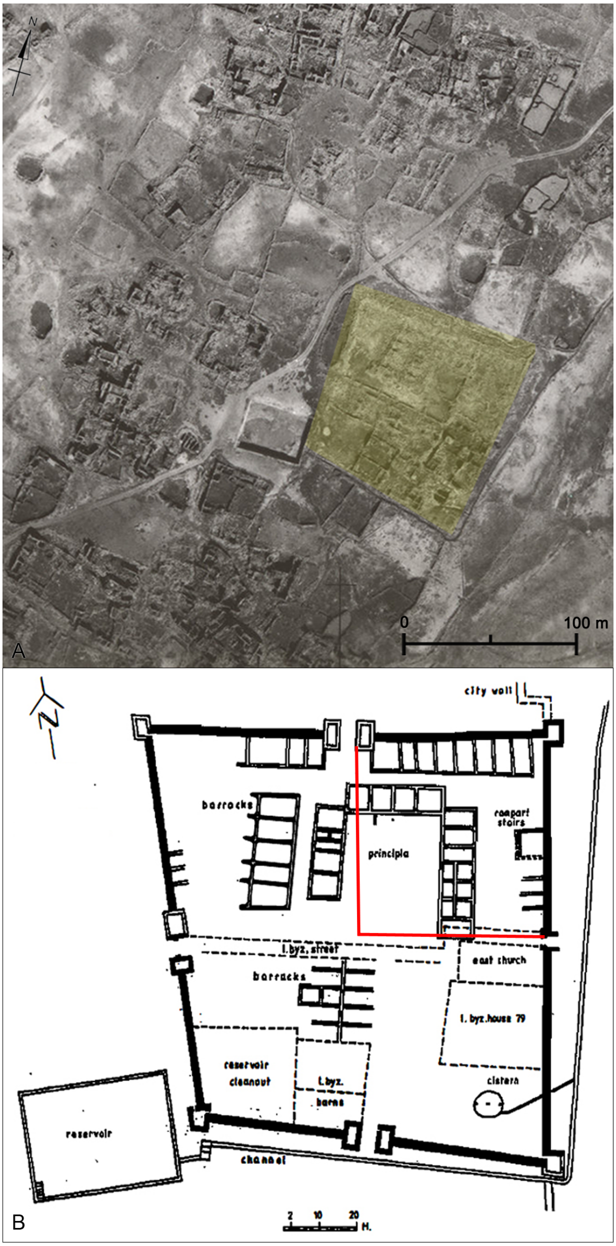


**Figure 3.** Umm el-Jimal: (A) vertical aerial photo taken by Sir Aurel Stein in 1939, highlighting the area of the fort in yellow (photograph courtesy of the British Academy); (B) plan of the *quadriburgium* (after de Vries 1993:Figure 4) and outline of the hypothesized first fort corresponding to its northeastern corner (after Arce 2015:Figure 9.7).


**Figure 4.** Umm el-Jimal: (A) general plan of the *vicus* (after de Vries 2000:Figure 2); (B) CORONA satellite photo taken in 1970 (imagery courtesy of the USGS); (C) WorldView-2 satellite image taken in 2013 (imagery courtesy of Google Earth).

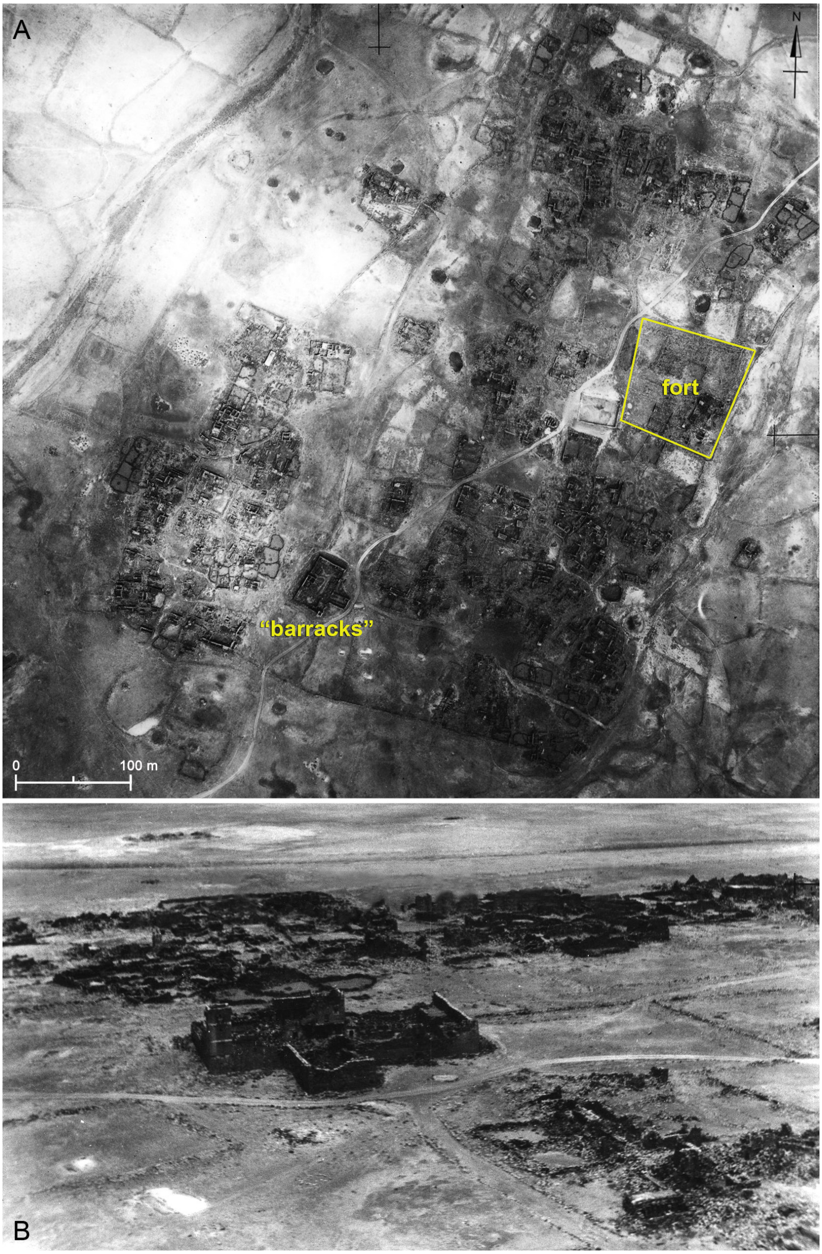


**Figure 5.** Two aerial photos taken of Umm el-Jimal by Sir Aurel Stein in 1939: (A) vertical view of the *vicus* and the fort; (B) oblique view of the south sector of the *vicus* with the so-called "barracks." Photographs courtesy of the British Academy.

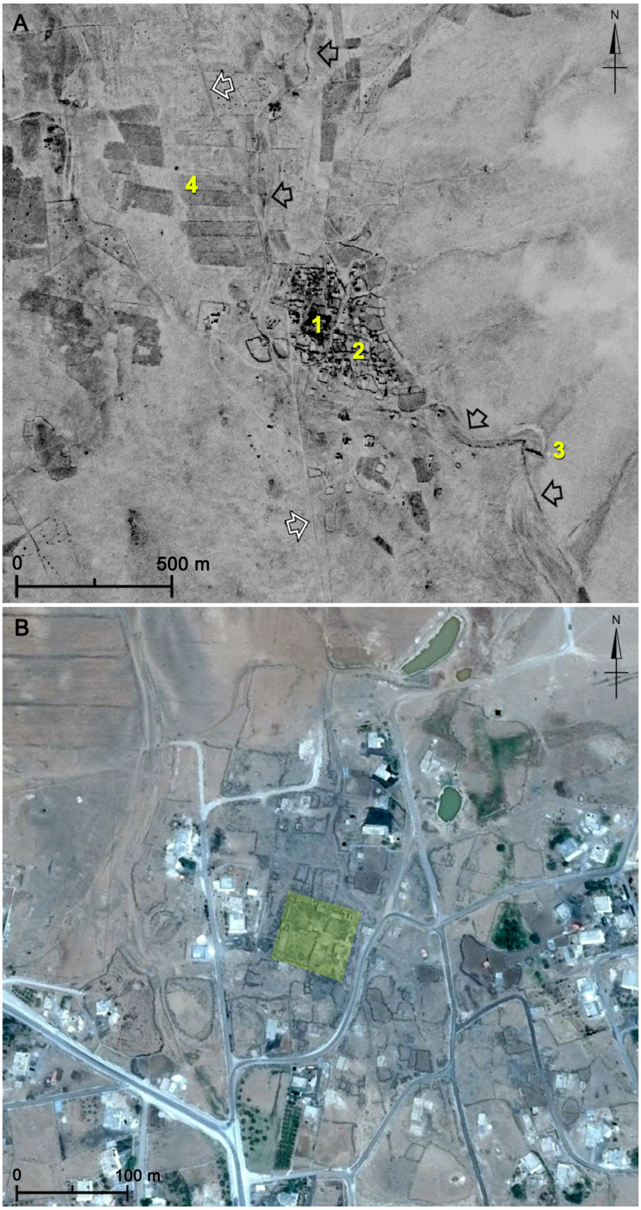


**Figure 6.** Deyr el-Kahf: (A) CORONA satellite image taken in 1968, marking the remains of the fort (1) and the *vicus* (2), a dam (3) along the wadi (black arrows), the possible remains of ancient agricultural estates (4), and traces of the ancient route with a north–south direction (white arrows; imagery courtesy of the USGS); (B) Pléiades satellite image taken in 2017, highlighting the area of the fort in yellow (imagery courtesy of Google Earth).

**Figure 7.** Deyr el-Kahf: aerial photo taken by Sir Aurel Stein in 1939. Photograph courtesy of the British Academy.

the southeast quadrant of the fort, where much of the previous structures were reused (Cheyney et al. 2009; de Vries 1990, 1993, 2013; Kennedy 2004:86–91; Kennedy and Riley 1990:183).

Umm el-Jimal was situated along the eastern boundary of a late antique *vicus* (a small village) that probably occupied the site of a settlement dating back to the second century CE and that was located close to a Nabatean village (Figure 4A). Blocks from the fort were reused in building the walls surrounding the settlement. A CORONA KH-4B image taken on June 8, 1970, shows the ancient site (Figure 4B, no. 1) and the surrounding area before modern urbanization, as testified by recent satellite imagery (Figure 4C). In particular, in the satellite image we also can see a wadi close to the *vicus* (Figure 4B, no. 2) and the remains of a Nabatean village nearby (Figure 4B, no. 3). Stein made aerial surveys of the site on March 11, May 4, and May 9, 1939, taking seven photos: three oblique and four vertical, taken from an altitude of 200–300 and 5,000 feet, respectively. The vertical photos


**Figure 8.** Deyr el-Kahf: (A) plan of the *quadriburgium* (in black), indicating the area of the previous fort (in red) and the post-Roman phases (in grey; after Arce 2015:Figure 9.4); (B) aerial view taken in 2011 (photograph courtesy of APAAME).

document the plan of the ancient remains: it is possible to identify the fort and the *vicus*, with its irregular urban planning characterized by the presence of clusters of houses enclosing private courtyards, various water reserves, churches, and other buildings (Figure 5A). These structures, such as the so-called "barracks" of the early fifth century CE, are clearly documented in the oblique photos, as well (Figure 5B).

*Deyr el-Kahf*

The second case study regards the fort of Deyr el-Kahf, built along a road extending south from the *Strata Diocletiana*. This road, dated to the Severan period (about 208–210 CE) by the milestone found at Azraq (Kennedy and Riley 1990:179), reached this site through the Roman settlement at Imtan and ran close to Deyr el-Kahf, which was located at the southern end of the basaltic Hauran Plateau (for more on this road, see Kennedy 1982:169–186, 1997:88–91). The fort was located on a flat site crossed by some wadis (Kennedy 2004:72–77; Kennedy and Riley 1990:179). Cisterns, water reserves, and a dam along the main wadi were close to the settlement, as shown in a CORONA KH-4B satellite photo taken on November 12, 1968 (Figure 6A). Moreover, the satellite image shows remains of a late antique *vicus* southeast of the fort and field systems immediately north of the site, which may be related to agricultural estates that could have been in use since the Roman period (Arce 2010:480). Today the ancient structures are surrounded by a modern village, and this recent urbanization prevents us from analyzing the site's relationship with its territorial context (Figure 6B).

Deyr el-Kahf had a quadrangular shape of about 60 x 60 m with square towers at the corners and two intermediate towers along its north and west sides. Stein visited the site on March 4 and 8, 1939 (Gregory and Kennedy 1985:253–259). Later, on the morning of March 11, he documented its structures from an airplane by taking five oblique photos (Figure 7). These showed the site before modern urbanization, documenting its topographic relation to the main wadi and a secondary wadi, the cisterns excavated in the rocky basement (which probably had been used as a quarry for the settlement), and the water reservoirs and ancient structures outside the fort. Moreover, Stein's photos showed several stone fences for animals that had been built by the Bedouin shepherds who frequented the area, as well as the cultivated camps surrounding the site. A recent stratigraphic analysis of the structures—built entirely in local basalt—and of their relative


**Figure 9.** Qasr el-Azraq: CORONA satellite photo taken in 1967, indicating the modern roads which retraced the routes from Bosra (A) and Deyr el-Kahf (B), a route toward the east (C), and a possible rectangular basin (D). Imagery courtesy of the USGS.


**Figure 10.** Qasr el-Azraq: (A) Pléiades satellite image taken in 2019, indicating the fort (red arrow; imagery courtesy of Google Earth); (B) plan of the *quadriburgium* (after Kennedy 2004:Figure 7.2); (C) aerial view taken in 2011 (photograph courtesy of APAAME).


**Figure 11.** Two aerial photos of Qasr el-Azraq taken by Sir Aurel Stein in 1939: (A) vertical; (B) oblique. Photographs courtesy of the British Academy.

building techniques provided relevant data regarding the fort's origin and development from the third to eighth centuries CE and allows us to distinguish four main phases (Figure 8; Arce 2010:475–480, 2015:104–106):

1. A square fort (28 x 28 m) was erected during the Severan period (at the same time as the construction of the road between Imtan and Azraq), corresponding to the southeast corner of the fortified settlement. It had no towers and was accessible from its east side.
2. A *quadriburgium* (60 × 60 m) was built in the Tetrarchic period, adding towers and incorporating and enlarging the previous fort to the north and west.
3. The fort was guarded by a garrison of *limitanei* until the mid-sixth century CE, at which point it was reused in part by a monastic community that built a chapel in the middle of the courtyard and in part by Ghassanid federate troops as a temporary encampment and logistics base.
4. The monastery and the rest of the complex were abandoned. The structures were later reused in the Umayyad period (eighth century CE), probably as part of an agricultural estate.

### *Qasr el-Azraq*

The last case study is the fort of Qasr el-Azraq, located at a strategic site close to a very large and important oasis at the edge of the desert steppe (Kennedy 2004:58–62; Kennedy and Riley 1990:81–84, 179–181). As mentioned above, it was at the southern end of the Severan road that extended south from the *Strata Diocletiana*, and it was also accessible by the road from Bosra built by Septimius Severus. Moreover, caravan routes beginning from this site led to the east and southeast across the desert steppe and toward the Euphrates River Valley and the Arabian Peninsula (Roll 2015:111–114). A CORONA image taken on September 26, 1967, shows the fort immediately to the north of an extensive area of pools and marshes belonging to the oasis (Figure 9), which constituted the only water source in a vast desert region. The satellite image documented the site before the extension of present-day Azraq: modern roads retrace the routes from Bosra (A) and Deyr el-Kahf (B). Furthermore, a route toward the east (C) and a possible rectangular basin (D) are visible.

Stein visited Qasr el-Azraq, today completely surrounded by modern buildings (Figure 10A), on March 14, 1939 (Gregory and

Kennedy 1985:261–270), after documenting it from an airplane on March 9 by taking three aerial photos: two oblique and one vertical, taken from an altitude of 200 and 2,000 feet, respectively (Figure 11). Despite the reuse of the structure in the Byzantine and Umayyad periods and again later in the thirteenth–sixteenth centuries, the structure of the Roman fort—built in local black basalt—is clearly identifiable: it had a quadrangular shape of 79 x 72 m with square corner towers and intermediate towers. The fort is very similar to the *quadriburgium* of Deyr el-Kahf, and it probably also dates back to the Tetrarchic period. However, a Roman settlement of the second or at least third century CE is attested in this area by epigraphic documentation, and it is also suggested by the construction of the two Severan roads that reached the site from Bosra and Deyr el-Kahf. Thus, it is not possible to exclude the existence of a previous Severan fort here—as at Umm el-Jimal and Deyr el-Kahf—and maybe with the same dimensions as the Tetrarchic *quadriburgium*, but no element of this hypothetical structure was identifiable in the building of the early fourth century CE (Arce 2015:103).

## Conclusions

This preliminary work has shown the opportunities given by the study of aerial photographs and satellite images when integrated with the analysis of archaeological and epigraphic data. The region under examination has undoubtedly constituted a border area between two different cultural and social landscapes, corresponding to the sedentary people in villages and the nomadic populations. It has been, therefore, the theater of relations between these two different lifestyles. The *limes Arabicus*—as well as other frontier areas of the Roman Empire—was a particular "ecosystem" in which political, social, economic, and religious elements converged. Roman forts constituted places of interaction where new architectural typologies and building techniques were developed. The forts thus bear witnesses to Roman history: their structural changes probably testify to the changes of Roman policies in the area. The chosen sites are clear examples of these changes and of the Roman ability to adapt their settlements to different conditions.

Our intention is to clarify the history and function of these forts and legionary camps, which were abandoned or transformed into monasteries or small villages by the end of the fifth century CE. For example, Umm el-Jimal evolved into a small town with a monastic structure: indeed, the Roman fort was the nucleus of urban development. Further research on other sites of the so-called *limes Arabicus* will allow us to understand Roman policy in the area better—specifically, by analyzing in detail each fort and camp and by focusing on the dynamics of the interactions between nomads, semi-nomads, and sedentary people, together with the impact that climate change had on local populations, in order to understand how the Arab tribes became the principal actors in the war between the Byzantines and the Persians. It is very likely that some of these structures were not military structures. They may have served other purposes, such as hospices for travelers or farms (Findlater 2002:141–142). Collected data needs to be integrated with fieldwork in order to understand the real function of these structures.

The interrelationship of sites and routes with the landscape through which the *Via Nova Traiana* and the *Strata Diocletiana* ran constitutes a clear sign of a well-supervised policy. The origins of this relationship can be traced back to the Nabataean Kingdom, and it continued until the Byzantine period, when something changed. The emergence of local Arab tribes in this period was, in fact, probably also caused by a decline of imperial interest in controlling the area or by a less efficient way of governing the local people.

*Acknowledgments*

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# Chapter Eight
# Roads or Embankments? The Double Function of the Terramare Connective/Hydraulic System in the Valli Grandi Veronesi

Laura Burigana, Armando De Guio, Luigi Magnini

The rise of the Terramare culture was one of the most significant and impactful phenomena in northern Italian prehistory. It involved a large part of the eastern Po Valley that currently corresponds to the regional territories of Emilia-Romagna, part of Lombardia (Provinces of Cremona and Mantova), and part of Veneto (Province of Verona). The contextual demographic increase led to a massive reconfiguration of the settlement system, with important repercussions on the landscape, creating large new spaces dedicated to production and connection infrastructure. The evidence for these ancient settings is one of the main subject matters of our research group (see below), whose work is focused on the area of the southern Valli Grandi Veronesi Meridionali (or Verona Valleys) in Veneto. At the end of Middle Bronze Age (1650–1330 BCE), indeed, more complex power relationships started to emerge in the whole area, fully developing in the Recent Bronze Age (1330–1150 BCE). The entire system acquired the typical traits of a polity (De Guio 1991), with a level of complexity comparable to that of a simple chiefdom (De Guio 1997:155).

One of the main outcomes of this phenomenon was the massive reorganization of the territory. The inhabited areas (the so-called "Terramare," which were characterized by a large surface area, a higher elevation, and a long-lasting occupation) were also highly heterogeneous within a quite distinct and clustered landscape of power that followed a number of hyper-coherent spatial/functional rules, such as decreasing nearest-neighbor distances among a three-tier rank-size distribution of settlements (7–20 ha, 2–6 ha, and less than 2 ha) organized around the central place of Fondo Paviani (Balista and De Guio 1997; De Guio, Balista, et al. 2015). As in the rest of the Terramare universe, the first-rank sites were enclosed by an embankment and a

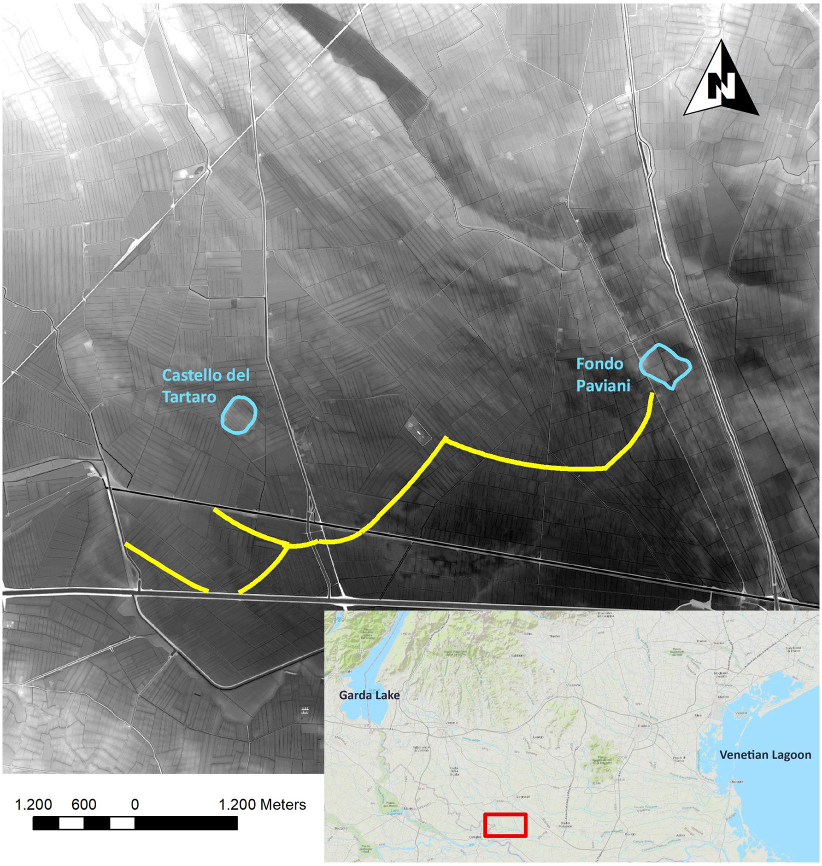


**Figure 1.** Locations of the path of the SAM (outlined in red), Castello del Tartaro (in blue, on the left), and Fondo Paviani (in blue, on the right) overlaid on a high-resolution digital terrain model (DTM, 2010). DTM courtesy of the Consorzio di Bonifica Veronese.

ditch that, in some cases, have left traces that are still visible, especially in remotely sensed imagery (Balista and De Guio 1997:159). The territorial transformation involved not only the inhabited areas, but also the whole intra-site to inter-site space, for both productive and connective purposes. The best preserved evidence of the ancient agricultural landscape is the area surrounding the site of Castello del Tartaro, where clear traces of an extensive irrigation system can still be remotely detected.

The new Terramare settlement system also led to more frequent exchange relationships that presumably contributed to the development of a dense connective network. The Valli Grandi Veronesi

**Figure 2.** Aerial view of the traces of the SAM. Image, acquired by aircraft in October 2018, was treated with a saturation stretch enhancing algorithm.

Meridionali, in particular, seems to have been part of short-distance exchange circuits (with sites near Lake Garda and with the Terramare area on the south bank of the Po River), medium-distance circuits (with the entire Po Valley, the Alpine region, and the rest of the Italian peninsula), and long-distance circuits (with the Aegean–Mycenaean and Levantine worlds). Such an increase in complexity most likely required significant labor, managed and controlled by an emerging elite, for both the construction and maintenance of infrastructure (Cardarelli 1997:654).

The southern Valli Grandi Veronesi Meridionali are delimited to the south by the resurgent Tartaro River, which separates the area from the topographically more depressed and less well-drained valleys of the Polesine area (Balista 2009), while the northern geographical boundary is determined by the emerging sediments of the ancient

Adige River conoid (dated to the end of the Pleistocene epoch; Balista and De Guio 1997). The area was spared from the floods generated by the Adige and Po Rivers, turning into a depressed alluvial basin. The morphogenetic processes of the Valli Grandi Veronesi Meridionali include the contribution of sediments from several resurgence rivers that were activated during the ancient Holocene—the Paleo-Tartaro, the Paleo-Tregnone, and the Paleo-Menago—which impacted the area with their passage, thus causing the formation of adjacent terraced plains. During the Subboreal climate period, these watercourses underwent a considerable decrease in flow rates in a sharp alternation of phases of drought and humidity (De Guio et al. 2010:91).

The Alto-Medio Polesine-Basso Veronese project (AMPBV; in English: "High-Middle Polesine and Lower Verona Plain") is an Italian-British project that has been active since the 1980s and is focused on the study of protohistoric evidence in the area of the Valli Grandi Veronesi Meridionali. The favored research methodology relies mostly on non-invasive techniques, limiting the degree of impact caused by archaeological excavation in favor of remote sensing, surface survey, geophysical prospection, and the observation of "stratigraphic windows" exposed by modern land management practices, such as excavation and the maintenance of agrarian ditches. One of the best-preserved connective infrastructures studied during the investigations of the AMPBV project is the so-called "Strada su Argine Meridionale" (SAM; in English: "Road on the Southern Embankment"), which is visible from Case Bellini (southwest of Castello del Tartaro, Municipality of Cerea, Verona) up to the site of Fondo Paviani (Municipality of Legnago, Verona) for a total length of approximately 6 km (Figure 1). Seen from a remote perspective, traces of the SAM look like a lighter band (due to the sandy soil composition of the embankment), flanked by two darker and thinner marks (corresponding to the side ditches, filled by less well-draining and therefore more humid soils; Figure 2). The width of the embankment measures from a maximum of 15 m to a minimum of 11 m; the southern and northern side ditches are large, between 10 and 13 m, and between 9 and 18 m, respectively. In the last investigations of the SAM, presented here, we made use of new imagery from modern sensors and some image-processing techniques, with the aim of better understanding its function in relation to its route and shape and, consequently, its importance as the collective effort of a well-organized society.

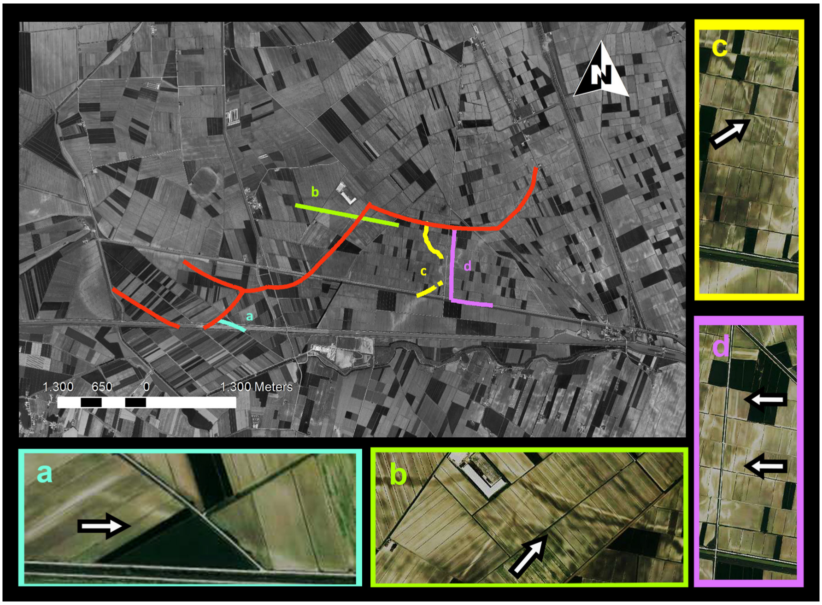


**Figure 3.** Visualization of the four additional branches of the SAM in aerial orthophotos from 2006. Photographs courtesy of the Consorzio di Bonifica Veronese.

## The Route of the SAM

At its starting point about 1.5 km southwest of Castello del Tartaro the SAM has an arched track, which leads northeast toward its connection with the trace of the paleochannel (the Paleo-Tregnone River) that drained the lands around the settlement of Castello del Tartaro. There the road deviates to the east and continues with an almost rectilinear trend following the Paleo-Tregnone up to Ponte Moro, where it begins pointing northeast, arching slightly, and then heads toward Fondo Paviani (Balista et al. 2005:97–98). In its eastern stretch, the embankment is also frequently overlapped by paleochannels coming from the north. The construct has been analyzed and documented in various publications since the 1990s (Balista et al. 2016; Calzolari 1991, 1993, 2001; Tozzi 2009; Tozzi and Harari 1990).

In addition to its main path, recent remote sensing analysis had identified additional branches (Figure 3):

a. The first branch, to the west, has an arched trend very similar to the main route running south, and it crosses another segment with a northwest–southeast orientation.

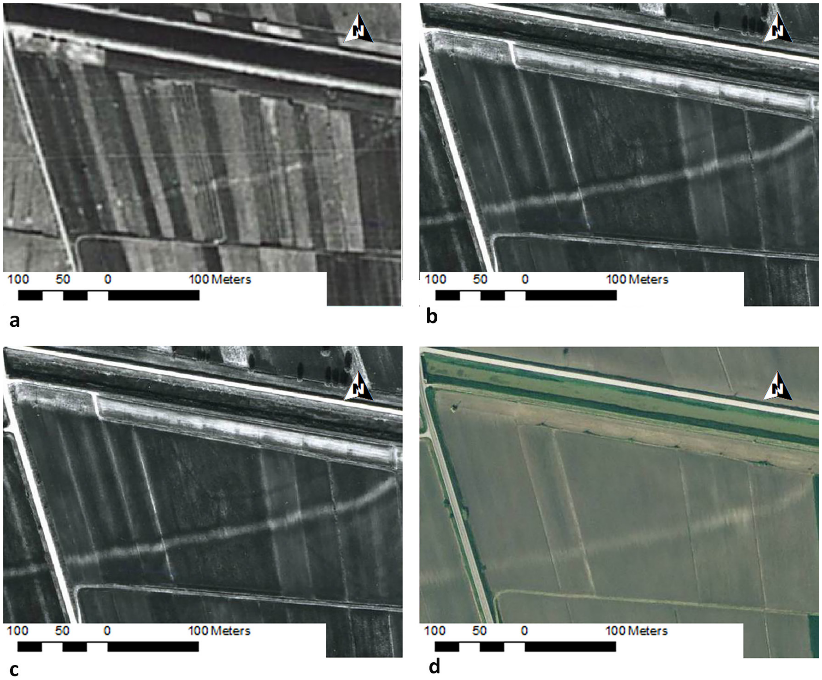


**Figure 4.** Detail of the SAM (Val Passiva), comparing the trace's visibility in aerial imagery over time (after Betto 2013): (a) 1955 (GAI flight); (b) 1983 (SCAME flight); (c) 1990 (ReVen flight); and (d) 2006 (satellite orthophoto courtesy of the Consorzio di Bonifica Veronese).

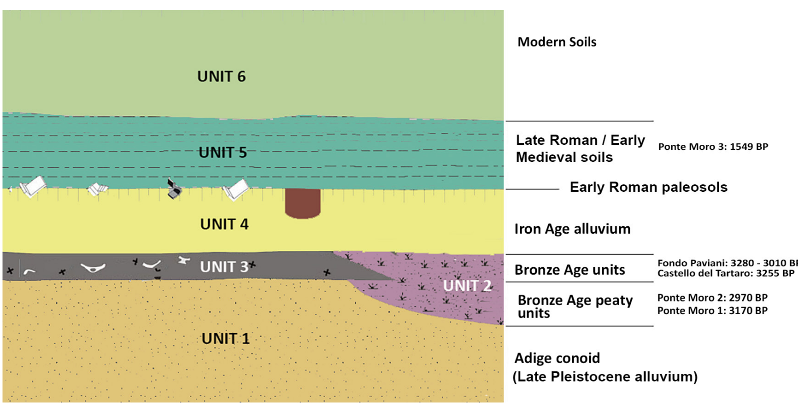


**Figure 5.** Graphic representation of the stratigraphic Bronze Age units (radiocarbon dates from Balista et al. 2005).

b. About 200 m before crossing the Paleo-Tregnone, another possible branch, with a southeast–northwest orientation and an approximate length of half a kilometer, departs on both sides from the main path and goes toward Castello del Tartaro.
c. The third branch, which can be followed almost up to the Paleo-Tartaro, departs from west of Ponte Moro. It is more irregular, with two wide curves: one facing west and the other facing east.
d. Another branch can be detected from Ponte Moro leading south, almost reaching the town of Torretta; it follows an almost straight line up to Fossa Maestra, where it curves in nearly a right angle.

Field analysis was performed in areas deemed critical for their location or for their information potential regarding stratigraphic relationships and chronological interpretation. Remote sensing investigation included several different and sometimes experimental methodological applications.

## Time Series Analysis and Ground Truthing

The analysis by means of remote sensing (time series analysis) of how the features' visibility has evolved has brought particularly interesting results regarding the monitoring and conservation of the traces of the SAM, assessing the rapidity with which modern agriculture relentlessly impacted the archaeological landscape. Between the 1950s and 1980s, the introduction of mechanized agricultural systems at first significantly enhanced the traces' visibility by exposing the buried ancient soils. However, starting in the 1990s, the cyclical and increasingly deeper plowings soon began to erase the ancient deposits, thus mixing and homogenizing the sediments, similar to what happened in many other archaeological areas (see, for example, Cimadomo et al., this volume).

The traces visible above ground in historical aerial photography series were observed, measured, and compared (Figure 4), looking both at the areas that had been previously explored and at ten other sample points that were selected at intervals of about 500 m. Two critical points thus identified were then further investigated through targeted ground checks. The first checkpoint, located in Ponte Moro (Municipalities of Cerea and Legnago), was examined in the fall of 2003, when a stratigraphic section was documented along a modern canal that intercepts the SAM trace almost orthogonally (Betto 2013).

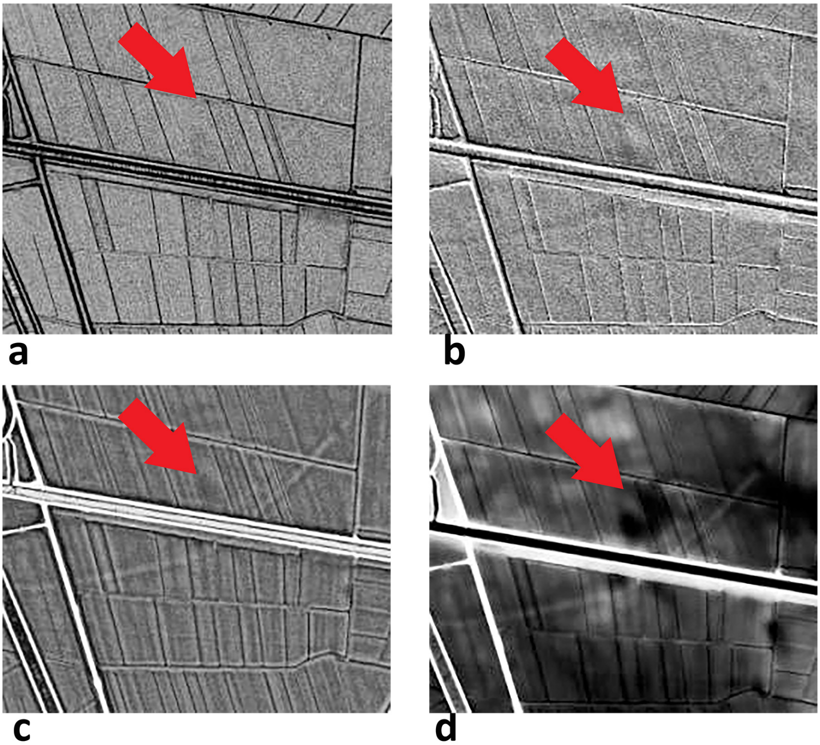


**Figure 6.** DTM processing in order to enhance the visibility of the SAM (after Burigana and Magnini 2017): (a) sky view factor; (b) hillshade; (c) local relief model; and (d) contrast stretch. DTM courtesy of the Consorzio di Bonifica Veronese.

The exposed section allowed for a detailed analysis of the stratigraphic relationships between the units of the SAM (related to the embankment and the ditches) and the local alluvial deposits. The preserved stratigraphic units are mainly composed of reddish-brown and gray sands, which are now almost entirely remixed with the upper pedological horizons. The ditches, on the other hand, are still quite well preserved, the northern being narrower and deeper than the southern. It also was possible to determine a more precise stratigraphic position of the construction, which covers mid-Holocene soils and underlies the local alluvial Iron Age deposits that partially fill the ditches in their post-abandonment stage. In addition to the frequent discovery of Recent Bronze Age ceramic clusters in close proximity to the SAM, an absolute chronology is given by the Ponte Moro stratigraphic sequence, where a lateral colluvial deposit of the SAM bank is comprised within two peaty strata dated by $^{14}C$ analysis to 1614–1274 cal BCE (2σ median 1443 cal BCE) and 1371–1051 cal BCE (2σ median 1186 cal BCE), thus providing the *terminus post quem* and *terminus ante quem* for the SAM bank's construction (De Guio, Balista, et al. 2015).

The investigation was successively extended to another nearby section, where the exposed stratigraphic sequence also presented a series of units attributable to Iron Age floods that covered the pedogenetic alterations of more ancient soils; the SAM stratigraphic units are located above these layers (Figure 5). The lateral ditches, of which only the western one could be documented, cut the alluvial deposits and are filled with organic silty colluvial stratigraphic units. This evidence suggested that the ditch could have been reactivated for use in later times (Balista et al. 2005, 2016; Betto 2013).

## Image Processing and Analysis of LiDAR Data

Being an already-explored archaeological scene, the SAM also served as a test subject for image processing methodological research. For this purpose, several processing algorithms were tested on different kinds of data, such as radar, LiDAR, and multispectral images. One of the most rewarding strategies turned out to be the LiDAR analysis, for which we had at our disposal a high-resolution (0.5 m) digital terrain model (DTM). Several image-processing algorithms were experimentally applied in order to evaluate their use in the detection and interpretation of archaeological features in the study area (Figure 6):

- Contrast stretch through image histogram manipulation;
- Mono (single-band) and multidirectional (azimuth angle; RGB composite) hillshade, keeping the artificial light source at a height of 30° in order to better enhance the lowest reliefs;
- Principal component analysis (PCA) of different DTM hillshade visualizations, processed as a set of linearly correlated variables (Estornell et al. 2013);
- Sky view factor (SVF), a treatment based on the use of diffuse lighting that indicates the portion of the sky visible from every observation points (Zakšek et al. 2011); and
- Local relief model (LRM), an operational sequence developed with the aim of excluding larger landscape features and highlighting the local small-scale relief (Hesse 2010).

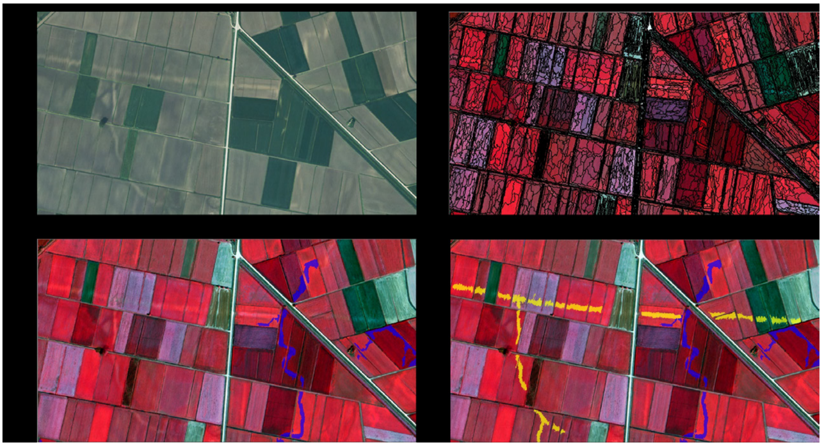

**Figure 7.** Ponte Moro area (Municipalities of Cerea and Legnago): (a) 2008 orthophoto (courtesy of the Compagnia Generale Ripreseaeree); (b) multi-resolution segmentation of the NIR false-color band combination (NIR, red, green); (c) classification of the paleochannels (in blue); and (d) classification of the paleochannels (in blue) and the SAM (in yellow).

A small-scale visibility comparison was then carried out by means of autoptic analysis for each section of the SAM. The hillshade algorithms and the LRM gave the best results; the latter, in particular, successfully highlighted both the bank trace and the depressed marks of the side channels, proving the efficacy of this processing not only for mountainous areas, but also for level ground with minimal height variations. The hillshade algorithm worked best in multiple image combinations by implementing PCA and simple three-band composition (Burigana and Magnini 2017).

## Object-Based Image Analysis and Landform Classification

The issues that arise from the automatic analysis of high-resolution imagery of wide-range areas are still widely discussed in the scientific community, including within the archaeological domain (Casana 2020). Among the most frequently and widely used methodologies in recent years, machine learning techniques—and, in particular, convolutional neural networks (CNN)—have had wide diffusion (Ball et al. 2017; Trier et al. 2018; Verschoof-van der Vaart and Lambers 2019). Looking at the available literature, it seems possible to argue that the success of machine learning applications is especially related to the homogeneity and standardization of the archaeological remains that have been considered. However, when inferences from external agents (i.e. natural and anthropic factors) occur that change the archaeological record along the diachronic dimension, it is very difficult to implement these differences in a single semantic model ready to be used for machine learning (Magnini and Bettineschi 2019). In this perspective, a knowledge-based approach is more flexible and adaptable to the context, with the foresight to not result in overfitting by making the set of classification rules too specific.

For the case study of the Valli Grandi Veronesi Meridionali, we decided to systematically apply an object-based supervised classification technique (object-based image analysis, or OBIA), which was previously established in the field of archaeology for the classification of landforms (Drăgut and Blaschke 2006; Verhagen and Drăgut 2012), for the semi-automatic classification of archaeological traces (Davis 2019; De Laet et al. 2007; Freeland et al. 2016; Sevara et al. 2016), and for the development of predictive models (Magnini and Bettineschi 2021). This method, which can be adopted at any scale, provides for the partitioning of the image into homogeneous objects through segmentation, on which a classification is subsequently applied (for a complete overview of the methodology, see Blaschke 2010).

### *SAM Semi-Automatic Classification: Ponte Moro (Municipalities of Cerea and Legnago, Verona)*

This study focuses on the issues related to the semi-automatic analysis of linear archaeological features and, specifically, on the SAM and the numerous hydrological features that characterize the area (De Guio, Magnini, and Bettineschi 2015). The test was conducted on the fairly limited area of Ponte Moro (less than 1 km$^2$), where both types of infrastructure are present. Regarding the SAM, there is also a "crossroads" in the surveyed area that allows us to test the methodology even in the presence of a drastic directional change of the road. As starting data, an orthophoto of the area in the visible spectrum (RGB; Figure 7a) and an image in the near-infrared spectrum (NIR; Figure 7b) were selected, allowing us to maximize the chromatic differences of both the soil marks and the crop marks. In fact, if the road is more visible in the RGB orthophoto for areas without vegetation, the NIR layer (and related false-color band compositions) maximizes the variations in vegetative growth (De Guio 2015).

The first step of the work consists in dividing the image (in this case composed of four layers) into image-objects through a segmentation algorithm; the choice fell, as in most archaeological case studies, on

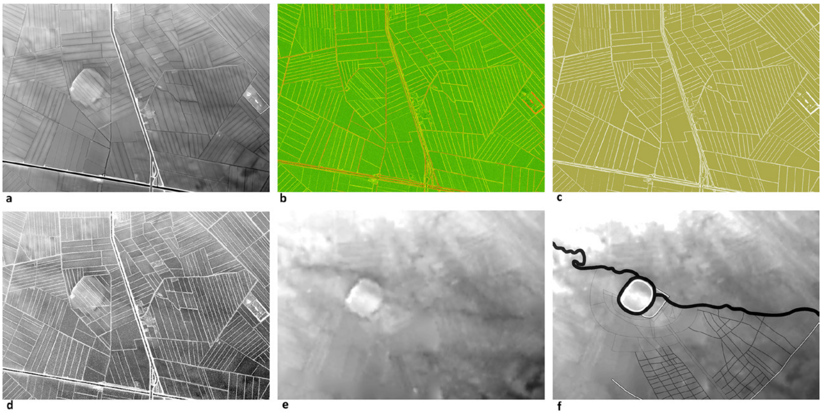


**Figure 8.** Castello del Tartaro area (Municipality of Cerea). Visualization of the main operational stages in order to create our model: (a) original DTM; (b) slope gradient map; (c) extraction (from slope gradient) of values above the standard deviation; (d) "purged" DTM using the slope extraction map as a mask; (e) interpolation; and (f) final model, including the reconstruction of the SAM and irrigation network.

multiresolution segmentation (for details, see Baatz and Shäpe 2000; Benz et al. 2004), with a trial value of 60 in the scale parameter (Figure 7b). The selection of the segmentation scale parameter largely depends on the data source, the aims of the case study, the geographical context of the investigation, and the internal heterogeneity of the data (Zhang et al. 2018).

The subsequent classification encountered critical issues because of the difference between what is expected considering the knowledge-based semantic model and the real-world archaeological record in its present form. The presence of modern roads and ditches that interrupt the spatial continuity of ancient archaeological traces also modifies the overall geometric structure and how it is perceived in the software environment (Magnini and Bettineschi 2019). Our mind, in fact, is perfectly able to discern ancient evidence from modern structures, and it implements an "automatic interpolation" procedure of the traces even when they lack spatial continuity. For the classification of ancient hydrological features, the use of spectral parameters (especially on the NIR layer) and dimensional parameters was favored (Figure 7c), while for the classification of the roads, geometric parameters such as rectangular fit and length / width ratio were used in addition to the previous parameters (Figure 7d). The application of these parameters was possible because of their relative regularity, even in the absence of spatial continuity (De Guio, Magnini, and Bettineschi 2015). It also should be stressed that the same archaeological evidence can have different outcomes depending on the utse of the land in which it is located at the time of data acquisition (i.e. the seasonality factor of the traces). In fact, looking at Figure 7a, the trace of the SAM appears to be lighter on plowed fields and darker on those with active crops. These differences in outcomes also affect the (semi)automatic recognition of traces. The opportunity offered by OBIA to modify all the classification parameters opens new perspectives in a more robust (semi) automatic recognition, even in the presence of complex archaeological objects and in palimpsestic contexts (Magnini and Bettineschi 2019).

Remote sensing and image processing analysis showed clearly how the SAM connects the sites of Fondo Paviani and Castello del Tartaro as a road. However, the visualization of the SAM path on the DTM suggested further considerations about the function of this infrastructure. Indeed, on its southwest side, in proximity of Castello del Tartaro, the SAM does not cover the shortest possible inter-site distance, but rather turns north in a wide curve, following (according to the contour map) an almost regular isoline of 8.25–8.50 masl; the northern stretch toward Fondo Paviani, whilst being much straighter, maintains the same altitude range. Furthermore, the path never has an altitude below 8 m. Its altitude and trend, as well as some of the additional branches that have been identified, could be related to specific planning in order to preserve the territory from floods and the spreading of marshes.

Starting from these considerations, the AMPBV research group recently developed a simulation of the Castello del Tartaro irrigation system (of which several faint traces are still detectable remotely) in order to better understand its relationship with the SAM and the oscillations of the underground water table.

### *Creation of the Base Model*

The main operations to create the digital support model focused primarily on the reconstruction of the Recent Bronze Age irrigation network. For this purpose, the DTM at our disposal was processed in order to obtain a surface more akin to the protohistoric landscape. The most critical challenge in this phase was filtering out the "background noise" to get rid of the modern facilities and infrastructure features, which would have later compromised the simulation. The following operations were thus executed in a Geographic Information Systems (GIS) environment (Figure 8):

- creation of a slope gradient raster from the z values in each DTM raster cell;
- extraction of all values above the standard deviation calculated from the slope gradient raster;
- combination of all extracted values in a unique feature class;
- buffering of the obtained feature class (with a "safety" value of 2.5 m) to cover any residual anomalous pixels;
- removal of the buffered features from the original data;
- conversion of the treated DTM to a multipoint feature class;
- interpolation of the multipoint file into a triangulated irregular network (TIN) surface model; and
- conversion from the TIN to a new raster image.

The paleochannel recreation was possible thanks to a large number of archaeological and geological data that were collected during both fieldwork (such as core samples and stratigraphic sections) and remote sensing investigations, which helped in locating many related crop-marks and soil marks. The artificial hydrographic network model was based on a reconstruction by Dr. Paolo Cima, which connects all the detected tracks in the study area that are attributable to the so-called "second hydraulic stage" of Castello del Tartaro (De Guio, Balista, et al. 2015), coeval with the site's bank–moat perimeter system. Two additional factors of complexity were also taken into account: the significant dimensional differentiation of the various network components, and the position of some positive reliefs (namely the banks) both on-site and off-site.

The depth and width measurements of the paleochannels and artificial ditches were extracted from field survey data collected since the mid-1980s (for a synthesis, see Bovolato 2012). Based on this information, a hierarchical order was established, according to which the features were classified (each class being represented by an average value). Because of its broader range and variance, we chose width as the discriminating value for the classification into six orders of magnitude:

- 1st order: the settlement moat and its tributary watercourse (width: 45 m, depth: 2.5 m).
- 2nd order: the southeast ditch, which supposedly delimited a livestock area (width: 7.5 m, depth: 1 m; Balista and De Guio 1997).
- 3rd order: the SAM side channels (width: 6 m, depth: 1 m).

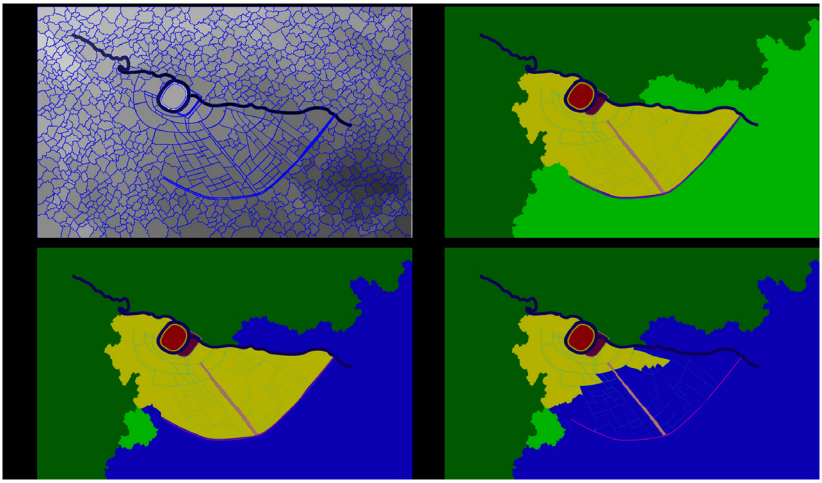

**Figure 9.** Castello del Tartaro area (Municipality of Cerea): (a) multiresolution segmentation of the modified DTM; (b) semiautomatic classification of the anthropic structures and landforms: the positive anthropic evidence (in red and rose shades), the hydraulic infrastructure (in blue shades), the fields (in yellow), and the natural landforms (in green shades); (c) flood simulation (in blue) on the complete model; the presence of the SAM safeguards the fields from flooding; (d) flood simulation (in blue) excluding the SAM as a dike; in this case, the water height causes the fields to flood.

- 4th order: the side channels of the so-called “Big Road” (De Guio, Balista, et al. 2015), a droveway connecting the settlement with the nearby pastures that ran perpendicular to the SAM (width: 4.5 m, depth: 0.5 m).
- 5th order: the large concentric canals in closer proximity to the settlement, connected to each other by shorter cross-channels and related to a probable horticultural “near-site” area (width: 3.5 m, depth: 1 m).
- 6th order: the smallest canals irrigating the off-site farmland in a narrow closed-field system (width: 0.75 m, depth: 0.5 m).

Three raised elements (for which a height and width were also estimated based on ground-truthed data) were then added to the reconstructed landscape: the site embankment (width: 20 m, height: 5 m), the southeast corral (width: 10 m, height: 2.5 m), and the SAM bank (width: 12 m, height: 1 m).

Since the main goal was to verify tangibly how the agricultural irrigation system may have worked within the local macro-morphology, the analysis required accepting some necessary approximations. Here are reported the most evident:

1. Each vector in our digital model has a flat-bottomed profile, unlike the real hydrography. Consequently, the water flow rate is, in part, overestimated.
2. The current landscape results from repeated territorial restructuring actions (most of which involved land-levelling for agricultural purposes), so that the reconstruction of the smallest reliefs is currently unattainable.
3. Several of the smallest irrigation canals are supposedly no longer detectable by any means now; hence, the reconstructed hydrography may be incomplete.

### *Landform Classification*

The local landforms of Castello del Tartaro were defined in relation to the natural and artificial (i.e. anthropic) characteristics of the site and the near-site; subsequently, the quantitative data were integrated with a qualitative-functional interpretation of the individual classes. As in the previous case study, the multiresolution segmentation algorithm was used, but the scale parameter was increased to 80 in order to obtain medium image-objects in an area of less than 20 $km^2$ (Figure 9a). The following classification started first with a macroscopic definition of three main landforms: “highlands,” “low lands,” and “ditches.” The selected rule set was based mainly on the absolute altitude of the image-objects, but it also employed morphological and relational features.

The first classified anthropic structures were the embankments and the platform of the site, which, in addition to sharing a higher elevation in relation to the other image-objects, had high values of proximity to the ditches. By linking the morphological characteristics of the embankments to single ditches, it was possible to create three different classes. The same operating practice was also adopted to classify the droveway (Figure 9, in pink).

Secondly, five different functional classes were created for the hydraulic infrastructure (Figure 9b, in shades of blue). With respect to the manual classification carried out during the DTM creation, it was decided to merge the concentric channels (5$^{th}$ order) and distal channels (6$^{th}$ order), because functionally they perform the same task. In this case, the semiautomatic classification took into account the flow rate, directionality, and relationship with other anthropic and natural structures. Once all the anthropic structures were classified, the remaining landforms were merged into three classes, defined as "highlands," "low lands," and "fields" (see Figure 9b, in dark green, light green, and yellow, respectively).

Ultimately, we simulated two different water flooding scenarios (with a general water-level increase of 1.5 m with respect to the lowest area): the first simulation considering the SAM as a dike; the second, without considering the SAM. As can be seen in Figure 9c, the presence of the SAM limited the flooded area in the southeast corner of the model, leaving the fields inside the near-site area completely dry, while the absence of this infrastructure would have led, in the event of the overflow of the Po River, to the rapid flooding of a large part of the fields close to the inhabited area (Figure 9d).

## Conclusions

The rise of a complex and articulated territorial system such as the Terramare in the Valli Grandi Veronesi Meridionali must certainly have required an efficient connective network that could favor both long-distance (inter-polity) exchange relationships and a stable connection between its major places, such as Fondo Paviani and Castello del Tartaro, to the benefit of a rapidly growing local population.

The highly visible spatial layout of the SAM confirms the basic function of the infrastructure as a road; some of the branches detected in remote imagery—the chronology of which has not yet been verified in some cases—also suggest a possible reuse in later times, when the connections still in place could have been exploited well after the collapse of the Terramare system. However, the more pronounced curves of the southern portion of the SAM (which appears to delimit the farming area of Castello del Tartaro), its location in relation to the DTM isolines, and the identification of additional branches that are equally adapted to the local land morphology lead to a more complex interpretation.

The location of the Valli Grandi Veronesi Meridionali between the more elevated Adige River conoid (to the north) and the upper limit of the more depressed Polesine area (to the south) during an unstable climatic phase could have made this area vulnerable to waterlogging and consequent crop damage. The experimental simulation on the reconstructive model proves that the massive SAM embankment and its lateral drainage channels could have acted as protection for the most depressed, at-risk areas. Analyzing the remotely sensed images through different processing techniques gave us the opportunity to integrate the information collected in the field and thus create an accurate idea of the SAM and the hydraulic system at Castello del Tartaro. The operational sequence we came up with in order to attain a suitable landscape for the simulation will hopefully be a useful asset in the future, whenever a reconstruction of the current terrain in rural areas will be needed. Finally, the virtual simulation allowed us to run an experiment on the whole system and, thus, to better understand the functionality of the SAM, which proved to work as both an embankment (moreover, its lateral drainage channels could have acted as further protection for the most depressed areas) and a connection. In this perspective, the SAM definitely appears to have been the output of an integrated risk- and uncertainty-management strategy aimed at implementing a locally sensitive double functionality of connectivity (road) and land-use protection (embankment).

As for the wider debate about the social and political implications of similar large-scale connective/hydraulic networks in the past (and in the ethnographic present), the SAM and its related infrastructure at "landscape resolution" seem to have acted as a paradigmatic icon of Scarborough's (2003) neo-Wittfogelian "flow of power" hypothesis. In fact, the proposed scenario appears to be in line with the suggested status of "emergent complexity" with regard to the local polity (De Guio, Balista, et al. 2015) and its expected capability to hierarchically mobilize (from the top down) the huge amount of labor necessary to construct and maintain the highly engineered landscape. This compels us rather sadly to put aside, at least for our case study, the more seductive bottom-up counter-hypothesis so heartily advanced by Erickson (2009) on the basis of his extraordinary ethno-archaeological research and commitment to the noble domain of the archaeology for development. Here, in the Valli Grandi Veronesi Meridionali, a massive infrastructure such as the SAM more likely reflects a top-down power hierarchy typical of Italian protohistory.

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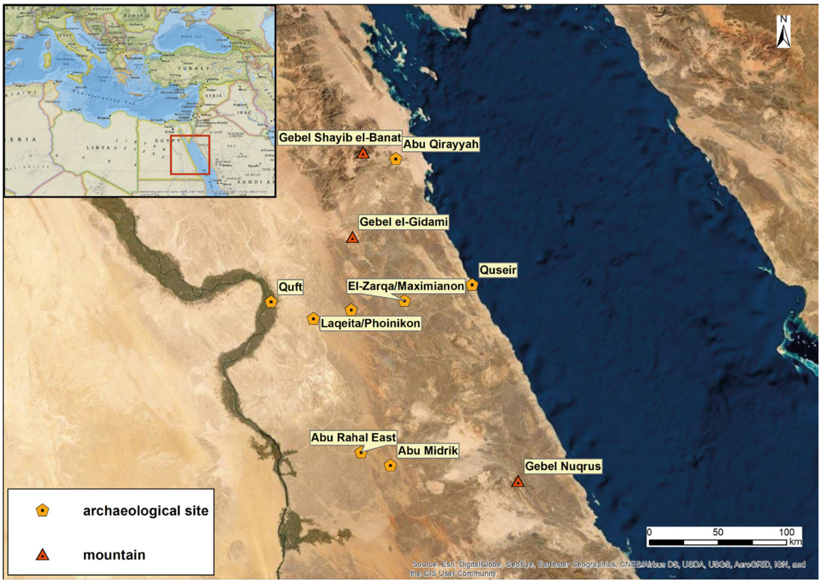


**Figure 1.** Location of sites in the Eastern Desert mentioned in the text. Imagery courtesy of Esri. © Desert Networks and L. Manière.

# Chapter Nine
# Roads in the Sand: Using Data from Modern Travelers to Construct the Ancient Road Networks of Egypt's Eastern Desert

Maël Crépy, Louis Manière, and Bérangère Redon

The Eastern Desert of Egypt is a hyperarid desert with significant temperature variations; its western part, made up of Nubian sandstone, is sandy and low in altitude (Figure 1). After approximately 100 km, this is abruptly replaced by a rocky or mountainous landscape that extends to the Red Sea (Harrell 2022; Hume 1907). Like all margins of Egypt, the Eastern Desert has always been considered an ambivalent territory. It is reputed to be inhabited by dangerous magical powers, wild animals, and dreadful nomadic populations. However, in spite of its dangers and aridity, the Eastern Desert was identified very early on as being richly provided with natural resources, including gold (Faucher 2018; Klemm and Klemm 2013) and hard stones of great value. Finally, because of its position, the Eastern Desert is also an interface between several worlds: it links Egypt to Nubia, and, above all, it provides access to the Red Sea and to the Arabian, African, and Indian worlds (De Romanis 1996; Gasse 2012; Sidebotham 2011). The peak of regional occupation occurred during the New Kingdom (second half of the second millennium BCE) and the Greco-Roman period (Cuvigny 2003; Gates-Foster 2012). The rulers of that period invested massively in the region, founding quarries and mines and creating a network of roads and fortified wells (Cuvigny 2013; Redon 2018), as well as several harbors. The Eastern Desert has been explored for almost three hundred years by scholars, and hundreds of ancient sites have been identified. Their exploration has yielded a tremendous amount of archaeological and written material (Brun et al. 2018; Sidebotham and Gates-Foster 2019).

The project "Desert Networks: Into the Eastern Desert of Egypt from the New Kingdom to the Roman Period," funded by the European Research Council, was launched in November 2017. It aims to study the ancient networks of the region based on the assumptions that one person cannot cross the desert alone and survive and that sites and people were likely to have been interconnected. Three main networks are considered: physical, economic, and social. As for the first, the ancient tracks of the Eastern Desert have hardly been studied at all—no doubt, paradoxically, because the waypoints they connect are well known, at least for the Roman era: the ancient *itineraria* give very precisely the names of the stops and the number of kilometers between them, so it has not been considered useful to locate the tracks themselves. As a result, maps of the Eastern Desert show only fairly linear paths (Meredith 1958) that ignore geography, the location of environmental resources such as water, and other natural constraints including those related to the physiological characteristics of camels—the desert vessels and major medium of transportation in the Egyptian deserts from the mid first millennium BCE (Agut-Labordère and Redon 2020) to the twentieth century CE (Crépy and Redon 2020). However, the *itineraria* only provide information about the networks at specific points in time, so their duration of use is uncertain, and the networks may have been much more mobile (in time) and complex (in space, with secondary routes). Some sites thus exist outside the main roads that have been represented traditionally, and it is essential to understand how they fit into the ancient network.

To go beyond these classical representations of the movement of people in the Eastern Desert, the Desert Networks project has worked on a more integrated reconstruction of the ancient paths using a theoretical model, 3D data, and also empirical data—in particular, the large quantity of information available in the many accounts of modern travelers. This multidisciplinary method is a consequence of both the work conditions specific to Egypt and the objectives of our project. This article aims to describe the stages taken in constructing our model in order to show how travelers' and early scholars' accounts can be used to calibrate least-cost path functions. We then present two case studies using this approach: a study of the least-cost path network of the Coptos–Myos Hormos road and an analysis of the route between the Ptolemaic forts of Abu Rahal and Abu Midrik. In a broader view, this model—whose approach is reproducible and transferable to other regions—will make it possible to calculate the durations and routes used for desert crossing more precisely and to question the dynamics of occupation of the Eastern Desert. It also provides crucial insights for future archaeological surveys.

## From Empirical Modern Traveler Data to Ancient Network Reconstruction

### *Path Determination Modeling through Least-Cost Path Analysis*

Least-cost path analysis is a spatial method for finding the best way for a traveler to cross a territory from one place to one or multiple destinations, and it is used in archaeology either to find ancient routes or to evaluate route accessibility (for an overview of archaeological route modeling approaches, see Verhagen 2018; Verhagen et al. 2019). The "best way" is defined as the path with the lowest cost of travel. This analysis can be done through a network as well as with a cost raster as an input, where each pixel represents the effort to cross that cell. The usual method is to classify and weight several raster data layers—each with different values that affect movement—into an overall cost raster. The main objective is to define the factors affecting travel, according to its restrictions, and then map it out. This cost raster is used to produce an accumulated cost surface or cost distance raster using geodesic distance. Then a least-cost path algorithm is used to identify the best way to link the nodes that are being analyzed.

Several difficulties arose when we first applied this traditional approach to reconstructing the Eastern Desert's roads. The climatic and environmental conditions of the area are very specific with many natural constraints, as are the means of transportation: most transportation was done with camels at least from the Greco-Roman period, and the use of these animals requires particular practices and environments. Furthermore, the project is seeking a level of precision that cannot be achieved via traditional approaches in order to develop a model that can lead our team's future surveys. In order to refine the quality of our model, we decided to incorporate empirical data taken from a very rich corpus at our disposal: travelers' accounts. By identifying the factors that influenced their itinerary choices while crossing the desert—notably, in an environment and under practical conditions that have not changed very much since antiquity—we asserted that these factors can be used to calibrate the function and reconstruct the ancient paths.

### *Traveler and Spatial Data*

This study is based on three main types of sources: data from the Desert Networks' spatial database, a 25-m resolution digital elevation model (DEM) based on Shuttle Radar Topography Mission

**Table 1.** The accounts of travelers and modern scholars used to build or assess the model.

| Author | Date of publication | Date of the journey | Aim of the journey | Used for |
|---|---|---|---|---|
| Denon | 1802 | 1799 | Military operation | Control |
| De Rozières | 1812 | 1799 | Military operation/geology | Control |
| Belzoni | 1820 | 1818 | Exploration/ archaeology | Time |
| Flaubert | 1910 | 1850 | Sightseeing | Control |
| Du Camp | 1860 | 1850 | Sightseeing | Control |
| Colston | 1886 | 1873 | Exploration | Time/route |
| Floyer | 1887 | 1886 | Exploration | Control |
| Couyat | 1910 | 1908, 1910 | Archaeology/ geology | Route |
| Bisson de la Roque | 1922 | 1922 | Exploration | Time/route |

(SRTM) 1 Arc-Second Global data,[1] and a set of travelers' accounts and maps dating back to the eighteenth, nineteenth, and twentieth centuries.

The Desert Networks project's geodatabase gathers data on the Eastern Desert that has been found in archaeological publications, topographic and geological maps, and travelers' accounts. It combines chronological, spatial, and descriptive data about archaeological sites (from the New Kingdom to the end of the Roman period), as well as data about mountains (*gebel*) and other natural features (passes and gorges), the hydrographic network (wadis), and watering places (natural or artificial basins, springs, wells; see Crépy and Redon 2022), offering a comprehensive reference for more than 1,600 natural and archaeological sites in the Eastern Desert of Egypt.

Empirical data about camel routes and travel conditions in the desert are taken from accounts of European and North American

[1] SRTM data is courtesy of the US National Aeronautics and Space Administration (NASA) and National Geospatial-Intelligence Agency (NIA) and processed by ATDI.

travelers and scholars who crossed the region in the eighteenth, nineteenth, and twentieth centuries and left a description of their journey. More than 60 accounts and several dozen maps relate to our study area, but not all of them are of sufficient precision to reconstruct the routes. For example, the account of James Bruce (1790), the first European to produce a detailed account of his journey in the region in 1769, is of little help due to the lack of continuity in place naming and because his descriptions are too vague and tinged with orientalism.

This is why, among this heterogeneous documentation, only eight accounts and one map were selected to develop, calibrate, and control our function (Table 1). These sources were chosen for their accuracy and reliability (i.e. they give distances, times, and many details that allow for the identification of a precise itinerary) and because they cover different types of routes and areas in the study region. The oldest trip under consideration took place in May 1799 (Denon 1802; De Rozières 1812); the most recent, in January 1922 (Bisson de la Roque 1922). The objectives of the expeditions in the Eastern Desert were quite variable (see Table 1), as were the logistical conditions: some were made up of very small groups (e.g. five people and five camels: Du Camp 1860; Flaubert 1910), while others were large caravans of over a thousand men and camels (Denon 1802). Depending on the aim of the journey, the expeditions lasted from three and a half days (the shortest time to cross the desert with camels) up to several weeks.

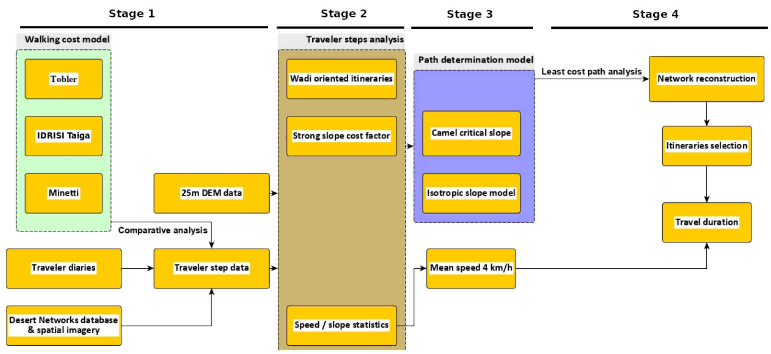


**Figure 2.** Conceptual scheme for data analysis and model design, from primary data to network output. © Desert Networks and L. Manière.

### *Path Determination Model Design and Network Reconstruction*

In the following paragraphs, our method and results will be detailed. The main stages are summarized in Figure 2.

- Stage 1: Plot the travelers' itineraries and extract a set of data on ancient sites; compute itineraries generated by three pedestrian cost functions. The resulting spatial data are analyzed with the help of GIS software (ArcGIS 10.5, QGIS 3.4, Google Earth Pro).
- Stage 2: Compare the itineraries generated by the pedestrian functions with the travelers' itineraries, determine the factors (including slopes influencing the travelers' choice of paths), and calculate the mean speed of the modern journeys. Calculate a critical slope for the travelers' itineraries.
- Stage 3: Create an isotropic slope function with the critical slope and via slope threshold calibration on travelers' itineraries.
- Stage 4: Reconstruct the networks of the sites in the Eastern Desert; identify the best itineraries; calculate duration from mean camel speed; compare with field data to assess the quality of the model at the regional and local scales.

## Stages 1–3: Modeling the Travelers' Path-Decision Factors

In order to conduct our analysis and highlight the criteria that prevailed in the choices made by travelers who crossed the desert, it was necessary to trace the precise routes they used despite sometimes disjointed or incomplete descriptions. To do so, we used satellite imagery, the Desert Networks' database, and topographic and geological maps to find landmarks (i.e. archaeological sites, modern settlements, or remarkable natural features) that the travelers described. Comparison with other accounts in the general corpus sometimes made it possible to refine or amend the routes through cross-checking.

The nine reconstructed itineraries were divided into steps, each step corresponding to a journey between two intermediate destinations within the itinerary. This method allowed us to assume that the traveler tried to find the best path during each step without being diverted by other specific sites or watering places on the way. The diaries provide qualitative data that describe the travelers' decision process during a step.

### *Comparisons between Travelers' Steps and Pedestrian Least-Cost Paths*

In parallel with the reconstruction of the travelers' itineraries, three well-known pedestrian least-cost functions were used to build least-cost paths for all the steps and itineraries considered in our study. The first was Tobler's hiking function—made by analyzing the Swiss military in temperate mountains (Tobler 1993)—which provides an anisotropic relationship between slope (gradient and inclination) and walking speed. The second was Minetti's anisotropic function—created by analyzing ten sportsmen walking—which observes the metabolic energy cost while walking in relation to the slope (Minetti et al. 2002). The third was IDRISI Taiga software, which provides an isotropic function between gradient and walking speed (although, nevertheless, it is important to note that the source of the data used to produce this equation cannot be found in the literature, but is referenced only in a footnote as personal communication about an example concerning cost-distance analysis in Nepal; see Schneider and Robbins 2009:Note 5).

The comparison between the least-cost paths built using these pedestrian least-cost functions and the paths the travelers followed in each of their steps is enlightening and interesting in several respects. Unsurprisingly, the pedestrian models—which were based

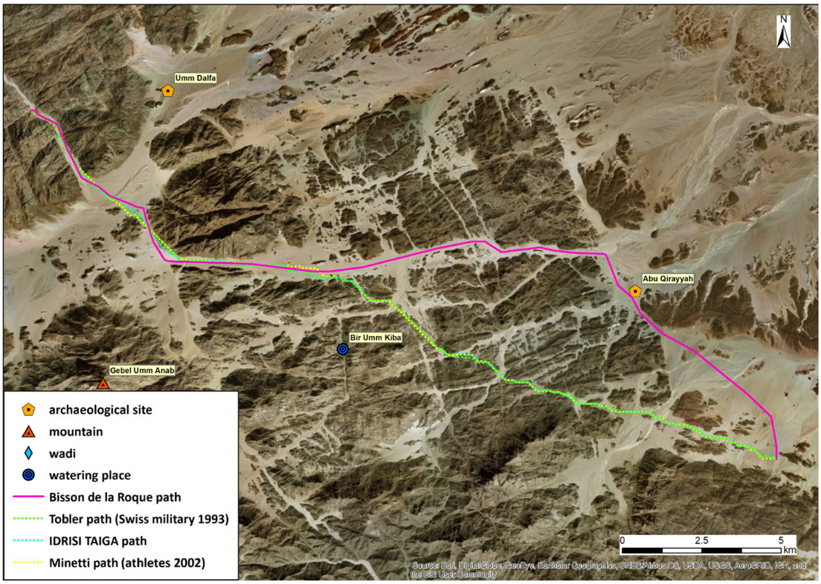


**Figure 3.** Comparison between Bisson de la Roque's journey and the least-cost path calculated using three modern least-cost-path functions based on pedestrian movement. Imagery courtesy of Esri. © Desert Networks and L. Manière, M. Crépy.

on present-day walkers equipped with modern orientation tools—are shorter paths than those of the steps reconstructed from the travelers' diaries (Figure 3).

This is easily explained by the two different modes of transportation and by the fact that the data on which the pedestrian least-cost functions are based are not from a desert environment. There is also a less sensitive slope factor for hikers, while heavily loaded camels are certainly more comfortable on gentler slopes. However, other factors should also be considered (see, for instance, Lewis, this volume or Murrieta-Flores 2014 for visibility; de Gruchy and Lawrence, this volume or Herzog 2014 for soil compactness, vegetation cover, etc.). In our study, one of the main factors that influenced the travelers' choice of paths was the great affinity that the travelers showed for staying in wadis (dry rivers), even if a shorter path with equally gentle slope was available, as evidenced in many of the accounts. For example, Cailliaud described a part of his journey as follows:

> We followed our way through several valleys; to the north, we left another major road to Qoceyr, on the Red Sea. […] A

> pyramidal masonry pile, placed on the top of the two mountains that border these roads, serves to distinguish them. The one on Mount Zabarah in the east is also marked in many places; without it, the rains destroying the fugitive traces left by the caravans, we would be lost at any moment and stopped by the mountains. Indeed, we believe we see gorges from afar with the appearance of a passage, we transport ourselves there, and we find them impassable [Cailliaud 1821:59; translation by M. Crépy].

The words of Floyer (1887:663) also shed light on the difficulties of orientation and the importance of the wadis:

> There is little to be seen that is not properly transferred to the itinerary. Down in a trough you rarely see far to the right or left. A glimpse now and then shows you nothing but hills, from which, if you try to select one as a landmark, you will be hidden by the next turn in the valley.

Similarly, Belzoni and his expedition—in need of water and food, and after the loss of several camels in previous days, probably from exhaustion—reached the site of Kanais by night by making a major detour to the east through the wadis; meanwhile, he reports seeing an ancient road that cut across a plateau and could have saved him 15 km (Belzoni 1820:344–345). Belzoni's choice was probably driven by the difficulties of orientation on the plateau (which corresponds to the area mentioned in Figure 10), especially at night, because the cairns indicating the path to follow are not easily visible in low-light conditions.

In addition to having gentle slopes and representing geographic references for orientation, especially during the night, the wadis provided a cohesive sandy or gravelly walking surface. This was also critical, as emphasized by Tregenza's (1955:4) description of walking in wadis: "It was not a straight walk, for both men and animals were winding a little as they avoided stones and surface irregularities."

### *Slope Factor Determination*

Two main factors that influenced the travelers' choice of paths—slope and orientation—emerged from comparing the traveler's step itineraries with the pedestrian least-cost functions. The slope factor appears to have been the more critical of the two.

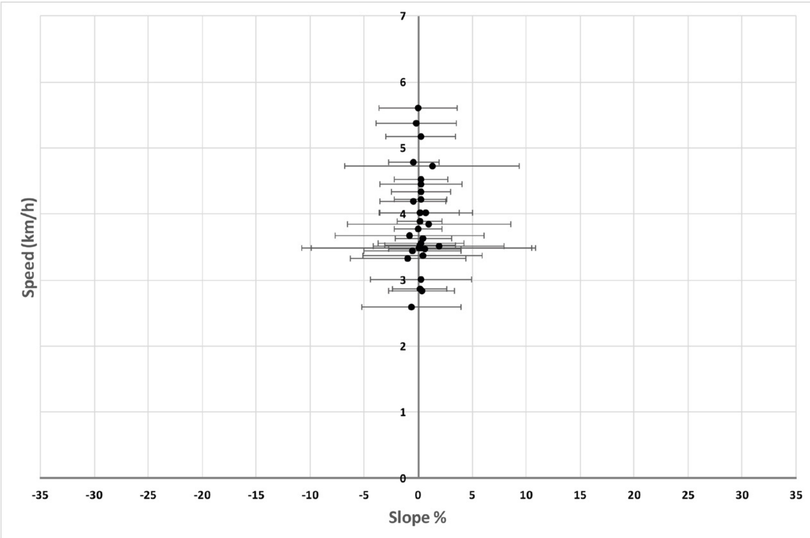


**Figure 4.** Relationship between mean slope and speed for the step travel models. Slope (in %) was extracted from a 25-m resolution DEM (based on SRTM 1 Arc-Second Global data) along 30 traveler steps. The average slope was used, with ±1.96 standard deviation or 95% of the values around the mean. © Desert Networks and L. Manière.

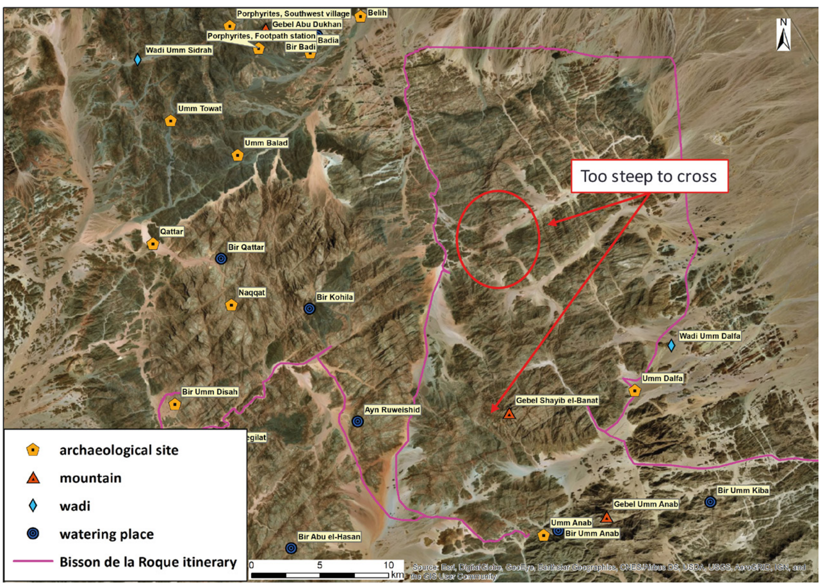


**Figure 5.** Bisson de la Roque's journey through the Gebel Shayib el Banat. Imagery courtesy of Esri. © Desert Networks, L. Manière, and M. Crépy.

Its effect on travelers' choices can be measured by calculating the slopes that the travelers crossed using a 25-m resolution DEM, extracting the slopes every 40 m along the travelers' paths. A very low magnitude of values is attested (Figure 4), with most slope values between +/- 5% and rarely beyond +/- 10%. This shows that the travelers stayed in flat areas as much as possible, even if it increased their travel distance and/or duration.

The journey of Fernand Bisson de la Roque illustrates very clearly the strong slope factor that emerges from reconstructing the travelers' itineraries, and it demonstrates how some slope restrictions greatly changed his path through the Eastern Desert. Bisson de la Roque was an archaeologist and explorer who was sent with a camel caravan to climb the Gebel Shayib el Banat, the highest point in the Eastern Desert. The terminal part of his ascent was planned without camels, as the slopes are very steep and the paths extremely narrow. Before that, he tried to reach the foot of the mountain with his camels, but he was forced to turn back on several occasions due to steep passes and having to make a very long detour to the north. Specifically, in reference to the al-Zarqa Pass (Figure 5), which seemed to be the shortest way he wanted to take, he wrote: "This descent does not seem practicable to me for a caravan" (Bisson de la Roque 1922:125).

Indeed, if the slope is too steep or the surface unstable, camels can slip, become injured, or even die, as mentioned by Gustave Flaubert, who made the trip from the Nile to Quseir in 1850 with Maxime du Camp, two guides, a translator, three riding camels, and two pack camels. In his account, he described seeing dead camel carcasses in a place that corresponds to one of the two steepest areas along the route he took during his journey, and he specified that they had to cross the pass by foot (Flaubert 1910:245). Regarding the passage of a difficult pass, Belzoni (1820:317) wrote:

> When we reached the top of the road, our camels were exhausted; some of them had fallen on the way, and were unloaded to enable them to ascend, and the strongest camels had to return to fetch the loads of the others. I never saw the camels suffer so much on any occasion as on this. A steep and craggy road over a mountain is no more adapted to a camel, than the deep sand of the desert to a horse.

The importance of the slope factor is also shown by Ball (1912), a geologist and a particularly reliable informant, who thoroughly

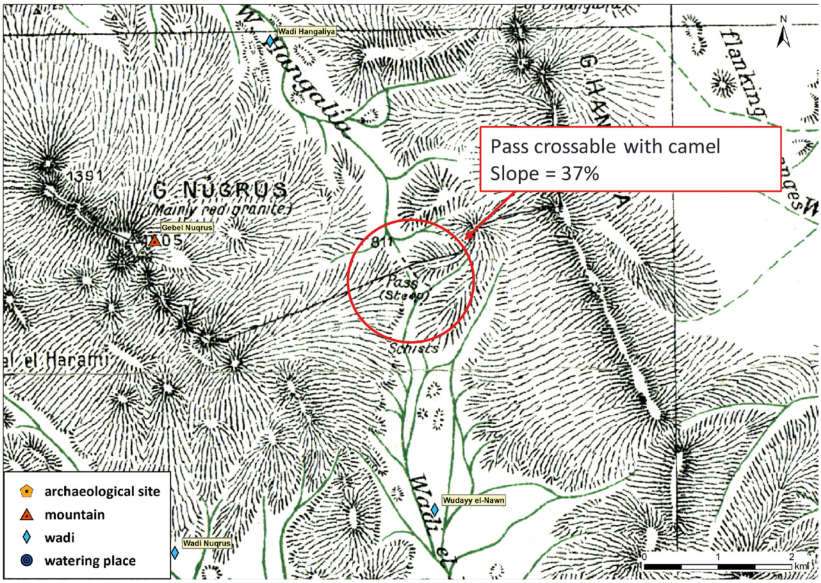


**Figure 6.** A pass through the Gebel Nugrus on Ball's (1912) map. © Desert Networks and L. Manière.

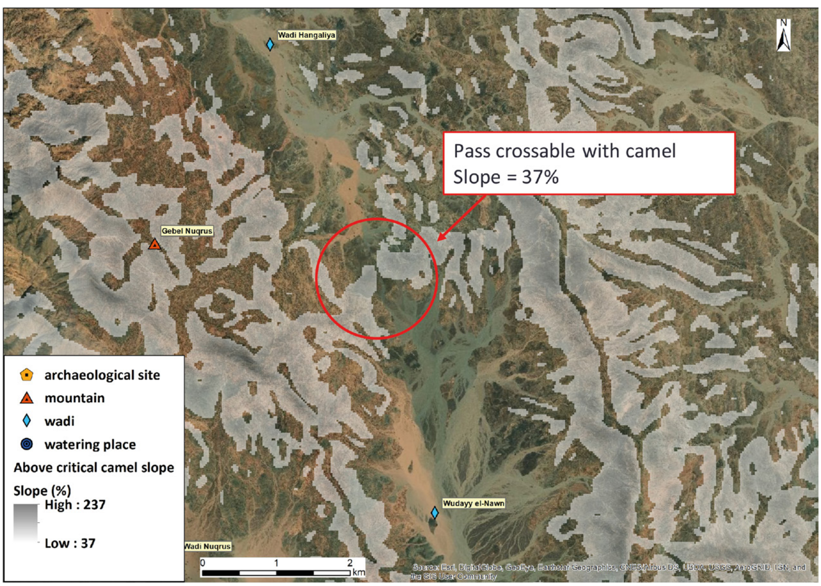


**Figure 7.** A pass through the Gebel Nugrus with slopes above 37% (the slope restriction for camels) highlighted in gray. Imagery courtesy of Esri. © Desert Networks and L. Manière.

surveyed the region over several months in order to draw topographic and geological maps. Traveling throughout the whole of the Eastern Desert with camels, he worked very systematically and covered each available track in his survey area. His camels were heavily loaded in the same way as the camels of the ancient caravans. On his maps, he precisely indicated the passes that could be crossed and the ones that caused difficulty (Figure 6).

From the steep slope restrictions noted in Ball's maps and drawings, along with the other accounts under study, the critical slope—that is, the slope beyond which camel caravans cannot travel—can be deduced as 37% (Figure 7).

### *Mean Speed Calculation*

It is possible to calculate the speed of each step in the itineraries and the mean speed of all the itineraries (see Figure 3) as 3.9 km/h +/- 1.45 km/h. Because of the spatial scale of the steps (each being several kilometers long) and the fact that the travelers avoided steep terrain, it is impossible to go further and estimate the speed for each slope value, since a mathematical model cannot be fitted between speed and gradient. Nevertheless, the mean speed we calculated is consistent with other sources from modern scholars and travelers about camel speed:

- Barron and Hume (1902:3–4), two geographers who surveyed and mapped a huge part of the Eastern Desert, explained that, when their measuring wheel was out of order, they measured distance via a time scale using a camel speed of 4 km/h. The accuracy of their maps shows the quality of this method.
- Bisson de la Roque (1922:113) mentioned the mean speed of his camels as 1 km per 15 minutes (i.e. 4 km/h).
- Tregenza (1955:4) wrote: "Loaded camels move slowly, at about two and a half miles an hour, and that would be our speed for the next three months." This rate corresponds to 4.023 km/h.

The same range of values has also been found in more recent scientific publications, with the speed of pack camels ranging from 4 km/h (camels from Mauretania and India) to 5 km/h (camels from Pakistan and Kenya; see Schwartz 1986:Table 5).

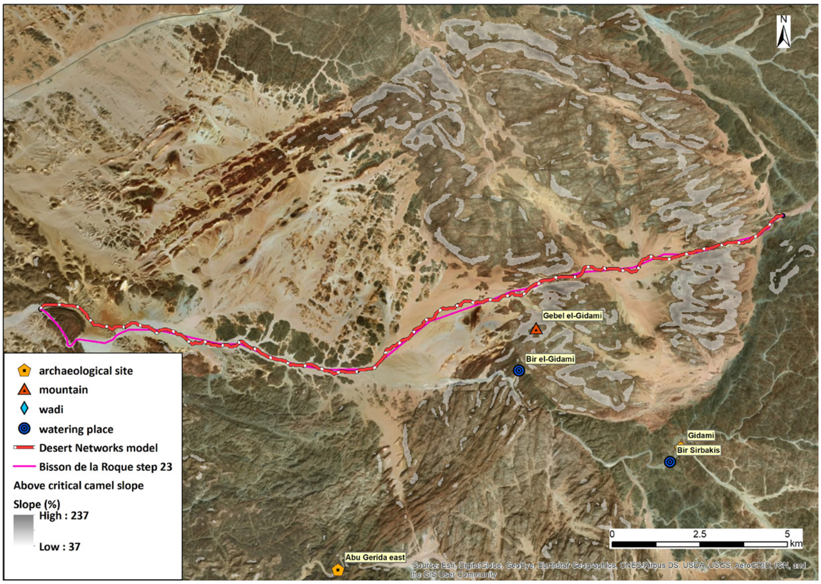


**Figure 8.** Example of slope-based cost function calibration of Bisson de la Roque's survey in the area of Gidami (step 23). Imagery courtesy of Esri. © Desert Networks and L. Manière.

## *Design of the Path Determination Model Based on Slope*

Finally, having extracted slope and speed data from the travelers' accounts, the next stage in building our slope-based model was to create a slope/speed model for camels. However, as already stated, this cannot be done directly, since our data are at the scale of the itinerary steps and not the pixel due to the low resolution of our DEM (25 m). Therefore, the cost for each slope interval threshold was adapted to fit the dataset of traveler's paths using a trial-and-error process for each least-cost path computation (Figure 8). Nine steps were used for this calibration (which is still ongoing), which enabled our cost value and slope interval thresholds to gradually become more accurate and better fitted with the travelers' dataset. It should be stressed that by applying this very empirical method, the computational cost is unitless and is more a relative cost than an absolute one; thus, the route produced by a least-cost path computation based on this model is more the result of a decision process than a way to minimize time or effort. Also, it is important to note that this method is limited by the resolution of the DEM and the accuracy of the step reconstruction, which is at the wadi scale. To determine if the path calculated by the least-cost path analysis from cost and slope interval thresholds is valid, the output path should follow the correct valley without taking into account the variability inside the wadi.

In the slope calculation, and despite the fact that our slope function is isotropic, we chose to give weight to the orientation of the slope. In the case of an anisotropic slope function, the gradient is computed with the azimuth to establish the slope orientation and apply the appropriate cost. We thought it would be crucial to apply the same process in an isotropic function even if the same gradient will produce the same cost regardless of the slope orientation. By doing so, if a position is considered at a certain altitude, the slope-based costs of adjacent cells will take this altitude into account when calculating the cost distance (therefore, the slope will not be calculated and classified before the cost distance is calculated). This method allows the computed routes to run along the slopes rather than forcing them through the thalwegs.

## Stage 4: Applications of the Desert Networks' Least-Cost Path Model and Initial Results

### *Network Reconstitution*

Once the cost and slope interval thresholds are calibrated, a network can be built by iterating the least-cost path computation (our model uses Dijkstra's [1959] least-cost path algorithm) through all the nodes in consideration: that is, the archaeological sites and watering places listed in the Desert Networks' database.

By creating a network, instead of linking only from a departure point to a final destination, intermediate nodes such as watering places (which are critical in the desert) are taken into consideration to reconstruct the roads. Indeed, these waypoints are essential elements in the reconstruction of paths; however, this point-type spatial data cannot be integrated into a cost raster. The network method also makes it possible to represent different possible routes between a source and a destination. It provides a way to calculate and visualize all the alternative itineraries between two nodes by considering all the sites known during a certain period.

The analysis of the network and the selection of intermediate nodes for modeling a specific route ensured a broader understanding of the choices that the caravans had in realizing their route.

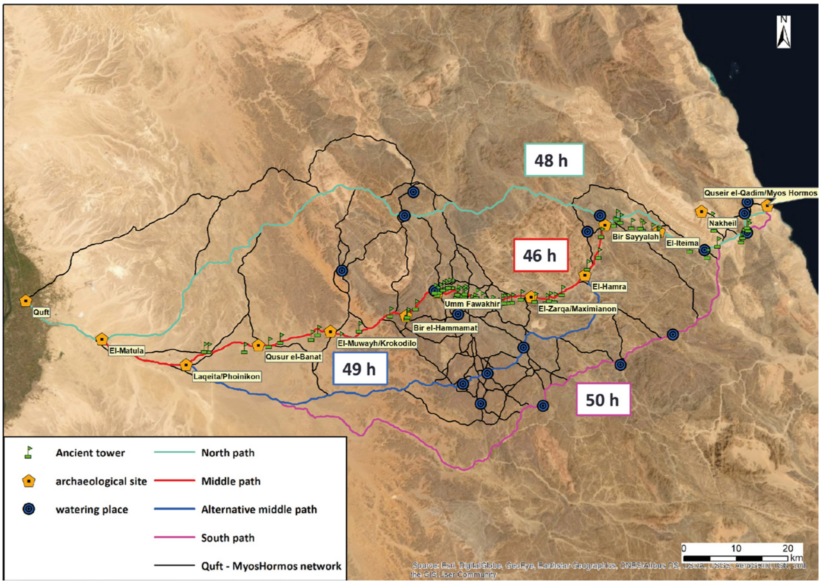


**Figure 9.** Network reconstitution by least-cost path iteration between sites from Quft (ancient Coptos) to Quseir el-Qadim (ancient Myos Hormos). Imagery courtesy of Esri. © Desert Networks and L. Manière.

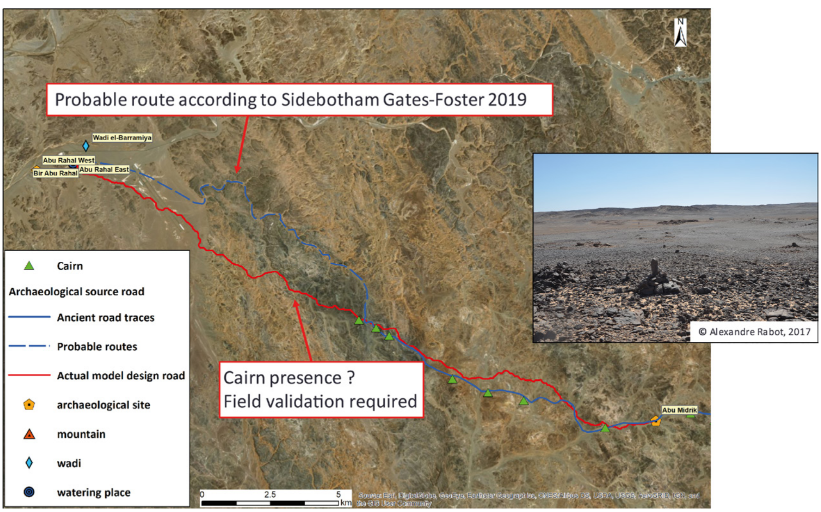


**Figure 10.** Comparison between the modeled path and route retraced from fieldwork between Abu Midrik and Abu Rahal. Imagery courtesy of Esri. Photograph by A. Rabot, Mission Archéologique Française du Désert Oriental. © Desert Networks and L. Manière.

### *Ancient Road Reconstruction: The Coptos–Myos Hormos Roman Road*

To assess the quality of the newly created model, we chose to work on the road between Quft (ancient Coptos) and Quseir el-Qadim (ancient Myos Hormos), which is particularly well known and was heavily used during the Roman period (Figure 9). The network links watering places from all periods (but many of them are ancient or at least show the presence of available water in the area) and Roman archaeological sites, which also include watering places. The green flags correspond to towers that are not well dated (Brun et al. 2003) and were thus not considered as sites when building the network. Each journey's duration is calculated using 3.9 km/h as the mean traveler speed.

Four itineraries can be identified in the network generated by the model: departing from Quft, they each follow different paths into the mountains, but they all exit via the same gorge (where the natural spring of Ayn el-Ghazal is still flowing today) in the Wadi el-Ambagi, at the end of the trip to Myos Hormos. The path marked in red (the middle path) is the fastest and corresponds with the route of the Roman road that has been generally reconstructed by archaeologists and historians (Brun 2018; Cuvigny 2003). The towers are all located along this itinerary, and thus there is a good chance they were Roman; they were probably there to guide and secure travelers along the road during the apex of its utilization. The other paths show alternatives with slight differences in travel time. At least two of them (the purple [south path] and blue [alternative middle path]) were used by the travelers included in our study, as well as by pilgrims or merchants going to Mecca in modern times (Bruce 1790:169–203; De Rozières 1812:84–86). The modeled travel durations fit quite well with the durations mentioned in travelers' accounts that were not used to build our model but rather to assess it, which indicate Quft–Quseir journey durations ranging from 41 to 46 hours (Denon 1802:188, 41 hours and 55 minutes; De Rozières 1812:91, 42 hours and 30 minutes; Flaubert 1910:253, 45 hours and 30 minutes from Qena to Quseir, and 41 hours and 15 minutes from Quseir to Qena via a shorter road).

### *Finding an Alternative Route*

After testing the accuracy and quality of our model on a regional network, a second test was carried out on a local network (Figure 10), focusing on an ancient route between the sites of Abu Midrik and Abu Rahal that was recently retraced via survey by S. E. Sidebotham and

J. Gates-Foster (2019:Figure 3.178). The first half of the road's path is secured by the presence of cairns that guided travelers. The second half, however, is absent of cairns; thus the archaeologists proposed that the road would have followed a large wadi toward its final destination of Abu Rahal.

A least-cost path was calculated with our slope-based cost model between these two locations. It reproduces quite well the first part of the road, where the cairns were spotted by the archaeologists. After the last cairn, however, it takes an alternative path that is straighter and shorter and does not follow the large wadi that could have helped orient travelers. This path will be explored in the future to look for cairns or other remains that may have been missed by our colleagues in order to validate whether this was an actual or purely hypothetical road.

## Discussion: Limitations of the Desert Networks' Model and Future Improvements

Our method has several limitations or biases that are important to mention; however, it also has several advantages when compared to classical least-cost path models. Firstly, it may seem that the accounts of travelers and modern scholars are too anecdotal, imprecise, or unstructured to produce meaningful results or usable data for modeling ancient roads. However, on the condition that they are studied according to a systematic method and compared with sufficiently exhaustive geographical data (e.g. toponyms, geology, topography) and that caution is exercised with regard to orientalist trends, they are of great value for conducting a detailed analysis of routes and for highlighting the criteria that led travelers to choose those routes. Cross-referencing several accounts that span more than a century constitutes a significant element of reliability, in the sense that they allow us to distance ourselves, at least partially, from the *topoi* relative to a period—or at least to identify those *topoi*.

Secondly, taking into account the factor of water resources and the sites that could potentially be visited during a step requires considering all the sites and water points during path modeling. However, among these nodes, watering places are particularly problematic. It is very difficult to evaluate their age and decide whether they were in use during antiquity or not, since they have yielded few archaeological materials and have had fragmented phases of exploitation. The springs and wells used in the modeling of ancient networks are extracted from 1:50,000 and 1:250,000 topographic maps (Egyptian General Survey Authority 1989–1990 and US Army Map Service 1953–1960, respectively). Many of today's watering places are ancient wells that have been rehabilitated recently. For example, Murray (1955:175–176) mentioned a well in Wadi el-Sidd that was dug by Seti I (end of the second millennium BCE) and reopened in 1905 to supply workers from a neighboring mine. It might not have been exactly the same well, but it is in the same area, and the modern workers only needed to clear the well to use it. Moreover, some wells situated at Roman stations were still in use in the nineteenth century (De Rozières 1812:85–86; Du Camp 1860:267), and it was still usual to look for a well in the center or vicinity of ancient stations during the mid twentieth century (Tregenza 1955:228). Since it is much simpler and safer to clean an old well than to create a new one, this practice is not surprising. However, it implies the assumption that these areas have had a constant groundwater resource over time. In other words, while not all the ancient wells dating to the periods of study have been found, contemporary maps locate some of them as well as other zones that may have been exploited for their water resources (e.g. surface water in natural basins, or underground water from springs and wells). This method makes it possible to link sites that were occupied during a certain period with water supply locations that were potentially in use. These watering places would have been exploited or abandoned depending on the use of the network roads.

Most of the difficulties, both for travelers crossing the Eastern Desert and for route reconstruction and modeling, are concentrated in the Red Sea Hills to the east of the region. The topography of this area includes narrow passes and gorges that constitute a challenge in implementing the model and introduce a significant bias in its results. Indeed, a pass or gorge must be at least 50 m wide at all times in order for it to be represented accurately in the 25-m resolution DEM; any passes with points narrower than this can appear closed and, therefore, are not treated as viable routes during the path calculation. The use of a DEM with a higher resolution would partially compensate for this problem, but it also would have the disadvantages of considerably lengthening processing times and generating more noise in flatter areas.

Currently the Desert Networks' cost model is based exclusively on slope. Calibrated with data from modern itineraries, it generally produces routes that follow low slopes that are particularly well adapted to loaded camels. However, in some areas where the modeled route cuts through valleys across more rugged areas where the surface is composed of bedrock or coarse sedimentary deposits, other factors need to be considered. Among the possible criteria for determining paths, the slope factor alone cannot represent the constraints of orientation and surface conditions that encouraged travelers to follow the sandy wadis. A new cost layer weighted with the slope that distinguishes sand/gravel material surfaces from bedrock or coarse sedimentary areas will be built to integrate the wadi-tracking factor. Satellite image processing by remote sensing tools and theoretical hydrographic networks will be used in the classification of these areas.

One of the other main limitations of the method is related to the resolution of route reconstruction, possible restitution errors, and the imprecision of written sources on certain points. For example, it is impossible to determine which exact path was taken in the riverbed of a large wadi, as some of them are several kilometers wide. Similarly, it is not always possible to know by which side a modest topographical obstacle was circumnavigated, or which path was used to climb a pass when several choices were possible. Finally, in very flat areas with few landmarks, the reconstruction of routes is less precise. Fortunately, the multiplicity of sources makes it possible to obtain general rules about route selection despite the impossibility of reconstructing to perfection each of the routes followed by individual travelers. This is generally not a problem at the scale of analysis that is generally used for this type of study (and that is used in the case of the Desert Networks project). In any case, the geomorphological evolution of the area between antiquity and the present day—and the impact it may have had on local topographical changes—makes any more detailed modeling illusory.

To conclude, as it stands, and despite the limitations and biases listed above, the newly created model of Egypt's Eastern Desert, although perfectible, already opens up many new research avenues—in particular, for a finer analysis of the sectors where the ancient road that has been reconstructed from archaeological remains diverged from the modeled least-cost route. It will help us to identify factors not linked to slope or surface conditions that have influenced the route layout, such as the presence of unknown resources, sites that have escaped detection by archaeological survey, and so on. The modeled routes will also guide the Desert Networks project's next field surveys in search of new sites or roads, particularly more discreet archaeological sites with fewer built and inscribed remains (for examples, see Manière et al.

2021a). The least-cost path analysis tool developed within the framework of the project and the complete dataset (Manière et al. 2020, 2021a), as well as a data paper specifying its development conditions (Manière et al. 2021b), have been published in order to allow for wider use. The Python scripts—also available as ModelBuilder models for ArcGIS 10.5—can thus be applied to other regions where pack camels were the main mode of transport if the environmental, topographical, and geomorphological conditions are similar to those of the Eastern Desert of Egypt, particularly in some mountainous areas of the Arabian Peninsula, the Levant, the Maghreb, and Central Asia. However, it is preferable to create a local validation dataset based on travelers' accounts or other sufficiently detailed data sources in order to adjust the parameters. In order to apply it successfully, the archaeological data must be sufficiently developed to constitute the elementary nodes of the network and to offer opportunities for assessing the validity of the modeled network.

In a broader view, this chapter demonstrates the importance of taking into account the means of transportation and its specificities when applying least-cost path analysis (a point that is also emphasized by de Gruchy and Lawrence, this volume). It also shows that the accounts of travelers and early scholars, numerous in every part of the world, make it possible to document and take into account these specificities with sufficient finesse to succeed in creating valid route networks. While the model we have developed for camels in the Eastern Desert can only be applied to certain regions under similar conditions and with similar pack animals, the approach and process of its development can be applied almost everywhere in the world and to any kind of transportation that was still in use in the last few centuries.

*Acknowledgments*

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# Chapter Ten
# Seeing While Moving: Directon-Dependent Visibility of Bronze Age Monuments in the Cumbrian High Fells, England

Joseph Lewis

Mobility is both vital and all-pervasive in the learning and structuring of the world around us (Bender 2001a:4, 2001b; Gori et al. 2019; Ingold 2004; Ingold and Vergunst 2008; Leary 2014a; Sheets-Johnstone 2011), with movement no longer seen to occur in a static landscape devoid of social meaning (David and Thomas 2016a:25–92; Tilley 1994). Instead, places and spaces within the landscape are viewed as dynamic participants in human behavior (Bender 1993; Branton 2009; David and Thomas 2016b; Gramsch 1996; Ingold 1993; Knapp and Ashmore 1999; Thomas 2001; Tilley 1994, 2004), influencing the social structure in which the identity of its users is defined (Ingold 2004; Tilley 1994:31, 34, 41, 1996). Despite the importance of both place and space, movement in the space between places is rarely discussed outside of phenomenological studies (e.g. Thomas 1996, 2001; Tilley 1994, 2004), with place given precedence (Anschuetz et al. 2001; Bowser 2004; Bradley 1998, 2000; Branton 2009; Casey 2016; Frederick 2014; Gramsch 1996; Ingold 1993; Leary 2014a:4, 2014b; Thomas 1996:83–91; Tilley 1994:18). However, as noted by Tilley (1994:27–30), movement through the landscape contains traces of past activities, with paths establishing and maintaining social linkages between individuals, groups, and political units. Therefore, by not studying movement in the space between places, the archaeological record is prone to be viewed as static (Leary 2014a, 2014b; Roughley 2004), rather than emerge as the perceiver moves within the world (Goetsch and Kakalis 2018; Ingold 2011:168).

This emphasis on place over space is particularly present in visibility studies that use geographic information systems (GIS; Bender 2001a; Llobera 1996; van Leusen 2002:6.1–16; Wheatley 2014; Wheatley and Gillings 2000). Through this, the observer is situated within the landscape, standing back from the thing observed (Bender 2001a), and inheriting a privileged god-like view in all directions (Llobera 1996;

Thomas 1993; Trick 2004; Wheatley and Gillings 2000). This is most evident from the prevalence of GIS-based visibility studies that assess the visibility from fixed places within the landscape (e.g. Fisher et al. 1997; Kantner and Hobgood 2016; O'Driscoll 2017). Although it has been argued that GIS-based visibility studies can be "humanized" by including phenomenological approaches to understanding landscapes (Gillings 2009, 2015; Llobera 1996, 2003, 2006; Llobera et al. 2010; Murrieta-Flores 2012, 2014; Roughley 2004), its application has not focused on how humans visually experienced the landscape whilst *moving* in the space between places (e.g. Bell and Lock 2000; Gearey and Chapman 2006; Lock and Pouncett 2010; Murrieta-Flores 2014). Landscapes continue to be viewed as *containers* for action rather than as the *medium* in which human practices and meanings are developed.

This research proposes the GIS-based "direction-dependent visibility" to overcome the abstraction of landscapes as containers for action. By limiting the potential visibility to the confines of humans' field-of-view when moving in the space between places, the application of GIS for understanding visibility is "grounded," with the focus being on how people in the past visually experienced the landscape and its features whilst moving within it rather than from fixed places beside it. Using the Cumbrian High Fells, England, as a case study, this paper assesses the direction-dependent visibility when moving along least-cost paths calculated between cairnfields. These results will be compared to the more traditional viewshed analysis, allowing for discussion of how direction-dependent visibility can provide a more nuanced understanding of the landscape in which movement occurs.

## Background

### *Prehistoric Cumbria*

Occupied by humans since ca. 11,000 BCE (Barton 2009; Gale et al. 1985; Pettitt and White 2012; Salisbury 1988; Wymer 1981), Cumbria has yielded archaeological evidence for settlement from the Mesolithic period onward (e.g. Cherry and Cherry 1987, 1995; Turnbull and Walsh 1997). However, few Mesolithic sites with human remains have been found in Cumbria, with the majority of evidence coming from lithic scatters (Hodgson and Brennand 2006; Milner and Mithen 2009:37) and paleoenvironmental data (e.g. Mellars 1976). The lack of physical evidence for domestic occupation continues for the Neolithic (Cummings 2017:181; Thomas 2004), with the period being distinctive for its axe trade and large number of monumental

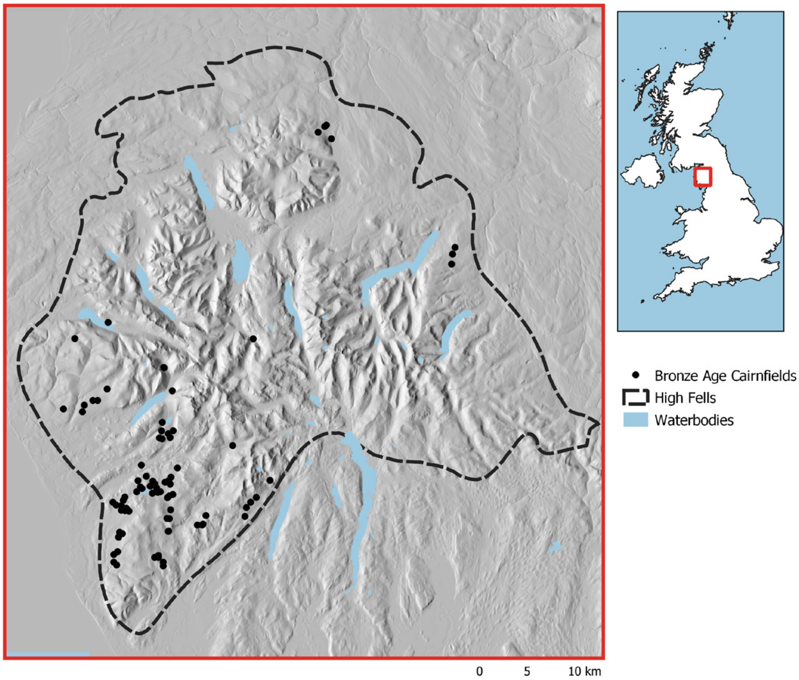


**Figure 1.** Study area of the Cumbrian High Fells, showing the Bronze Age cairnfields.

structures (Bradley and Edmonds 2005; Burl 1976, 1988; Clare 2007; Claris et al. 1989; Edmonds 2005; Waterhouse 1985). The Bronze Age continues to be typified by monumental structures (Clack and Gosling 1976); however, permanent settlements are now being developed (e.g. Richardson 1982; Young and Simmonds 1995). Furthermore, woodland clearance increases, with the development of field systems that divided land between social groups (Evans 2008).

### *Bronze Age Cairnfields*

Bronze Age cairns in Cumbria are well represented in the archaeological record (Clack and Gosling 1976; Evans 2008:149; Hodgson and Brennand 2006:41; Johnston 2000). Although reductionist in its description, cairns are piles of stone in the landscape, with closely spaced cairns constituting a cairnfield. The interpretation of their construction and meaning has centered on whether they resulted from the occupational practice of upland clearance that occurred during agricultural activity, or whether they are funerary monuments that signify "family" groups that established and asserted rights to land (Barnatt 1999; Darvill 2014; Fleming 1971; Johnston 2000, 2001).

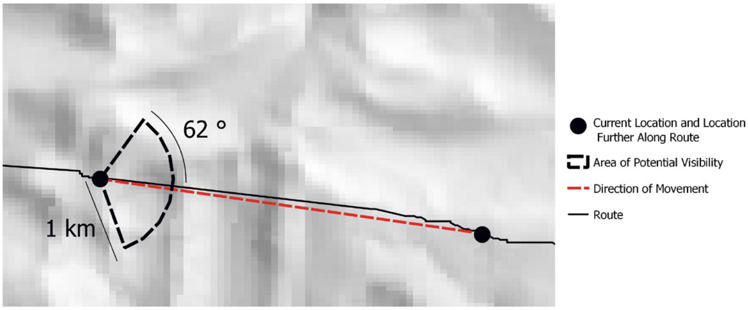


**Figure 2.** Calculation of direction-dependent visibility when walking along a route.

## Data and Methods

### *Study Area*

The Cumbrian High Fells is situated in the north–central part of Cumbria, North West England, and is characterized by mountains, lakes, and valley systems (Figure 1). The locations of 84 Bronze Age cairnfields were identified from the Lake District National Historic Environment Record (HER) stored in the Archaeology Data Service digital repository. Furthermore, both visibility methods and the least-cost paths were calculated using the Ordnance Survey 50-m Digital Elevation Model (DEM).

### *Direction-Dependent Visibility*

By assessing whether there is an uninterrupted straight line of sight between two points, areas both visible and not visible can be identified (Wheatley 1995). Unlike traditional viewshed analysis, which calculates the visibility in all directions around a fixed point (Wheatley and Gillings 2000), direction-dependent visibility limits potential visibility to the confines of humans' field-of-view (Figure 2). The angle of movement from a current location to a location further along the route within the landscape was calculated. This angle represents the direction of movement that would be taken when moving through the landscape. In order to incorporate horizontal movement that emulates the movement of the head whilst moving through the landscape, a random value from a normal distribution (mean = 0, sd = 20) was added to the direction of movement for each step along the route.

From this, the potential field-of-view was limited horizontally to 62 degrees on either side of the direction of movement and represents the visual limit of human visibility (Tilley 2002).

The potential visible area was limited to 6 km from each location along the routes within the landscape, with an observer height of 1.65 m. This reflects the distance at which clarity of visibility begins to decay significantly (Ruestes Bitrià 2008), which is particularly important due to the weather in Cumbria often hindering visibility (Evans 2008:27). This process was repeated in both directions when moving along the routes within the landscapes. From this, the areas visible according to the direction-dependent visibility analysis when moving along the routes in both directions were cumulatively added and averaged to create a final visibility field.

*Cumulative Viewshed Analysis*

Cumulative viewsheds were also created by calculating and summing the areas visible within 6 km from each of the cairnfields within the High Fells. From this, areas of the landscape visible from the cairnfields were identified and compared against the direction-dependent visibility results.

*Movement between Cairnfield*

Like other prehistoric tracks (Taylor 1979), the location of the tracks between the Bronze Age cairnfields are unknown. In order to identify potential routes of movement in the landscape, least-cost paths (LCPs) were calculated between cairnfields. LCP analysis identifies the path of least resistance by calculating the optimal connection between locations based on distance and the cost needed to cover the distance (Verhagen and Jeneson 2012). The cost of traveling in a landscape is often based on environmental variables such as slope (Surface-Evans and White 2012). As the Cumbria High Fells is mountainous, a slope-derived cost function was included as a cost. The difficulty of moving across slope was calculated using the Modified Tobler cost function (Márquez-Pérez et al. 2017), which combines Tobler's hiking function (Tobler 1993) and the Método de Información De Excursiones (MIDE), a method for calculating walking hours for an average hiker (París Roche 2002). Furthermore, movement across the waterbodies were prohibited in the LCP calculation. To decrease the number of LCPs calculated, cairnfields deemed to be connected were limited through the use of a Gabriel graph (Groenhuijzen and Verhagen 2017), resulting in 121 LCPs.

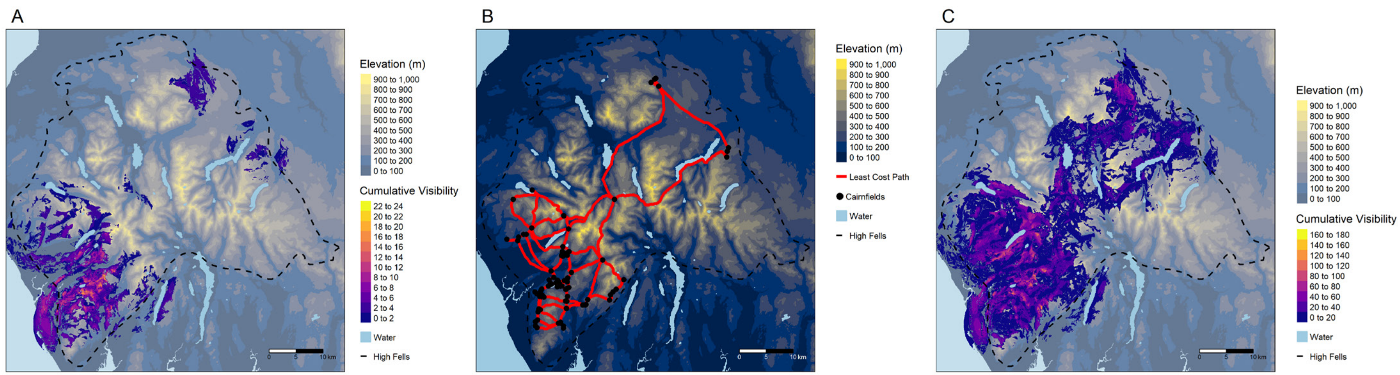


**Figure 3.** (A) Viewshed analysis from the cairnfields; (B) least-cost paths calculated between cairnfields; (C) direction-dependent visibility when moving along the least-cost path routes between cairnfields.

## Results and Discussion

### *Visibility from and between the Cairnfields*

The cumulative visibility of the High Fells landscape from the cairnfields using traditional viewshed analysis has identified that the majority of the landscape is not visible. This is in contrast to the visibility of the landscape when direction-dependent visibility is calculated along the least-cost path routes between cairnfields. More specifically, only 8.5% of the High Fells is visible within 6 km of the cairnfields (Figure 3A), in comparison to 22.6% when calculating visibility along the least-cost path routes (Figure 3C).

In particular, the maximum number of times that an individual cairnfield is visible when calculating visibility from all cairnfields using traditional viewshed analysis is 12. This is in contrast to the visibility of cairnfields when moving along the routes via direction-dependent visibility, with the maximum number of times being 75. Although the increase in visibility is to be expected—as the direction-dependent visibility calculates the visibility along the routes connecting cairnfields and, therefore, calculates visibility from more vantage points—it illustrates how calculating the visibility from the cairnfields using traditional viewshed analysis ignores the "grounded" perspective of moving within the landscape. Furthermore, this suggests that the cairnfields are prominent features and would have been visible often when moving within the landscape: in short, the cairnfields would have been emerging, present, disappearing, and re-emerging as the perceiver moved within the world.

Despite the advantages of direction-dependent visibility in incorporating the perceptual limits of humans' visibility when moving through the landscape, there are methodological issues in its application. First, and with particular relevance to this case study, is the fact that the routes connecting cairnfields were calculated using least-cost path analysis. Although its application was a necessity due to the lack of information about the routes taken between cairnfields, there are multiple issues that can affect the results: for example, the resolution of the DEM has been shown to have an impact on the location of the calculated LCP (Branting 2012; Herzog 2014); the calculation of the LCP assumes that there is only one route between locations (Branting 2012), ignoring the possibility of alternative routes (see Crépy et al., this volume); and the use of the Modified Tobler function assumes that the routes were chosen to minimize the time taken to travel between cairnfields. Due to this, it is important to remember that LCPs are idealized paths that may not represent the actual routes used by past peoples (Branting 2012). Secondly, direction-dependent visibility simplifies the experience of visibility whilst moving through the landscape by fixing the maximum field-of-view to 62 degrees on either side of the direction of movement. Although the method was “humanized” by incorporating a random value that represents the movement of the head, direction-dependent visibility does not incorporate factors such as fatigue from moving through the landscape that may result in the lowering of the head and, thus, a reduction in the visibility of the landscape. Furthermore, the application of direction-dependent visibility in this case study generalizes the experience of visibility when moving through the landscape to a particular instance: a 1.65-m tall person who can see a maximum of 6 km moving along LCP routes dictated by a mathematical function created from data of unknown provenance (Herzog 2013). Factors that can affect route selection such as age, health, fitness, body characteristics, and experience (Pingel 2010) are therefore ignored, leading to an understanding of visibility that is devoid of diversity (see Kalaycı, this volume).

Despite the aforementioned issues in LCP analysis and direction-dependent visibility, the High Fells case study has shown that the proposed method is a useful, complementary technique to the more traditional viewshed analysis from fixed locations within the landscape. Instead, direction-dependent visibility shifts the focus from place within the landscape to the space between places within the landscape. Through its application, a more nuanced understanding of visibility whilst moving through the landscape can be achieved.

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*Data Availability Statement*
Data and code are available at: https://github.com/josephlewis/Seeing-While-Moving-Direction-Dependent-Visibility.

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# Chapter Eleven
# *Viae Potentiae Per Oriente*: Imperial Self-Representation of the *Domus Licinia Augusta* (253–268 Ce) through the Latin Epigraphy of the Eastern Provinces

David Serrano Ordozgoiti

The period from June 253, when Valerian (253–260 CE) came to imperial power, to September 268, when his son, Gallienus (253–268 CE), was killed near Milan (Geiger 2013:173–198; Glas 2014:115–121; Pareti 1952:28–32, 57–61; Peachin 1990:37–40, 74–84, 297–363), was a period of continuous internal and external instability in the eastern Roman provinces ranging from western Asia to eastern Mesopotamia.

The whole period is characterized by the continuous external pressures from bordering peoples, such as the Sasanian Empire. The Sasanian king Sapor I launched a massive military campaign against the Roman Empire in the year 252, conquering Roman Mesopotamia and all of northern Syria, even beyond Zeugma. Valerian successfully restored order in 254, but, after his return to Rome in 256, first Dura-Europos and then Antioch on the Orontes fell to the Sasanians. Once again, Valerian was forced to return to Syria to reconquer the region and set in motion a punitive expedition against Sapor I, which, however, ended in tragedy with the capture of Valerian himself in 260 near Edessa. General Septimius Odaenathus continued fighting against the Sasanians until his great campaign in 262–266, when he marched through Mesopotamia to Ctesiphon, forcing the Sasanians to retreat to the positions where they had started 12 years before. But it was not only the Sasanians who did great damage in the East; the Gothi from north of the Black Sea and the Borani from the Crimean Peninsula also attacked and pillaged many sites between 254 and 268. The Gothi razed many cities along the coasts of Bithynia, Asia, and even Cyprus between 256 and 268, while the Borani attacked the northern coast of Cappadocia between 254 and 266 (De Blois 1976:2–8; Geiger 2013:93–96, 128–138; Glas 2014:122–135, 163–186; Le Bohec 2017:625–633; Pareti 1952:28–32, 57–61).

To these external threats must be added the constant internal instability of the eastern provinces, which was caused by the continuous uprisings of a total of six or seven usurpers between 260 and 268, among them Macrianus Senior (260–261), Macrianus Iunior (260–261), Quietus (260–261), Ballista (261), Trebellianus? (?), Septimius Odaenathus (262–267), and Zenobia (267–272). After fighting off the Sasanians in 260 through a guerrilla war, Macrianus Senior (*procurator arcae et praepositus annonae in expeditione Persica* [treasury commander and supervisor of supplies on the Persian expedition] with Valerian) and Ballista (prefect of Valerian's guard) set out to achieve imperial power. Macrianus Senior marched west with his son Macrianus Iunior, but both were defeated by Aureolus. In the East, however, it was Septimius Odaenathus who intervened in the capture of Emesa, eliminating the threat of the other two usurpers: Quietus (another son of Macrianus Senior) and Ballista himself. Septimius Odaenathus—then named *Dux Romanorum*, *Imperator*, *Corrector Totius Orientis*, and *Rex Regum* (Duke of the Romans, Emperor, Corrector of the East, and King of Kings)—ruled the Roman East autonomously until, sometime after August 267, he was assassinated during his march to Heraclea Pontica, leaving Zenobia leader and founder of the Palmyrene Empire (267–272; De Blois 1976:2–8; Geiger 2013:120–125, 128–138; Glas 2014:122–135, 163–186; Kienast 1990:223–230, 239–242; Le Bohec 2017:625–633; Pareti 1952:28–32, 57–61; on the Palmyrene Empire, see Dignas and Winter 2007; Slootjes and Peachin 2016; Smith 2013; Varga and Rusu-Bolindet 2017; Veyne and Fagan 2017).

Our object of study will be the Latin epigraphy of the eastern provinces directly related to the *domus Licinia Augusta*, the imperial family in power between 253 and 268 and led by the Emperors Valerian and Gallienus, to which we must add the rest of the components of the lineage: Valerian's wife, Egnatia Mariniana; Gallienus' wife, Cornelia Salonina; and the sons of Gallienus and Salonina, Valerian II, Saloninus, and Marinianus. In this way, we will study the most significant types, origins, and imperial titles, identifying two different chronological phases and paying special attention to the milestones and the reconditioning of public roads in the imperial Latin dedications of the time.

## Overview of the Eastern Latin Inscriptions

The Licinia family is represented in the eastern provinces today through only 21 Latin epigraphs, which come from 7 different provinces (from

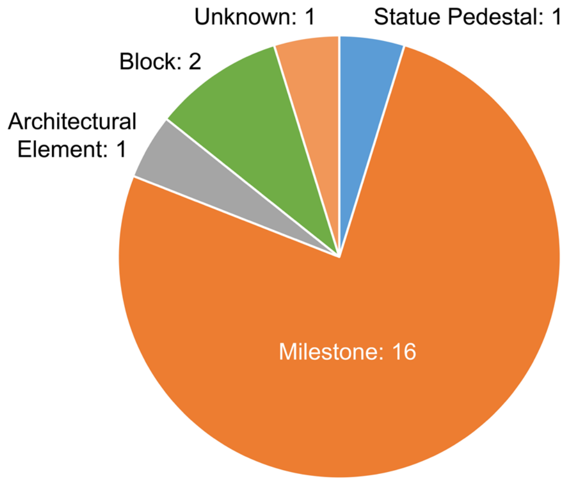


**Figure 1.** Typology of the eastern Latin epigraphs of the Licinia family.

west to east): Asia, Lycia et Pamphylia, Pontus et Bithynia, Galatia, Cappadocia, Syria, and Arabia. Completely outside the Latin epigraphic representation of the imperial family are the provinces of Cilicia, Cyprus, Armenia, Mesopotamia, and Iudaea, regions which may have been smaller and more marginal but might have been expected to offer substantial examples. The absence of Mesopotamia—together with part of the eastern *limes* (border)—is, perhaps, more significant than that of the other areas, which were further from the central power and its political diatribes. The total number of epigraphs available from the East is generally rather low; it is comparable to that of the province of Hispania, with 17 examples, but far fewer than that of other areas such as Italy or Africa, with more than 100 testimonies each. In any case, it is important to view these numbers with caution, since Latin was not the main language of these provinces, and it is also important to take into account the corresponding contemporary Greek epigraphy that also referred to the imperial family.

We identified only four basic types for the set of eastern inscriptions: milestones, statue bases, architectural elements, and blocks (Figure 1). The lack of diversity in inscription types indicates a marked uniformity of political intent in eastern Latin-language epigraphy. The overwhelming majority of the testimonies—76% of the total (16 of 21 known examples)—were found on milestones. In the East, on the one hand, the milestones responded to an important need to adapt the viability of the roads to the needs of the local populations—often separated by geographical accidents, as is the case of the Anatolian Peninsula—while on the other hand, they indicated the legions' deployment capacity and their effective mobility in the eastern *limes*, which was especially important in the provinces bordering the Sasanian Empire. Moreover, the milestones exemplified here the central power's authority (e.g. the power to repair and modernize roads), and for this reason the Latin language was used, while the Greek language was used on statue pedestals, plaques, or tombstones—features that imperial and local elites used for self-representation.

The four other inscriptions for which a type could be established (19% of the total) include a statue base from Gerasa, Arabia (modern Jerash; *EDCS* 3000811; *AE* 1996 1604),[1] an architectural element from the north wall of the temple of Zeus/Baal in Baitokaike, Syria (modern Hoson Sulaiman; *EDCS* 22300087; *CIL* 3 184; *IGLS* 7 4028; *CIG* 4474; *ILS* 540; for the sanctuary, see Ahmad 2018; Freyberger 2004:13–40, 2009:265–292; Rey-Coquais 1997:929–944; Virgilio 1985:218–222), and one block each from ancient Satala, Cappadocia (modern Sadak), and Bostra, northern Arabia (modern Busra), the ancient Colonia Nova Traiana Alexandriana and seat of the Legio III Cyrenaica (Third Cyrenean Legion). We do not know the typological nature of the remaining inscription from Thelseai (modern Ad Dumayr; *EDCS* 21200199; *CIL* 3 130; *CIL* 3 14160, 2), probably because the piece has been lost and has not been studied since the end of the nineteenth century.

It is also worth noting the absence of many types that were common in other geographical areas, such as votive shrines, plaques, tombstones, and urban architectural and decorative elements, such as doors, friezes, and arches—all of which were commonly used for imperial epigraphy of an honorary nature. Again, very probably, the tendency to use Greek in inscriptions in the Roman East is the reason why so few Latin inscriptions have been found here, despite the region's size and relevance to the Roman world.

The distribution of epigraphs in the eastern Roman provinces is an interesting indicator for measuring the objectives of the imperial family's self-representation (Figure 2A and Figure 2B). Two areas were the most popular in terms of quantity of testimonies: the Anatolian

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[1] See "Abbreviations" for a list of the standard reference works cited in the paper.

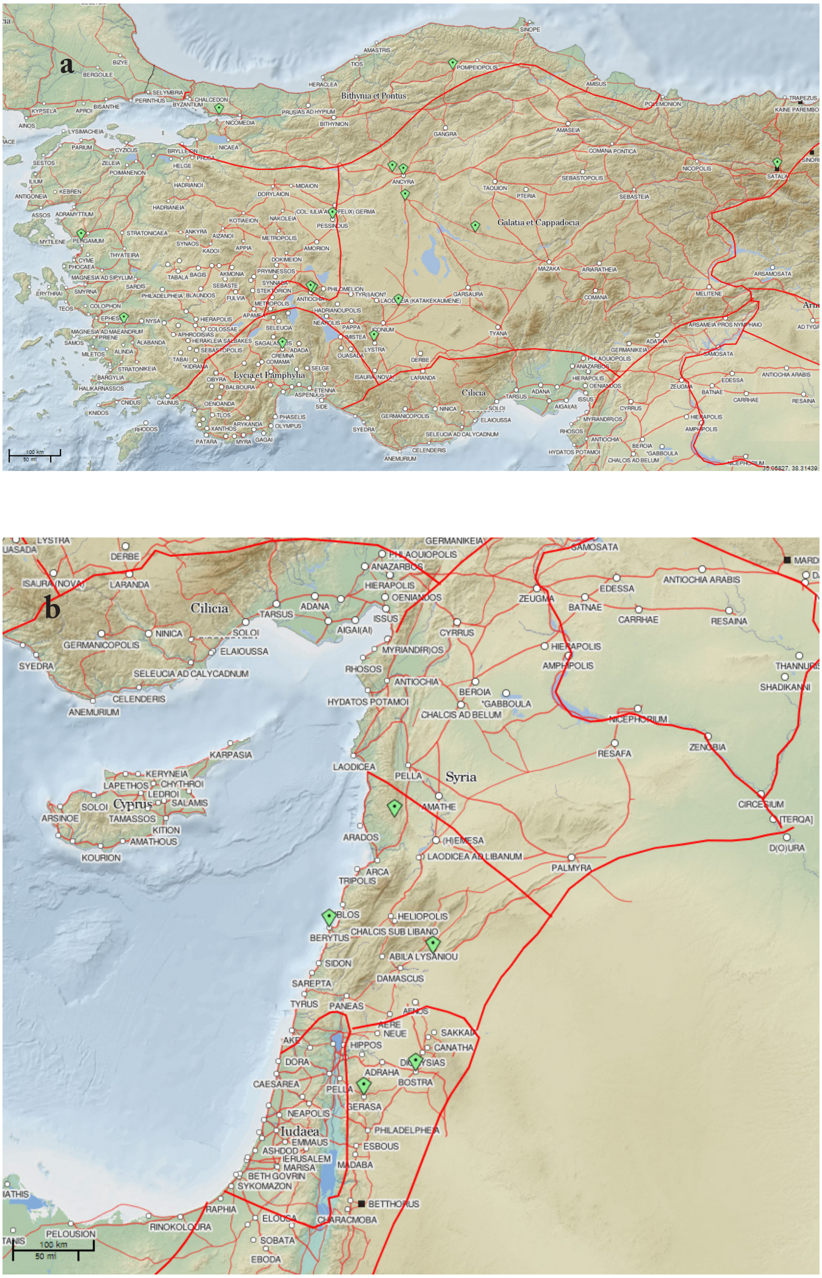

**Figure 2.** Distribution of the eastern Latin epigraphs of the Licinia family: (a) modern Turkey; (b) modern Levant. Map created with the Digital Atlas of the Roman Empire (http://dare.ht.lu.se/).

Peninsula and the Syrian-Palestinian corridor. On the one hand, we have the central area of the Anatolian Peninsula in the eastern part of Asia, north of Lycia et Pamphylia and west of Galatia. Some of the most important cities were located around the ancient lakes of Tatta (modern Lake Tuz) and Karalis (Lake Beyşehir), such as ancient Ancyra (modern Ankara; *EDCS* 22300503; *CIL* 3 246; Bosch 1967: no. 281; *RRMAM* 1 39a; *RRMAM* 2[1] 92; *RRMAM* 3[2] 117a), Pessinus (modern Ballıhisar; *EDCS* 38200038; *IK Pessinous* 183; *RRMAM* 3[2] 9; *AE* 2005 1476), Antioch of Pisidia / Colonia Caesarea (modern Yalvaç; *EDCS* 31800113; *IK Piside* 158; *RRMAM* 3[2] 89), and Lystra / Colonia Iulia Felix Gemina (near modern Hatunsaray; *EDCS* 28501125; *CIL* 3 6956; *CIL* 3 6957; *CIL* 3 12215a; *MAMA* 8 8; *RRMAM* 2[1] 628; *RRMAM* 3[2] 102b). Also in this area were the roads that connected the cities to each other and to other important nodes, such as Bithynia or Syria. All the findings in this area are composed of milestones, which confirms the presence of a predefined plan during the reign of Valerian and Gallienus to restructure and accommodate the complex viability of this central area of present-day Turkey, thus also highlighting the philanthropy of the emperors toward their eastern Roman subjects.

The family of Valerian and Gallienus also took an active part in the repair and refurbishment of two famous roads in Asia Minor: the Pilgrim's Road and the *Via Sebaste*. The Pilgrim's Road linked ancient Chalcedon, opposite Byzantium, with Antiochia in Syria, passing through the Anatolian Peninsula via enclaves such as Nicomedia, Nicaea, Ancyra, Parnassus, Garsaura, Tyana, Tarsus, and Alexandria ad Issum (*RRMAM* 1 and 4[1]:15–22). Of the 111 total milestones found along the Pilgrim's Road, the two emperors contributed 4 (4%) to the maintenance of the road, far fewer than the great interventions of Hadrian (12 milestones, or 11% of the total); Diocletian, Maximian, and the Tetrarchs (22 milestones, 20%); and Constantine I and his family (14 milestones, 13%). The contributions by Valerian and Gallienus are similar in number to those previously built by Septimius Severus and family—Caracalla, Elagabalus, Severus Alexander, and Gordian III—of between 5 and 6 milestones (5%) each. At the same time, it surpasses the contributions of other monarchs of the third century, such as Philip the Arab, Trebonianus Gallus, Aemilianus, Aurelian, or Tacitus, who contributed only 1 or 2 testimonies each.

The *Via Sebaste*, on the other hand, was conceived by Augustus in 6 BCE to unite the newly created Roman colonies of Perge and Lystra, passing through the cities of Comama, Lysinoe, Apollonia, Antioch of Pisidia, Neapolis, and Iconium (*RRMAM* 4[1]:41). Valerian and Gallienus participated in its repair and erected 3 (3%) of the 86 total milestones found along this road, again far fewer than the contributions of Augustus (16 milestones, or 19% of the total); Hadrian (7 milestones, 8%); Septimius Severus and family (8 milestones, 9%); Maximinus, Constantine, and Licinius (7 milestones, 8%); and Constantine I and family (17 milestones, 20%). Nevertheless, the contributions of the two emperors constituted a fairly interesting number in the context of the third century, surpassing both earlier emperors (such as Severus Alexander, Gordian III, or Philip the Arab) and later emperors (such as Claudius II Gothicus, Carus, Carinus, and Numerian), with only 1 or 2 examples each.

On the other hand, we observe a remarkable number of findings in the central area of the Syrian-Palestinian corridor: namely, in the southern areas of Syria and northern Arabia. Testimonies have been found in ancient Baitokaike (mentioned above), Berytus / Colonia Iulia Augusta Felix (modern Beirut; *EDCS* 73600002; Thomsen 1917: no. 8.1), Thelseai (*EDCS* 21200199; *CIL* 3 130; *CIL* 3 14160, 2), Bostra, and Gerasa. These inscriptions are associated with different types such as statue bases, milestones, walls, or blocks, but they do not allow us to infer concrete policies regarding the realization of these dedications beyond a strengthening of the communities and a reinforcement of the links between the central power and the provincial elites.

If we analyze, in parallel, the provinces with the highest number of findings related to the imperial house, we see that Galatia accounts for more than one-third of the testimonies, with 8 examples (38% of the 21 total inscriptions); followed by Arabia, Asia, and Syria, each with 3 cases (14% each); Pontus et Bithynia, together with 2 examples (10%); and other regions such as Cappadocia and Lycia et Pamphylia with only one testimony (5%) each. These data confirm the preeminence of the central region of Anatolia as the vertebral axis of Latin epigraphy related to the imperial family, while also highlighting, to a lesser extent, the Syrian-Palestinian corridor as an important demarcation for Valerian and Gallienus' policies in the East.

## The Çağırkan Milestone

It is precisely in the central part of Turkey that we find one of the most interesting milestones in the whole region (*EDCS* 57000125; *RRMAM* 3[2] 69b; *AE* 2012 1563):

Imp(eratori) Caes(ari) P(ublio) Ael(io)
Licin{n}io Va
leriano P(io) F(elici) Aug(usto)
et Imp(eratori) Caes(ari) P(ublio) Li
cin{n}io Egna
tio Gallieno
P(io) F(elici) Aug(usto) et P(ublio) Li
cin{n}io Egnati
o Valeriano Sa
loni{a}no indulgen
tissimo Caes(ari) Aug(usto)
et Saloninae matri
Augg(ustorum) et castror(um)
ux(ori) A(ugusti) P(iae) F(elici) Aug(ustae)

The milestone was found at the site of the Özer camp İsmail, about 3–4 km north of Çağırkan (Kaman, Kırşehir Province, about 140 km southeast of Ankara), and it was published in 2012 by the British Institute at Ankara, led by David H. French (*RRMAM* 3[2] 69b). The milestone was moved to a new location 2 km north of the Roman road that connects ancient Ancyra (modern Ankara) and Caesarea (modern Kayseri) in a northwest–southeast direction; it is located approximately halfway (99 Roman miles) to Ancyra along the branch to the ancient town of Aquae Saruvenae (near modern Kırşehir). Another milestone was found next to this one, dating to the reign of Nerva and commemorating the restoration of the road, carried out in Nerva's name by Titus Pomponius Bassus, governor of Galatia and Cappadocia. Our milestone, therefore, would commemorate the restructuring or reconditioning of this secondary road between Ancyra and Caesarea in the middle of the third century, following a previous restoration at the end of the first century CE (*RRMAM* 3[2] 69a and 69b; AE 2012 1562–1563).

The milestone is made of limestone, a particularly hard and pale type of stone. The piece is made up of a simple cylinder, complete with a flat-topped surface and an irregular axis. The tenon is large and round, although it rotates underneath the base. No other decorative elements are visible (*RRMAM* 3[2] 69b; *AE* 2012 1563).

The lettering is of the square capital type, although of inferior quality, with measurements ranging from 6.2 cm to 3.4 cm. The *ordinatio* (organization) of the text is quite irregular, although it remains centered on a medium axis. The thickness of the lines of the text decreases in a descending direction, the first line being the thickest and the last the thinnest. The letters, which are slightly worn, constantly fall out of their respective lines. Very interesting, no doubt, is the shape of the letters "e" and "l," the former clearly influenced by the Greek small epsilon, while the latter has an extremely long and inclined horizontal stroke, as is the case with the "g" (*RRMAM* 3[2]69b).

The milestone was engraved when Gallienus' youngest son, Saloninus, entered public life (i.e. between 258, when he was named *Nobilissiumus Caesar* [Most Noble Caesar], and 260, when he was handed over to the usurper Postumus and executed). The title of *Augustus* (Emperor) in line 10 refers specifically to the autumn of the year 260, when he was appointed *Augustus* in Cologne. However, this title occasionally appears earlier in inscriptions and coins, so a longer chronology is perhaps also the safest option (*RRMAM* 3[2] 69b; *AE* 2012 1563; Kienast 1990:221–222; Peachin 1990:37–40, 74–84, 297–363).

As for the text, we can see various elements within it that give us a good idea of the peculiarity of the piece and the context in which it was made. The text is dedicated to Valerian, Gallienus, Saloninus, and Salonina, in that order. In line 1, we see how the veteran emperor is called Publius Aelius, a name that does not correspond at all to him as a member of the Licinia family but that, rather, reminds us of other emperors such as Hadrian (117–138), Marcus Aurelius (161–180), or Commodus (161–169), all of whom were well classified among the *boni* (good) emperors of the second century CE. The same phenomenon, although less serious, can also be seen in the ninth and tenth lines with the inclusion of the Egnatia family in Saloninus' full name (Kienast 1990:128–130, 137–139, 143–145, 221).

Furthermore, the lapicide committed a series of errors by including some of the remaining letters in the names, such as the "n" incorrectly split in the name "Licinius" or the inclusion of an "a" in the last name "Saloninus" in lines 10–11. This proves that the lapicide, likely from a Greek background, had problems with the spelling of the full names of the emperors and the imperial family, very possibly due not only to language, but also to the relative scarcity of epigraphy about the Licinia family in the area.

In addition, the epithets used to praise the imperial family were also extremely unusual. First of all, Saloninus is called "*Indulgentissimus*" (Most Indulgent), an epithet that appears (albeit rarely) in the epigraphy of Gallienus but nowhere else in the entire body of epigraphy related to Saloninus. The comparison is even more extraordinary if we consider that in this milestone Gallienus is attributed only the usual epithets of "*Pius*" (Pious), "*Felix*" (Fortunate), and "*Augustus*" (Emperor). without a trace of any other special titles. The case of Salonina is similar to that of Saloninus. The very mention of her name is an anomaly in the milestones of the whole Empire, but, moreover, her title is unusually long. This inscription attributes to her two titles that are common in other epigraphic examples: "*mater Augustorum et castrorum*" (Mother of the Emperors and the camps) and "*uxor Augusti*" (wife of the Emperor). But after these also appear the epithets of "*Pia*" (Devotee), "*Felix*" (Fortunate), and "*Augusta*" (Empress), totally unusual in relation to Salonina and, in some way, emulating point-by-point the titles of the two main emperors, Valerian and Gallienus. If it were not for the preeminent position of the two main emperors in the text, in a certain way it could be said that both Saloninus and Salonina are assigned special importance in this milestone. It is quite possible that this is only reflecting specific local dynamics, but what is evident is that, in this example from Çağırkan, the less relevant members of the Licinia family enjoy equal or even greater importance than that of the two great emperors. This results in a stronger and more vigorous dynastic image, in which all members of the family—regardless of their position—have a place in the official propaganda, even in areas further away from imperial power such as the eastern provinces.

## References to the Roman Legions

If we look now at the geographical distribution of inscriptions found in the East, we can see that no single city stands out among the others in terms of the number of finds; instead, a certain uniform dispersion predominates. The only city that stands out (with 2 testimonies, or 10% of the total) is Bostra, the old Colonia Nova Traiana Alexandriana, in the north of Arabia (for Bostra, see Dentzer-Feydy et al. 2007; Farioli Campanati 2010:219–227; MacAdam 1986:169–192; Sartre 1976:38–47; Wallner 2000:97–107). After the Roman conquest, this ancient Nabataean city became the seat of the Roman government of the province of Arabia and the main base for the legionary garrison of the region, the Legio III Cyrenaica. The legion was stationed here from the beginning of the second century until at least the beginning of the fifth century, when its command was transferred to that of a prefect (*Notitia Dignitatum* Or. 37.21; Gatier 2000:341–344; Lenoir 2002:175–184; for the legion, see Brulet 1984:175–179; Gatier 2000:341–344; Hollard 2004:155–173; Kramer 1993:147–158; Lenoir 2002:175–184; Mennella and Filippi 1995:221–229).

There are many in-situ inscriptions referring to soldiers and high military officials of the legion. Two epigraphs, in particular, are important: a *tabula ansata* (carved tablet with handles) engraved in a block dedicated by the "soldiers of the Legio III Cyrenaica Valeriana Galliana" ("*Optiones centuriarum legionis III Cyrenaicae Valerianae Gallianae*") to the "Governor of the Emperors, Aelius Aurelius Theon" ("*legatus Augustorum pro praetore,* Aelius Aurelius Theon"; *EDCS* 21200158; *CIL* 3 89; *IGLS* 13[1] 9079; *IGLS* 13[2] 9079; *ILS* 1193), and a small fragment of a milestone in which the emperor Gallienus is mentioned *(EDCS* 42500079; Humbert and Desreumaux 1998: nos. 94 and 134). These two examples clearly show how the Roman central power proposed the adhesion of the most important military strata of the region in order to win their favor and their fidelity. The epithets "*Valeriana*" and "*Galliana*" of the Legio III Cyrenaica sought, precisely, to strengthen these bonds of dependence between the emperors Valerian and Gallienus and the commands of the legion. It seems that these links were more tenuous in the East than in the West, and it is possible that this situation gave rise to the numerous military usurpers who gained power throughout the region; these individuals may have taken advantage of the absence of a central power to install their own local power structures.

Also very significant is the absence of more testimonies related to the army and the imperial family in other units of the eastern *limes*, such as the Legio X Fretensis and Legio VI Ferrata in the nearby province of Iudaea, or the Legio IIII Martia, stationed at the fortress of Betthorus (modern El-Lejjun) in Arabia. Other units that are omitted include the Legio III Gallica and Legio I Illyricorum in bordering Syria–Phoenicia and the more distant Legio IV Scythica and Legio XVI Flavia Firma in Syria–Coele, the Legio I and Legio III Parthicae in Mesopotamia, and even the Legio XII Fulminata in southern Cappadocia. In Satala, seat of the Legio XV Apollinaris, we

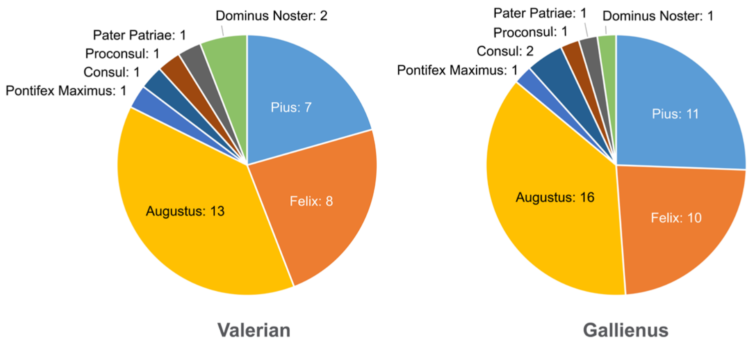


**Figure 3.** Distribution of the imperial titles of Valerian (left) and Gallienus (right) in the eastern Latin epigraphs.

find a block that mentions the consuls of the year 262, Gallienus and Nummius Faustianus; this block could well indicate a particular link between the legion and the emperor—or, at least, the central power (*EDCS* 9400680; Mitford 1997: no. 1; *AE* 1975 819; Mosser 2003: no. 229). However, despite the exceptions of Sadak and Bostra, the permeation of the ideas and images of the imperial family along the eastern *limes* was scarce and not very significant, at least as far as Latin epigraphy is concerned. This again reinforces the idea that the eastern provinces were less connected to Rome and the messages that were intended to spread from the capital of the Empire through the entire Roman world.

## Recurring Themes

The analysis of the text of the preserved Latin epigraphs from the eastern provinces of the Empire also provides us with interesting reflections. The most frequently repeated and most important element is undoubtedly that of the imperial title (Figure 3). The titles used to refer to the emperors Valerian and Gallienus appear in similar proportions, with both being described, rarely, as "*Pontifex Maximus*" (Greatest Pontiff), "*consul*", "*proconsul*", "*Pater Patriae*" (Father of the Fatherland), and the later "*Dominus Noster*" (Our Master). The most oft-repeated titles (accounting for more than two-thirds of the total cases) were "*Pius*" (Pious), "*Felix*" (Fortunate), and "*Augustus*" (Emperor). Some other titles—such as the *cognomina ex virtute* (surnames from virtues) or the special epithets that are found in other provinces—are completely absent, reflecting a lesser relevance and singularity in the imperial image, with the consequent loss of influence in these provinces that was so important for the central Roman power.

Another interesting element in the text of the epigraphs is the presence of the *damnatio memoriae* (damnation of memory)—that is to say, the abrasion of the name of Gallienus and his family as decreed by the Senate after the emperor's death in the year 268. In the eastern provinces, this phenomenon is attested in only one epigraph (*EDCS* 970200363; *RRMAM* 3[5] 21; *AE* 2014 1244). Representing 5% of the total, this proportion is clearly small and comparable to that of the Hispanic provinces, but it is far fewer than the 15% of North Africa or the 16% of the Italian Peninsula. This small number of testimonies confirms a weak impact of the image of power of the emperor's family in the East even after his death and public condemnation from 268 onwards.

An analysis of the types of people who dedicated the epigraphs provides further insight into the representative dynamics of the imperial family in the eastern provinces. The distribution of the dedicants is quite homogeneous: cities, members of the army, and members of the administration and government each are referenced in 3 dedicant epigraphs (of 23 total, or 13%). On the other hand, the great majority of imperial dedications (14 examples, 61%), have no known dedicator.

The other side of the coin is represented by the dedicatees of the epigraphs. Unsurprisingly, more than half of the 49 total dedicatory epigraphs (58%) are to Gallienus (15 examples, 31%) and his father Valerian (13 examples, 27%). The similarity of their representation evidences the relevant role they both played in the East in the self-representation of their family. The rest of the members of the Licinia family contributed, in a smaller way (20%), to the dynastic image of the family in the East. Saloninus is mentioned in 5 examples (10%), followed closely by his older brother, Valerian the Younger, with 4 examples (8%), while Salonina appears only once (2%) in the milestone from Çağırkan (*EDCS* 57000125; *RRMAM* 3[2] 69b; *AE* 2012 1563). The division of the dedicatees thus constituted a very determined hierarchy of power, with Gallienus and Valerian at the top, the sons of Gallienus and members of the future imperial succession (Valerian the Younger and Saloninus) the next step on the throne, and Salonina, Gallienus' august wife, relegated in the East to an almost nonexistent third level within the imperial hierarchy. The remaining dedications are to deities or other members of the imperial administration (9 examples, 18%) or, due to the fragmentation of some pieces that makes it impossible for us to know the addressee of the epigraph, to unknown individuals (2 cases, 4%).

We can find other interesting elements in the text that promoted the image of the imperial family, as is the case of the imperial civic and military epithets—*cognomina* that the emperors assigned to certain military units or even that certain communities added to their names in honor of the members of the imperial house. This phenomenon sometimes appeared in the eastern provinces, as we have three examples of military epithets: two referenced above in the block from Bostra dedicated to the "*legatus Augustorum pro praetore* [Envoy of the Emperors - acting for the praetor], Aelius Aurelius Theon," and one in the statue base from Gerasa dedicated to "*Vibia Domna*," in which the epithets "*Valeriana*" and "*Galliana*" appear to refer to the Legio III Cyrenaica. The percentage (3 of 21, or 14%) is significant: for example, it is higher than that of the epigraphs found in Hispania (1 of 20, or 5%) and Italy and the surrounding islands (7 of 125, or 6%), but lower than that of epigraphs found in North Africa (24 of 107, or 22%). The most noteworthy thing is that, unlike other provinces, the examples from the East contain no civic epithets, which again shows us how the different eastern communities were more suspicious of associations with the Licinia family and the central power, in contrast to the army units, which were perhaps slightly more involved in the self-representation of the imperial family thanks, surely, to the intercession of the General Staff and the military commands assigned there.

Another remarkable element in the analysis of the Licinia family's image in the East is the association, in the epigraphs, of the imperial family with the deities. The only divinity that appears in the entire eastern Latin corpus is Fortuna, who is referenced in five different examples, all of them milestones. She is always accompanied by the epithet "*Bona*," which in the eastern world was almost always associated with the goddess Tyche (Τύχη), protector of good luck and the prosperity and economic activities of the communities (for the cult of Tyche, see *LTUR* 2:267–268, s.v. "Fortuna (Τύχη Αποτροπαιος)"; Caccamo Caltabiano 2003:139–149; Calmeyer 1979:347–365; Chiarucci 1997:55–59; Gnoli 2016:135–149; Lichocka 1997). Very striking is the absence of most of the important divinities of the Roman pantheon of the time, such as Apollo, Jupiter, Mars, Neptune, or Mercury. Undoubtedly, even more remarkable for the East is the absence of any vestige or trace of an inscription dedicated to Sol (Ἥλιος), a priori,

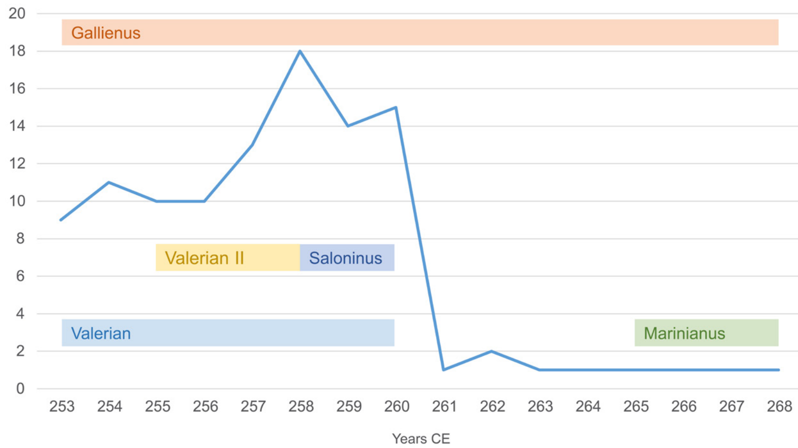


**Figure 4.** Chronology of the eastern Latin epigraphs of the Licinia family (maximum number of possible cases per year).

a cult that was very important for the construction of the imperial image of Gallienus himself, which had, especially in the eastern provinces, a high level of support and importance (De Blois 1976:155–169, 1989:77, 1994:173–174, 2006:275–276; Geiger 2013:238–245; Grandvallet 2002:32–33; Manders 2012:283–291).

## Chronological Patterns

Finally, it is also very interesting to analyze the eastern epigraphy associated with the Licinia family from a chronological point of view (Figure 4). We can immediately appreciate two clearly differentiated periods: the intervals 253–260 and 261–268. In the period of Gallienus' common rule with his father Valerian, the average number of inscriptions that have been preserved is 12–13 per year, with peaks of 18 and 15 testimonies in the years 258 and 260, respectively. This high number of testimonies coincides perfectly with the introduction of Gallienus' sons (Valerian the Younger and Saloninus) to the government of the Empire, first as *Principes Iuventutis* (Youth Princes) and *Nobilissimi Caesares* (Most Noble Caesars), and then as *Augusti* (Emperors). Thus, a dynastic image was created, wherein Gallienus and Valerian fulfilled the function of the most important emperors in the East.

After the capture of Valerian in 260, the death of Gallienus' sons in 258 and 260, and the uprisings in the eastern provinces by the Macriani (260–261), Quietus (260–261), Ballista (261), Septimius

Odaenathus (262–267), and Zenobia (267–272), the number of witnessed items almost completely disappeared, reduced to an average of about 1.13 testimonies per year and a small peak of two testimonies in the year 262. Compared to the first period, this represents a decrease of 91%. The internal weakness of the imperial institution, combined with the appearance of multiple usurpers in the eastern provinces, was a catastrophic combination for the image of the Licinia family, which practically disappeared from the epigraphic record in the second period. During this chronological arc, the usurpers most probably established the bases of their dominion—to the detriment of the image of the central power—and prepared the ground for the subsequent emergence of the Palmyrene Empire (267–272). Thus, the epigraphy is both a consequence and a cause of the deterioration of the central power, feeding back and serving as a true measure of the favor and appreciation of each province by the imperial family in office. In the East, as we have seen, the Licinia family suffered a debacle in the promotion of its personal image, almost completely abandoning a large portion of the empire in favor of foreign or eastern forces and powers.

## Conclusions

The Latin epigraphic testimonies of the Licinia family (253–268 CE) constitute an exceptional body of evidence for establishing the dynamics and behaviors associated with power in the mid third century CE. Only 21 such inscriptions have been preserved from the eastern Roman provinces. These testimonies give us the key to understand how the imperial family of Valerian and Gallienus interacted with the eastern military and civil elites and how they attempted to deal with one of the most critical moments in the Roman Empire's history in these regions bordering on the Sasanian Empire.

The first thing we notice is the great similarity between the results obtained from the eastern provinces and the most western provinces, such as Hispania. We find that these two areas furthest from the Empire have, among other similarities, a comparable number of preserved inscriptions (21 and 20, respectively), a similar presence of *damnatio memoriae* in the inscriptions (1 example each), similar characteristics in the observed military epithets (3 examples and 1 example, respectively), and similar dynamics in terms of the chronology of the findings (with the period 261–268 practically identical in the two cases). While waiting for a study of the Greek epigraphs to be carried out, it is evident that during the rule of the Licinia family between 253 and 268, the regions bordering the Empire behaved in a completely unequal way to the central regions of the Empire, with Rome still the undisputed capital. Postumus in the West and the six or seven usurpers in the East—starting with the Macriani in 260 and ending with Zenobia in 267—fed on the discontent of the local elites and the military classes and actively promoted an adherence to their policies and image that excluded any form of representation of the Licinia family at the periphery of the Empire. Thus, while in Italy and North Africa we find more than 100 inscriptions in each area that are attributable to interventions by the imperial family or the elites in favor of the Licinia family, in the East and in the West only 20–21 inscriptions have been found in each, perfectly exemplifying the loss of influence and action of the family of Valerian and Gallienus in such a pressing moment for the stability of the imperial institution in the middle of the third century.

Secondly, we can see how the milestones were the main protagonists of the image of the imperial family's power in the eastern Empire between 253 and 268. Representing a very high percentage of the total inscriptions (16 examples, or 76%), the milestones became the Latin communication strategy *par excellence* of the Licinia family and, more specifically and in all probability, of Valerian, who was closer to the problems of the East during his time as emperor. It was certainly Valerian himself who started the ambitious program of rehabilitating and strengthening the Roman road network in the center of the Anatolian Peninsula, specifically in the area around the ancient lakes of Tatta (modern Tuz) and Karalis (modern Beyşehir). After his death, this program was completely abandoned, and there were no further interventions or commemorations in stone.

Therefore, the two most important areas for the Licinia family's image of power turn out to be, on the one hand, the center of Anatolia (among the ancient cities of Ancyra, Pessinus, Antioch of Pisidia, and Lystra), and on the other, the central area of the Syrian-Palestinian corridor (in the areas of southern Syria and northern Arabia). Completely outside the Latin epigraphic representation of the imperial family are the provinces of Cilicia, Cyprus, Armenia, Mesopotamia, and Iudaea. The absence of Mesopotamia—where part of the eastern *limes* was located—is, perhaps, more significant than the absence of the other areas, which were more distant from the central power and its political diatribes, but this omission also indicates clearly the geographical limits of the imperial house's influence.

The entity that best reacted to the influence of the Licinia family in the eastern Latin epigraphy was undoubtedly the army, and specifically the Legio III Cyrenaica, which is attested in epithets in three inscriptions (14%). The rest of the units that were settled in the eastern *limes* (border), however, had no connection with any member of the imperial family. This fact, together with the lack of epithets describing the main eastern communities, indicates a not-very-favorable panorama of the imperial house in these regions. In some way, this anticipated the instability that was to come with the different usurpers and the subsequent creation of the Palmyrene Empire (267–272) by Zenobia.

Finally, we can identify in the epigraphy of the Licinia family in the East two diametrically opposed periods. The first period (253–260) was characterized by a global dynastic image with Valerian and Gallienus at the head, followed by the latter's sons, Valerian the Younger and Saloninus. In this period, an average of 12 to 13 epigraphs were produced each year. During the second period (261–268), there was a total collapse of Gallienus' and Salonina's self-representation in these provinces, with only one testimony at most appearing each year. This change represents the total failure of the imperial presence in the East, which was exacerbated by the appearance of various usurpers to the imperial throne, starting with the Macriani in the year 260. Gallienus, therefore, was unable to strengthen his personal image and prevent the eastern provinces—and a large part of the Empire, for that matter—from ending up in the hands of local warlords and false usurpers, who were always ready to flatter the elites in exchange for treason against the central Roman power. This situation thus threatened the unity and prosperity of the Empire in a period that was already strongly affected by the crisis of the imperial institution.

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## Abbreviations

*AE* = M. Corbier et al., *L'Année Épigraphique* (Paris 1888–)
CIG = A. Böckh, Corpus Inscriptionum Graecarum (Berlin, 1828–1877)
*CIL* = T. Mommsen et al., *Corpus Inscriptionum Latinarum* (Berlin, 1863–1936)
*EDCS* = M. Clauss, *Epigrafik-Datenbank Clauss-Slaby* (Online, 1990–)
*IGLS* = L. Jalabert and R. Mouterde, *Inscriptions Grecques et Latines de la Syrie* (Paris, 1929–)
*IK Pessinous* = J. Strubbe, *Inschriften griechischer Städte aus Kleinasien: 66. The Inscriptions of Pessinous* (Bonn 2005)
*IK Piside* = M. A. Byrne and G. Labarre, *Inschriften griechischer Städte aus Kleinasien: 67. Nouvelles inscriptions d'Antioche de Piside* (Bonn 2006)
*ILS* = H. Dessau (ed.), *Inscriptiones Latinae Selectae* (Berlin, 1892–1916)
*LTUR* = E. M. Steinby (ed.), *Lexicon topographicum urbis Romae* (Rome, 1993–2000)
*MAMA* 8 = W. M. Calder and J. M. R. Cormack, *Monumenta Asiae Minoris Antiqua: 8. Monuments from Lycaonia, the Pisido-Phrygian borderland, Aphrodisias* (Manchester 1962)
*RRMAM* 1 = D. H. French, *Roman Roads and Milestones of Asia Minor: 1. The Pilgrim's Road The Pilgrim's Road* (Oxford 1981)
*RRMAM* 2 = D. H. French, *Roman Roads and Milestones of Asia Minor: 2. An Interim Catalogue of Milestones* (Oxford 1988)
*RRMAM* 3 = D. H. French, *Roman Roads and Milestones of Asia Minor: 3. Milestones* (Ankara 2012)
*RRMAM* 4 = D. H. French, *Roman Roads and Milestones of Asia Minor: 4. Roads* (Ankara 2016)

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# Chapter Twelve
# Celestial Roads and Afterworld Landscapes: A Case Study of the Northern Black Sea Littoral in the Bronze Age

Iuliia V. Kozhukhovskaia

Landscape, as a geophysical complex, was an indispensable part of the ancient ritual system. The correlation between landscape and monuments is considered a dialogue (Scarre 2002:8), introducing the concept of a mythopoetic consciousness that sacralized the terrain and contributed to it cosmological significance. It is beyond argument that the development of a semantics of ritual arises from the specifics of a particular culture and takes shape under the influence of its particular time period. In the Early Bronze Age, the Pontic–Caspian steppe was populated by the nomadic cattle herders of the Pit-Grave (Yamnaya) culture, of which material evidence comes mainly from burial sites. While the Neolithic was characterized by the influence of the fertility cult on agricultural centers (Gimbutas 1991), the religious system changed considerably with the collapse of the Carpatho-Balkan metallurgical province. In the Bronze Age, the Circumpontic metallurgical province developed with the introduction of bronze into the economic activities of society. The emergence and advancement of wheeled transport contributed to the spread of both material culture and the belief system. Solar symbolism has been observed in the rituals of Indo-European cultures (e.g. cromlechs, wheels and wagons, and solar signs in art).

The differentiation between Bronze Age burial rites in the North Pontic region depends upon the culture: V.A. Gorodtsov (1916) was the first to introduce the Pit-Grave, Catacomb, and Timber-Grave (Srubnaya) cultures that followed each other chronologically; later, later, it was established that each of them had local variants, and more complex structure was developed. The population of the Black Sea–Caspian steppe is considered to be of Indo-European origin. The Pit-Grave culture (dating to the Early Bronze Age) and the

Timber-Grave culture (Late Bronze Age) are attributed to the Iranian branch of the Indo-European language family, and the Catacomb culture (Middle Bronze Age), to the Indo-Aryan branch.

Two dominant myths can be distinguished in the Indo-European mythology of the Bronze Age: the mythologeme of the *axis mundi* (Mannhardt 1875; Rappenglück 2017), and the motif of the dying and rising sun (Cahill 2015; Golan 1991; Kaul 1998; Kristiansen 2011), both extensively explored in prior studies. Both motifs imply the concept of a journey proceeding from the interconnection of the world along its vertical axis. The main goal of the present research is to determine the idea of the road as reflected in the burial rites of the Bronze Age population of the North Pontic region.

The nature of "the road" can be interpreted as a cultural landscape (Kerr, this volume). As roads pass from the physical world into the metaphysical, geographical space becomes mythological. It has been suggested that the idea of landscape implies a symbolic significance that is attributed to its natural features (Tilley 1994). World mythology presents a wide range of deities with dual symbolism who patronize various aspects of transition and borderline states that arise from natural phenomena. The celestial ferryman of ancient Egyptian mythology, who carries the souls of the dead across the underworld river, acquires a second face (his name being "The One Whose Face Is Behind, Whose Look Is Behind Him")—thus defining the dichotomy between the upper world and the netherworld (Ahmed 2016:128; Hornung 1968:38–39). Having two or more faces is intrinsic to the gods of the roads: Roman Janus, a solar deity who participates in the myth of the sun's journey, patronizes crossroads, thus introducing a spatiotemporal symbolism (Kozhukhovskaia 2020). Therefore, the process of categorizing the environment took place within a mentality that later merged into the collective memory.

## Mythological Space and Mythopoetic Symbols of the Afterworld Journey in Bronze Age Burial Rites

In the mythopoetic epoch, the terrain was mythologized, and the tribe and the person were merged with their environment, which was implicated in the developed system of rituals. It is through ritual that the connection between non-time, sacred time, and the eternal present takes place (Eliade 1952). At the same time, ritual focuses on reshaping chaos and transforming it into cosmos (Tokarev 1980:162).

This process determines the functioning of the *axis mundi* mythologem in religious symbolism as the central element for arranging space and turning it into structure within the cosmos–chaos dichotomy.

Among the people who inhabited the Eurasian steppes in the Bronze Age, rites aimed at inclusion into the axial symbolism became manifest in the construction of the burial mound as a replica of the Cosmic Mountain. Nevertheless, it should be noted that the semantics of the tumulus are multidimensional. First of all, it is necessary to highlight the tumulus' social functions. A number of authors have recognized the burial mound as a symbol of power (e.g. Palumbi 2007), including in Eurasia, where certain burials of the Pit-Grave culture were assumed to have brought tribal chiefs glory in the afterlife (Bogdanov 2004; Chechushkov and Epimakhov 2018; Korenevskiy 2012). In a broader sense, particular cases from all over the world demonstrate the coupling of social and religious functions within the conceptualization of mountains that are associated with the world axis. Tully and Crooks (2019:134, 138) emphasize the role of mountains as the embodiment of authority and order within the Bronze Age Mediterranean and suggest that it is through monumental architecture correlating with the mountainous landscape that control over the Cretan landscape was socially restricted and used by elites to obtain power. Besides, the circular form of the tumulus aims to replicate human society (Field 1998:323), an argument that reveals the multidimensionality of its social semantics.

The religious significance of the tumulus as a burial monument—and, therefore, its cult symbolism—arises not only from its morphology, but also from its correlation with the landscape. However, its role in the landscape acquires complex semantics. In the Eurasian steppes, the burial mound is a monumental sign or marker (Smekalova 2009:45). At the same time, case studies from other regions reveal similar mythological processes; tumuli also appear as markers in other Indo-European cultures. However, Fontijn (2007:71) questions whether a mound was a marker, or rather whether it was constructed as part of the closing ceremony of the burial rite itself.

The Anglo-Saxon belief system (Grinsell 1991; Semple 1998)—in particular, the case of southeast England—shows that the barrows were visible from afar (Field 1998:316), and they were especially visible from other hilltops but not from the lowland (Dunn 1989:37). The case of western Scania also attests to the dominant role of barrows in the landscape, as they are compared to exclamation marks in the landscape (Lagerås 2002:188). Moreover, tumuli were constructed for only a small part of the population (Lagerås 2002:186)—a phenomenon that was common also in other European regions (Theunissen 1999:104), thus defining their social functions.

The situation seems to have been different in the Pontic area, where burials commonly took place in kurgans. From the perspective of social significance, the burial mounds vary in height. The majority of them are low and, in some cases, almost indecipherable in the landscape. This leads to the primacy of the tumuli's cultic functions. In cases in which the burial mound did not act as a marker, this quality should not influence its religious significance. The intent of ritual is based on symbolic action, which is objectified in the mound's symbolic construction.

Therefore, the other question that arises is the purpose of the burial mound's construction in terms of the view *from* or *to* it. In other regions, it is emphasized repeatedly that it is the view *from* the burial mound that mattered (Lagerås 2002; Woodman 2000). The numerous Dutch mounds suggest this functionality on the basis that many of the mounds were very modest (Fontijn 2007:71). Specifically, the tumuli are considered a part of the seascape because their location often correlates with the sea. Their intentional location within the landscape of western Scania is notable; there, the view *from the mound* to the sea was essential, rather than the view from the terrain to the mound (Lagerås 2002:185–186, 188). In the instance of southeast England, on the contrary, the view from the sea *to the mound* was the best (Field 1998:321). In the Pontic region, the mounds are mostly located in the steppe, and they draw on toward the sea in chains, forming interdependencies *inter se* rather than a correlation or dialogue with the sea. Therefore, a cosmological dichotomy between land and sea is not pronounced in the region. Thus, it is not the view that is important, but instead the internal location of the components of the mound complex vis-à-vis one another.

From the analysis of Scythian tumuli, it has been recognized that numerous burial mounds in the Pontic steppes have a certain systematic organization: on the one hand, they marked the ancient roads, and on the other hand, they signified tribal ownership of pasture (Boltrik 1990; Smekalova 2009). Thus, they structured the living space of the ancient communities that inhabited the region in different periods since the Eneolithic and Early Bronze Age. Burial mounds were located in chains in the open steppe and functioned as road signs and landmarks, providing the security of moving along traditional nomadic tracks (Smekalova 2009:52).

The peak of development of barrow architecture was reached in the Early Bronze Age with the Pit-Grave culture and coincided with a shift in the mythopoetic paradigm—that is, with the transition from the earth cult to solar myth. According to Kopieva's (2017) analysis, the number of tumuli constructed in the Middle Bronze Age decreased significantly: in the case of the Tauric steppes, only 16% (34 of 206) of the monuments of the Catacomb culture were newly built, since the population preferred to use monuments that had been constructed previously by the Pit-Grave culture.

Thus, the location of burial mounds in the landscape introduces the notion of space within a mythopoetic model of the world. The understanding of space implies its movement from a geographical concept *per se* toward a multiplicity of meanings. It is a kind of cognitive mapping, wherein space is socially constructed through people's interactions and actions (Papadimitriou 2016; Tilley 1994), is continuously under construction (Massey 2005:9), and is polysemic (Maddrell 2016:170). That is, the monument site passes through the prism of individuals' emotions, while at the same time it is compliant with the prevailing belief system of society. It follows that space as a cognitive concept—including mythologized space—was overlapped with the geographical and sacred landscape that had been in formation since the Eneolithic and Bronze Ages and that continued to live in the consciousness of the inhabitants of the North Pontic region.

The siting of barrows within the terrain also depends on their interaction with elements of the landscape. It is suggested that territory is perceived through the attribution of the structure of meaning to the substantial world (Ingold 1986:45–46). The properties of the places themselves constituted the basis for the monuments' construction (Scarre 2002:12), while topographic features were set upon a network of cognitive structures that created symbolic references in the collective memory that remained unchanged over time (Alves 2002:53). Thus, the Breton menhirs imitated natural stone; the purpose of their construction was to create structures similar to those in which the gods dwelt (Cassen et. al. 2000; Scarre 2002:11; Sébillot 1903). Consequently, the boundary between the landscape and the burial was indistinct, as in the case when a significant person was buried in a mountain and, as a result, became associated with that mountain (Bergh 2002:150)—a phenomenon that is crucial to understanding the sacral nature of the burial mound.

In numerous cases, tumuli are situated on elevated ridges, making each site highly visible (Field 1998:315). For instance, there are Dutch barrows that are located along the edges of elevated terrains, such as high ice-pushed ridges (Fontijn 2007:71). However, cult sites and architectural forms of the Minoan civilization are concentrated on mountain peaks (Tully and Crooks 2019:131), demonstrating the frequency with which mountains were perceived as possessing axial properties. This feature is also observed in the North Pontic region. In particular, the construction of a mound on a natural hill took place in the Catacomb culture, while the top of the hill was sometimes cut (Kopieva 2017). This points to the cosmological significance of the burial mound's morphology in terms of its inalienable interrelation with the landscape.

The burial mound symbolizes sacred space surrounded by chaos and, as a model of the cosmos, thus reproduces the Cosmic Mountain in its embodiment of the *axis mundi*. The cromlech is at the core of its structure. Its semantics originate, first of all, in the movement of the sun, which involves a cyclical and symbolic rebirth—the main aim of the ritual. It also comes from its vertical symbolism via the idea of a journey's destination. This is either a path upwards (to where the gods dwell) or downwards. In the latter case, postexistence took place in the earth of the grave in a quasi-physical dimension (Griffiths 1996:26–27; Semple 1998:113). Due to their association with the netherworld, the fear of mounds existed in some cultures—such as eighth-century Christian Anglo-Saxon society (Semple 1998:115), where it was expressed in the perception of a Bronze Age mound as dangerous because it was thought to be inhabited by spirits (Semple 1998:123) and a dragon (Semple 1998:110), while emotions were also connected with boundaries (Semple 1998:123). The burial mound is the entrance to the underworld and, as a result, is associated with the chthonic realm, possessing "water" features in Indo-European mythology (e.g. Vritra, the Vedic serpent who captured all the waters of the world). Chthonic features explain the burial rites' reference to the image of the serpent-dragon. The burial mound Vishennoye Nº1, located on the slope of the left bank of the Biyuk-Karasu River in the Belogorsk area, contained a ring ditch (with a diameter of 11–12 m) that consisted of two disjoined segments. The plan of the east segment

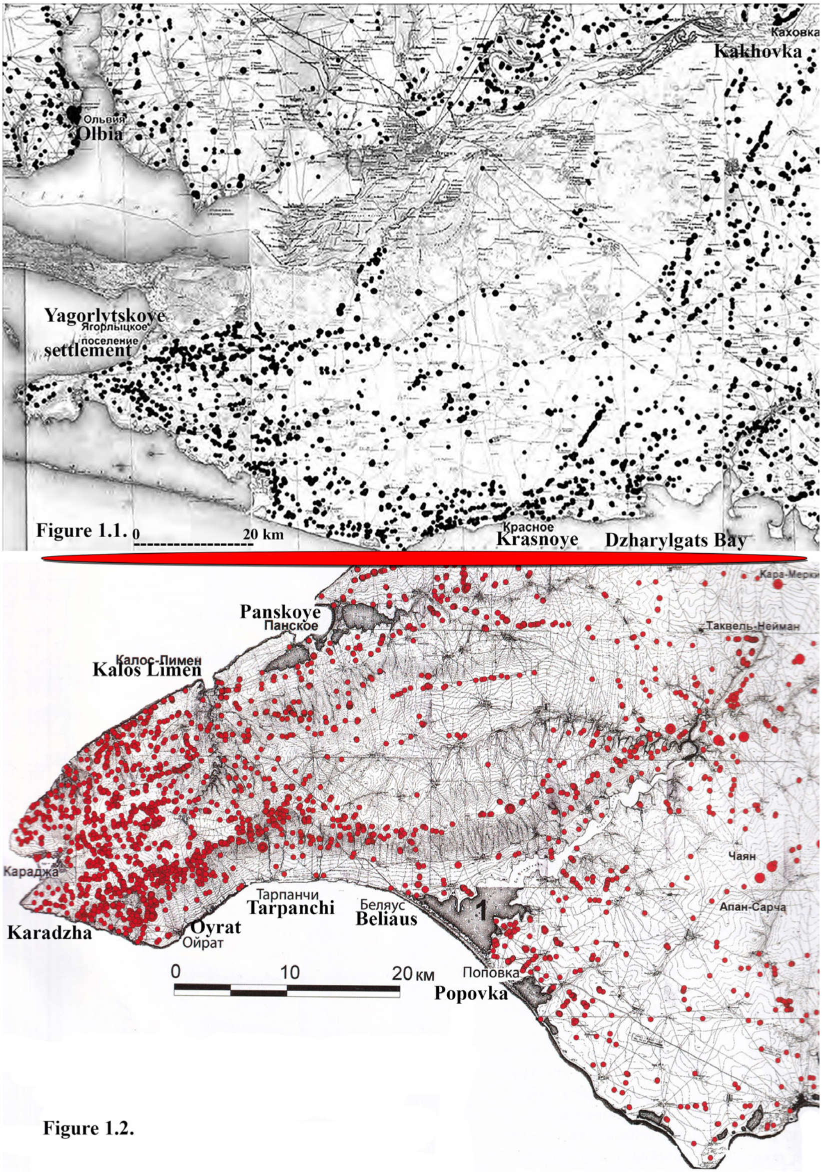


**Figure 1.** Distribution of barrows in the North Pontic region: (1.1.) the chain of barrows from Dzharylhach Bay toward the Dnieper River (after Smekalova 2009), (1.2.) the chain of barrows in the Tarkhankut Peninsula (after Smekalova and Kutaisov 2017).

formed a serpent with its head to the west, complex in shape, and its additional deepening apparently depicted the serpent's capacious womb (Kopieva 2010:17). The construction of the ring ditch preceded the construction of the main Pit-Grave burial located at its center (Kopieva 2010:16–18).

This water symbolism extends beyond the features of the chthonic serpent, concentrating on the role of rivers or other kinds of water in the afterlife journey that is central to the soul's crossing to the other world—or for its separation from the world of the living through memory. Mythological rivers fulfill various functions in the space of the netherworld: for example, ancient Greek rivers that are divided into destroying and reviving memory (Tokarev 1980:375). The core functions of rivers in the landscape of the afterlife focus on the symbolism of transition and the full range of borderline states. This implies their correlation with the territorial model, thus their inclusion in the burial rites.

The tumuli in Europe often have a distinct riverine distribution. In southeast England, there are barrows that are close to—yet nevertheless set back from—the rivers, though they do not interfere with the functioning of agriculture (Field 1998:316). In the area between the Orel and Samara Rivers, which border the Pontic region and represent the same cultural-historical communities, the location of the Catacomb burials, most of which were newly created among the earlier Pit-Grave and Eneolithic tumuli, tended toward river valleys and high river terraces. These burials are no more than 15–20 km distant from the nearest river. Later, the tumuli of the Timber-Grave and Multi-Cordoned Ware cultures moved farther into the depths of the steppe plateaus (Kovaleva 1983:8). Analyzing the localizations of Scythian burials from the Early Iron Age in the North Pontic steppe, Smekalova (2009:52) came to the conclusion that the nomadic territory had a defined spatial extent that was located mainly in the longitudinal direction, for the most part along the main Dniester, Bug, Inhulets–Vysun, and Dnieper Rivers. One of the longest and most linear chains of burial mounds can be traced around the town of Kakhovka; it stretches from the coast of Dzharylhach Bay toward the Dnieper River (Smekalova 2009:53–56). At the same time, the greatest concentration of Bronze Age tumuli in this area is observed specifically on the left bank of the Dnieper River (Figure 1.1; Smekalova 2009:56).


**Figure 2.** Distribution of burials of the Kemi Oba culture in the Tauric steppes and submountain region.

There are two types of spatial formations for burial mounds in the North Pontic region, many of which had been functioning for millennia since the Bronze Age. The first type tends toward linearity due to the mounds' location along spatially marked areas, such as rivers or ridges. The elongated shape of these formations points to boundaries that existed in the mythopoetic space. The second type consists of dense clusters of tumuli that may mark places of cult significance. These two groups of burial locations sometimes run into one another, creating thoroughly developed spatial-mythological schemes while aiming to fit into environment.

The riverine distribution of tumuli is observed particularly in the Kemi Oba culture, the burials of which are represented by stone and wooden grave cists (Figure 2). The Kemi Oba culture had its source in the Chalcolithic period, and it existed in parallel with the Pit-Grave culture until the early Catacomb era.[1] The map in Figure 2 presents the distribution of Kemi Oba burial monuments in the Tauric steppes, where they are most highly concentrated.[2] From a socioeconomic perspective, it is possible to conclude—by comparing their distribution to the chains of tumuli of other cultures in this area (Figure 1.2)—that

[1] It is still under discussion whether or not the Kemi Oba culture was a component of the Pit-Grave culture.

[2] It is necessary to note that, in some cases, the burials were added to already-existing tumuli of the Pit-Grave culture.


**Figure 3.** Distribution of the main burials containing details of wagons in the North Pontic region.

the spread of the Kemi Oba culture took place specifically along the rivers. One can identify three groups of burial site locations. The southwestern group centers along five rivers in the area: the Chernaya, Belbek, Kacha, Alma, and Bulganak Rivers. Burial sites in the central group cluster along the Salgir and Beshterek Rivers. The eastern group comprises monuments located along the Biyuk–Karasu and Kuchuk–Karasu Rivers. All these rivers originate in the mountains, and according to the mythological context, the mountain is the embodiment of the *axis mundi*. This leads to the possibility that, in the area under study, the river was a symbolic replica of the world axis.

The assimilation of the geographical river and the heavenly river is attested in some Indo-European cultures. Yamada (2013:68, 76–77) analyzes in detail the Vedic Rasā myth and interprets Rasā as a cosmological river that was located in a distant mountainous area, although the boundary between the mythological and geographical river is not always pronounced. The correlation between landscape and mythopoeia is observed also in the symbolism of the Milky Way as an embodiment of the celestial river, which features in the folklore of hundreds of peoples around the world (e.g. the celestial Ganges). Some myths demonstrate its origin in the underworld (e.g. the Desano of eastern Columbia; Berezkin and Duvakin 2020) or its primary nature in relation to terrestrial rivers (e.g. in the central Andes; Arnold and Yapita 1998), but also, in Greek mythology, its assimilation with Eridanus (Allen 1899).

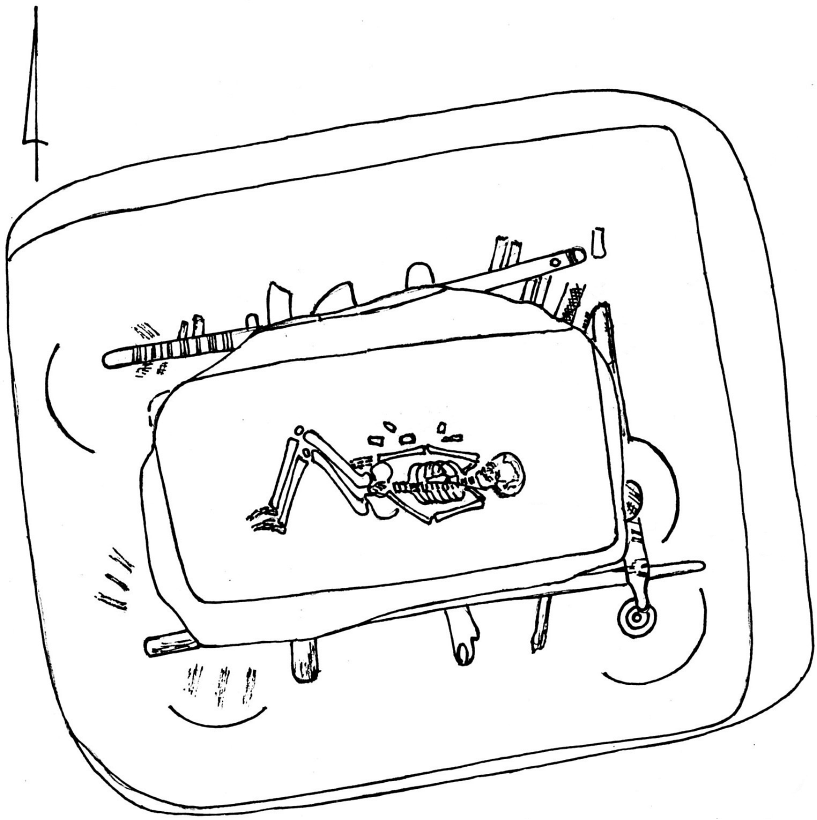

**Figure 4.** The Pit-Grave wagon burial: Kurgan Dolinka N° 1, burial N° 8 (after Kolotukhin 2008).

Thus, being a component of the landscape, the river does not just "divide" mythological space. It is a well-known fact that rivers were at the heart of the socioeconomic activity of ancient societies; they were metaphorical "roads" and "water arteries" owing to their connective properties. This feature was reflected in the axial symbolism that was crucial to Indo-European cultures, connecting both the upper world and the underworld, and eventually entwining into the myth of the dying and rising sun. The idea that the sun traveled into the realm of the lord of the earth and groundwater during its nightly journey contributed to the emergence of boat burials (Golan 1991)—the rite implying that water space was a dividing line between two worlds. This belief introduces the forms of burial in a vehicle: the burials with boats, wagons, or chariots.

## Burials with Wagons and Chariots in Bronze Age Cosmology

The morphology of the burial mound includes the burials with wagons that are widespread throughout the Pontic area (Figure 3). Wagons and chariots belong to space symbolism, and they imply a perception of the road in a metaphorical sense. Their ritual semantics is similar to boat burials, both types united by their solar symbolism as vehicles in the myth of the dying and rising sun. These features, along with their functions as a means of transportation and as a nomadic abode, shape their transition and boundary aspects within the ritual.

While burials in boats are common all over the world, burials in wagons and chariots play a significant role in Indo-European culture most of all, as supported by their mythological representation (e.g. the chariots of Surya, Savitar, Helios, and Sol). According to West (2007:40), burials in wheeled vehicles in the Eurasian steppes fall into two classes: block-wheeled wagons prior to 3300 BCE, and spoke-wheeled chariots from around 2000 BCE. As noted by Gei (2012, cited in Kornienko 2013), currently, the inventory includes 300 burials with fragments of wagons in the Pontic area of the Early and Middle Bronze Age, and their greatest concentration is observed in the Fore-Caucasus between the Caspian Sea and the Don River.

The early cases of wagon burials appear in the Pit-Grave and Novotitorovka (Novotitarovskaya) cultures, prevailing in the latter. Wagons or parts of wagons are found in one-quarter of adult burials of the Novotitorovka culture, which was located in the Kuban River basin and was synchronous with the late phase of the Pit-Grave culture (Gei 1991:66; Kaiser 2010:113). In the North Pontic area, there are up to 70 burials of the Pit-Grave culture that are accompanied by wagons or details of wagons (Izbitser 1993; Nikolova 2006:81).

Wagons and chariots played a central role in Bronze Age life and fulfilled a variety of functions, such as agricultural, residential, and transportational, and they were a means of long-distance travel, discovery, migration, and war (Kristiansen 2011; Lyashko 1990:43–44; Raccidi 2012:408). It should be noted that the first evidence for weapons appeared in the Middle Bronze Age; burial rites of the Eneolithic and Early Bronze Ages do not indicate a martial function of the steppe population (Kaiser 2010:100; Rassamakin 1999:154). Therefore, the interpretation of wagon burials originated in their religious significance. The idea of the burial wagon or chariot as a carrier of the soul was developed as early as the nineteenth century by Anuchin (1890), and it evolved into the cognate idea of a nomadic dwelling in the afterlife (Balonov 1996:16). However, the burials' details indicate that a more complex belief system was inherent to the Bronze Age cultures.

In Pit-Grave burials, wheels were placed at the corners of the grave (or at the sides of the skeletal remains) either singly or in multiples, and the wagons were dismantled in the majority of cases (Izbitser 1993:8; Lyashko 1990). It is impossible to know for certain how many wheels were typically included due to the poor preservation of the wood, since reconstruction of the wagon and its parts is usually required. However, analyzing the location of the wagons shows that, in the area under study, they were usually four-wheeled (Izbitser 1993:21). One can compare this to the Hittite tradition, which introduces the symbolism of the chariot in terms of the sun riding around four cardinal points (Gamkrelidze and Ivanov 1984:725)—thus the significance of the wagon's four wheels (in particular) in a rite that centers on spatiotemporal cosmological features.

In the Avesta, it is four horses that pull a wagon bearing the soul to heaven; considering this, Bessonova (1982:113–114) likens the relief from the Trybrat burial mound in the Pontic steppe, which depicts the altar-wagon carrying the deified deceased, to that of a solar deity. Therefore, the wagon acquires the symbolism of a temple. One can trace the images of the altar-wagon in other regions, as well. For instance, the rock art of Okunev monuments from Ust'-Byur combines the features of a wagon and a moveable altar and implies the delivery of a sacrifice to the gods, whereby the fire acts as charioteer (Esin 2012:31). Grave goods of the North Pontic area include a bag of wheat found on a wagon in a Catacomb burial (Izbitser 1993:14; Korpusova and Lyashko 1990). This finding indicates that food could be intended either for the gods (as in the case of a burial sacrifice) or for the deceased (as in the case of a ritual for the afterlife journey).

In the Caspian Sea region, animal bones and tools of stone and bronze were found atop some wagons, with the wheel blocking entrance to the chamber (e.g. the Catacomb burial Elista IIb/I; Izbitser 1993:11). The burial ritual changed to a great extent with the transition from the Pit-Grave to the Catacomb culture, and the symbolism of the wagon fit into the new belief system. Wagons were placed both at the entrance pit and in the chamber (Lyashko 1990). The construction of the catacomb suggests the obstruction of the chamber's entrance, as it was intended to denote, in order to isolate the space of the grave. In such wagon burials, it was the solar symbols of the wheel or parts of the wagons that closed the entrance. Drawing a parallel with mythology, the wheel sometimes caused the defeat of the solar god (e.g. the wheel stolen from Surya). While the wheat placed atop the wagon can be treated as a feature of the earth cult that was still traceable in the Pit-Grave culture of the Early Bronze Age, the Catacomb rite demonstrates the well-defined solar aspect of the cult in the Middle Bronze Age.

It was not only food and grave goods that were placed atop the wagon. Skeletons also were placed lying, sitting, or semi-sitting on parts of the wagon construction (Bessonova 1982; Izbitser 1993). For instance, in burials in the Prut–Dniester interfluve, the skeletons were found lying atop the wagon (Izbitser 1993:17). Burial mound N° 1 near the village of Dolinka contained two burials in which the skeletons were placed on the remains of wagons (and in one case, a sleigh without wheels): burial N° 3 contained the sleigh (with traces of red painting) located in a grave cist of the Kemi Oba culture, with a "tree ornament" painted on its inner walls (in red color on a white ground), while burial N° 8 with the wagon was associated with the Pit-Grave culture (Figure 4; Kolotukhin 2008:225–226).

Variations of the rite are observed in some cases. Monuments of the Novotitorovka and pre-Catacomb cultures include some wagons that are located at a considerable distance from their associated burial (Izbitser 1993:7). At times, the wagon could be located at the feet of the skeletal remains, with the wheels removed from the axles (as in the Catacomb burial of the Left-Bank Dnieper; Izbitser 1993:15). Their association with the temple and the tree symbol—and, particularly the placement of skeletons and grave goods atop the remains of the wagon—lead to its conceptualization as an embodiment of the universe, the *axis mundi*.

Wagons are sometimes found in association with oxen or horses in the burials. In the early stage of the Pit-Grave culture, oxen were harnessed to the wagons (Bessonova 1982:104), while horses were associated with lighter chariots that were first witnessed in a burial at Sintashta in the southern Urals that dated to the middle of the second millennium BCE (Bessonova 1982:104). In the North Pontic area, burials with horses and chariots appeared later on; they spread during the Early Iron Age as part of the Scythian solar cult. Not only is the functional aspect of the ox-drawn wagons relevant, but so are the origins of the symbolism of the bull in the agricultural cult that dates back to the Neolithic era.

There are two perspectives about the social class of those who were buried with wagons. The first asserts their high status (Bondár 2018:272; Gening 1977:68–69; Kaiser 2010:111). The second attributes to the rite of wagon burial the tradition of ritualistic killing that was supposed to ensure the well-being of the community; therefore, high social status was not required (Izbitser 1993:19–20). Furthermore, wagon burials are not marked with exceptional grave goods or the efforts involved therein, as they were a common practice in certain areas, such as Kuban (Gei 1991; Izbitser 1993; Trifonov 1983).

The features of the sacrificial rite were well defined in cross-border regions. The Sintashta burial contained the remains of disjointed horses accompanied by wagons. This ritual is interpreted in the context of the myth of sacrifice (e.g. Vedic Purusha, Norse Ymir) as it relates to horses: the so-called *ashvamedha* (horse sacrifice ritual), which implied the creation of a "compound" sacrifice from the divided parts (Sotnikova 2014:178–180).

In the Pontic steppe, the ritual of disconnection is observed in the findings of dismantled wagons (though the occurrence of human skeletal remains with bones out of anatomical order should also be noted). Dismantled wagons are found throughout the region, including in burials of the Left- and Right-Bank Dnieper as well as the Prut–Dniester interfluve (Izbitser 1993:15–18), both in fragmented pieces and in the dismantled form (Shishlina et al. 2014:379). In some cases, the wagons were intact; however, the wheels were usually removed. This points to a sacrificial motive in the North Pontic region, wherein the dismantled wagon embodied the dismantled universe. The ritual probably arises from the concept of "eternal return" that, according to Eliade (1952), consists of the periodic destruction and reconstruction of the world. Therefore, the tradition of dismantling the wagons may have two interpretations. On the one hand, the broken wagon objectified the distortion of the cosmic order, aiming at the separation of the afterlife through ritual. On the other, it offered a return to the beginning of creation, the reconstruction of the world from its parts, which is cognate not only to the Purusha-like myths, but also to the myth of the dying and rising sun that travels on its chariot.

## Conclusion

The Bronze Age of the North Pontic region demonstrates continuity in and wholeness of mythopoetic perceptions, which aimed to harmonize ritual actions and monuments with the environment. This leads to tetradic features that are observed in the burials with wagons rites, reflecting the spatiotemporal symbolism that originated in the primary myths of the epoch. The features of the earth cult that was prominent in the Neolithic are still traceable in rites of the Early Bronze Age against the backdrop of the symbolism of the solar journey. The mythologeme of the *axis mundi* was objectified in the physical, symbolic form of features both natural (i.e. components of the landscape: rivers, mountains, etc.) and non-natural (i.e. ritual objects: tumuli, wagons, etc.). As geographical space transformed into mythological, these two types of elements became correlated, as expressed in the burial mounds' riverine distribution and location on elevated steppe watersheds or along ridges. The cultic function of the tumulus was of paramount importance in the territory under study. In some cases, the tumulus morphology of Bronze Age cultures of the North Pontic area included burials with wagons that personified the model of the world, being a part of how the afterlife journey and afterworld landscape were conceptualized.

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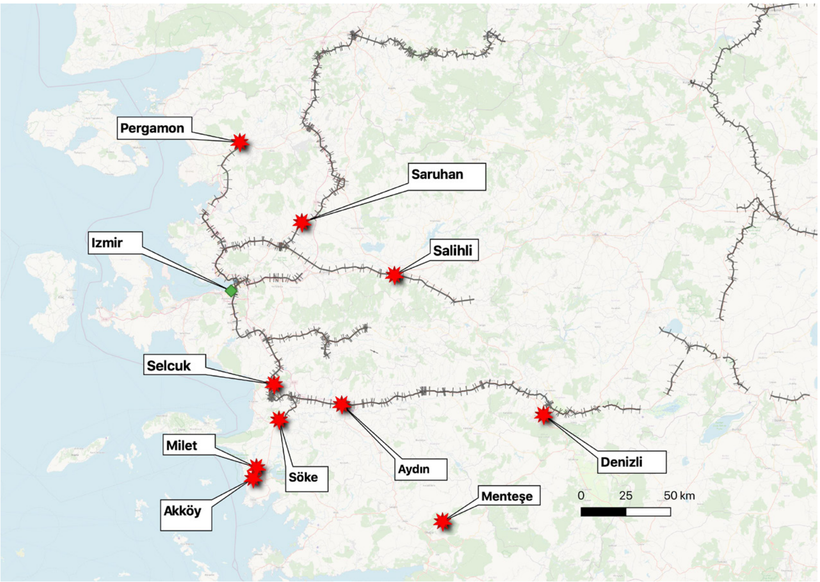

**Figure 1.** The railway line connecting İzmir, its hinterland, and nearby archaeological sites.

# Chapter Thirteen
# Transferring People, Goods, and Archaeological Finds: Railway Construction and Connecting İzmir with the Inner Land in the Nineteenth Century

Selvihan Kurt

The very first railway line in the Ottoman Empire was İzmir–Aydın, whose concession was granted in 1856 immediately after the Crimean War. This project was completed within a decade, and in 1866 the railway line began commuting passengers and goods. The line was supposed to have been completed in a few years, and although the state had the right to withdraw the concessions and transfer them to another company, the project deadline was granted an extension each time the company requested one. In the end, the deadline was extended three times, and the same railway company succeeded in obtaining two more concessions for additional lines in 1879 and 1888, extending the first line toward the eastern hinterland of İzmir (Figure 1).

The concession for the İzmir–Kasaba railway line was awarded in 1863 to a British man, Edward Price, and completed in 1866. This railway line was opened only a few months before the İzmir–Aydın line, and it was extended twice—in 1872 and 1888—with additional contracts. Although the railway line was originally initiated by Price's company, the state used its contractually agreed-upon purchase option and sold it to a French company in 1888 (Donkow 2004; Schoenberg 1977). With these railway projects, an infrastructure line was created in the Aegean region that was very well usable for both the Ottoman state and the European companies that were involved in its construction.

The creation of a railway network within the Ottoman Empire was motivated by the Empire's desire to create a military infrastructure and by the Europeans' realization of the potential profit that could be made in the railway construction business. The state's perspective was that an infrastructural network would ensure that armed forces could be deployed without problem and would enable it to control a wide geography, which was very tempting in the turbulent climate of the nineteenth century. During the Crimean War, the inadequacy of the current infrastructure made it clear that the creation of a railway infrastructure was essential for mobilizing the armed forces in a short time. The state's strong desire for centralization and the logistical role of the railway network in this context deeply influenced its decisions regarding railway construction. In the case of the Angora–Aleppo section of the Baghdad railway, for example, following the Mediterranean coast would have been less costly, but instead it followed the Cilicia line, which made more military sense and helped to control the vast geography (Özyüksel 2016; Schoenberg 1977).

Secondly, both the Ottoman Empire and the foreign investors were expecting the Aegean region to be integrated within the wider market with the construction of better transport in the region, and so railway construction in the Ottoman lands was a profitable investment on its own. After signing trade agreements with European countries during the 1830s, the Empire's external trade vastly increased, almost quintupling between 1840 and 1870. The raw materials produced in the Aegean region were highly crucial to European industry, but the lack of sufficient infrastructure increased transportation expenses. For instance, British cotton suppliers were impatiently relying on and waiting for the completion of the railroad as a result of the impact and damage created by the American Civil War. In addition, the British consulate in İzmir, in response to the questionnaire of the Manchester Cotton Supply Association in 1857, had already assured that transferring the cotton transportation from camel caravans to the railroad would reduce the cost (Akgüngör et al. 2011; Geyikdağı 2011). The military and economic impact of the railway network was the main motivation for developing such infrastructure and, obviously, was quite expected at the same time. However, the Europeans' discovery of the archaeological opportunities in the Aegean region caused both the field of Ottoman archaeology and the city of İzmir to be equally affected by the railway construction, which manifested in the process that led to the first bylaws protecting antique heritage and marking İzmir as an archaeological center.

This paper aims to explain and exemplify two aspects of the impact that the railway construction had in İzmir and the wider Aegean region. The first aspect encompasses the increase in foreign visitors who were motivated to travel to the Ottoman lands by the possibility of archaeological discoveries and profit; how the railway business brought these people to the Ottoman lands, especially İzmir; and how their archaeological activities paved the way for the regulation of archaeological findings. The second aspect is the infrastructural impact of the railway lines: the railway line connecting İzmir and its hinterland provided a great advantage for transferring archaeological finds to İzmir and indirectly helped it to become an archaeological center; in addition, the railway line determined the location of the İzmir Archaeology Museum (*İzmir Asar-ı Atika Müzesi*).

## The Railway Business and the Archaeology Adventurists

The railway construction projects that were carried out by foreign investors and their employees in the Aegean region and the eastern provinces paved the way for orientalists, entrepreneurs, and philanthropists. Their "raids" were motivated not only by the possibility of valuable discoveries, but also by an enthusiasm for exploring "the Orient" and the lack of protective measures and legislation from the Ottoman Empire regarding all kinds of archaeological activities. Both German and British teams—and especially figures like John Turtle Wood—benefitted from the disinterested bureaucratic climate for years, but the echo of their construction noise sensitized the state authorities to hear, finally, the voice and objections of educated bureaucrats like Osman Hamdi Bey. In other words, the issuance of antiquities bylaws was born out of foreigners attracting the attention of state bodies by carrying out a large number of excavations, especially in the Aegean region.

Railway construction in the Aegean region was intended to connect İzmir with its hinterland in order to guarantee a smooth supply chain for European industry and to enable its products from Asia Minor to enter the market. After the completion of the railway lines that connected the inland with İzmir, the flood of imported and exported materials and goods into the city made it crucial to build a modernized harbor, as well, a project that was completed in 1875. The construction of a modern harbor following the model of the railway was a very common phenomenon in East Mediterranean port cities such as Beirut, Alexandria, and Salonika during the nineteenth century. In many cases, modernized new harbors were built to cope with the huge increase in import-export activities that resulted from the improved infrastructure by replacing camel caravan routes with railways (Hastaoglou-Martidinis 2010; Issawi 1966). The improved transportation infrastructure—and specifically the railway line— also provided a smooth supply chain for European philanthropists, leading a way out for those who were targeting the archaeological heritage of the region.

The great expectation to derive direct and indirect profit from the railway construction brought British investors, officers, and engineers to the Aegean region. Soon after shipping logistics became easier, the region's archaeological finds also attracted the attention of foreigners who were working in the railway sector. John Turtle Wood (1821–1890) was one of the British officials who quickly recognized and took advantage of the archaeological opportunities offered by both the Aegean region and the railway construction. An architect and land surveyor, Wood had been working for the Ottoman Railway Company since 1858, and this position enabled him to undertake various excursions at Ephesus, whose railway station at Ayasoluğ (modern Selçuk) was in the immediate vicinity. In fact, it was prior knowledge of the archaeological site that determined this route: the engineers of the İzmir–Aydın line specifically chose Ayasoluğ as one of the stations because it was reasonably close to Ephesus (Özyüksel 2016). Wood had returned to England with a desire to excavate the temple of Artemis at Ephesus, having been fascinated by the absence of any visible trace of this temple. In England, he sought the help of the Board of Trustees of the British Museum, and his letters to John Winter Jones, the Deputy Principal Librarian of the British Museum, paved the way for starting the excavations in three months (in May 1863; Christensen 2017; Donkow 2004). For the British Museum, the contract with Wood was not a burden—financial or otherwise—but rather a promise of the valuable art and artifacts that he could unearth. According to the contract, Wood was responsible for all financial matters related to the excavation, documentation, and photography of all finds. The Museum was to pay the price of those items which had been bought from Wood (Wood 1877). The Museum was involved in more bureaucratic matters. Prior to his departure to Turkey, an amateur archaeologist teamed up with Wood with a royal decree from the Ottoman palace, which the Foreign Office and the British Embassy had obtained, that gave him permission to dig for twelve months (Donkow 2004). With this royal decree, Wood was free to do with the finds whatever he chose so long as he left behind a replica, and he only needed the landowner's permission to excavate the land. However, the royal decree was only valid for one year; having to renew the decree each year would later cause him trouble and delays (Wood 1877).

For four years, the disinterested bureaucratic environment enabled Wood to excavate and remove artifacts from Ephesus, but it also caused the inconvenience that would lead to the first bylaw on the excavation and export of archaeological finds in the Ottoman Empire. The governor of Aydın, Hekim İsmail Paşa, discovered that the agreement between the British excavators and Istanbul was being violated and denied Wood an extension of his permit in its fifth year. The Grand Vizirate instructed the governor to extend the permit, but he responded by listing and reporting his objections about the overall system of excavation and export of antiquities and, in particular, about the Wood case. All these objections were supported by the reports of Antonaki Edwards, a commissary of the İzmir–Aydın railway. According to reports covering nine months in 1868, Wood had dismantled 51 blocks of stone without producing replicas of finds, as agreed. In a letter Hekim İsmail Paşa sent to the *Şura-yı Devlet* (State Council), he lamented the Ottoman government's disfavored position regarding the acquisition of archaeological finds from the excavations at Ephesus, the amount of finds sent by Wood, and, more importantly, the general problem of allowing foreigners to keep the archaeological finds instead of founding an Imperial Museum that could drive the Ottoman authorities to take some action (Eldem 2011). In 1869 the first bylaw regarding the excavation and exploitation of archaeological finds from Ottoman soil was enacted; it finally prohibited finds from being taken abroad to be sold, giving the state the initial privilege of purchasing the antiquities as they were excavated from the ground (Çal 1997). Even though the letter and reports could have brought some movement on the issue of protecting the region's antiquities, the bylaw was not effective enough, and discussions and complaints about the excavations at Ephesus continued in the newspaper columns of İzmir and Istanbul. For example, in its April 24, 1872, issue, three years after the first bylaw, the newspaper *La Turquie* drew attention to the ongoing excavations at Ephesus and the quality and quantity of finds that were being sent away to decorate the British Museum, as well as the lack of excavation commissioners at the site who had the Empire's interests at heart (Akın 1992).

The 1884 bylaw attempted to fix the loopholes in the previous 1869 and 1874 bylaws by adding a list of items that were considered to be antiquities. Contrary to the first bylaw, individuals were not given any say about the antiquities found on their private property, and the state automatically obtained ownership of the land if it possessed antiques underneath. Further, the possession and export of antiquities were not possible without the consent of the Imperial Museum. Excavators were allowed to dig only on a precisely defined plot of land, and applicants were required to attach a map of the area to be dug. Finally, the state reserved the right to revoke the permit (Çal 1997; Eldem 2011). The 1884 bylaw was the result of the developing awareness of the need to protect local archaeological heritage from foreigners, but it also opened the way for further excavations by establishing a mechanism to request excavation permits. This mechanism was intended to benefit the Ottoman state, but while permits were issued one after another, the principle of protecting and representing the interest of the Imperial Museum remained unfulfilled. Moreover, the Sultan's involvement in these affairs usually ended with the circumvention of the Antiquity Law and the granting of permits, as in the case of Kaiser Wilhelm II of Prussia and Franz Joseph I of Austria (Eldem and Çelik 2015). The guidelines of this mechanism and the Sultan's initiative in the 1884 bylaw were systematically used in the eastern provinces of the Empire. The Hejaz railway, whose concession holder was Deutsche Bank, was a highly functional infrastructure for the discovery and documentation of ancient sites and, later, for the transport of priceless pieces to Germany. The Berggren Archaeological Portfolio was created as the end product of the discoveries that benefitted from the railway infrastructure. Guillaume Berggren was an accomplished Swedish-born photographer with a successful photo studio in Istanbul (Christensen 2017), and he was hired and commissioned by Karl Wilhelm Franz Gabriel Schrader, who presumably had an advisory position at Deutsche Bank and Anatolian Railways Company, to document the railway. The photographs in his album include station buildings, bridges, and tunnels. Although they might seem like an exploratory and instructive project about the construction of the Baghdad railway, the volumes of photographs depicting the pre-Islamic and medieval sites and the careful arrangement of the scenes in the photographs give the impression of an attempt to make an inventory (Christensen 2017; Hopkins 1968).

In the case of the remains of the Mshatta palatial complex, both the tensions related to the bylaws and the functional role of the railways reached their peak. The Umayyad complex at Qasr al-Mshatta was discovered by the civil engineer Gottlieb Schumacher while surveying for the Palestinian railway, and he played a crucial role in the removal of antiquities from the site. From the beginning, he was very conscious of and interested in the ancient finds he might come across during his investigations. In the maps he prepared for the Palestine Explorations Fund, he included not only the current topography, but also the ancient ruins (Christensen 2017; Willert 2021). After this discovery, Richard Schöne, the director of the Royal Museum of Berlin, and (with Schöne's letter) the archaeologist Otto Puchstein both became involved, and the German Embassy in Istanbul was entrusted with obtaining the Sultan's decree and mediating between the two countries. The original plan was to transport the massive palatial façade on the Hijaz railway line to Damascus and then to the port of Haifa, where it was to be shipped to Hamburg. Although various delays in the railway project brought to the table the option of carrying the massive stones by camel, the excavation team—and especially Schumacher—insisted on waiting for the completion of the railway in order to move it without attracting the attention of Osman Hamdi Bey, the director of the Imperial Museum, who would have interpreted the move as a personal offense and intervened in some way. With the support of the Governor of Damascus, Nazim Pasha (who successfully organized the finds' protection by providing guards until they could be transported), the excavation team waited patiently for the completion of the railway. Osman Hamdi Bey was deliberately excluded from this process, and his eventual discovery of the project led to a failed attempt to resign. After Osman Hamdi Bey's resignation was rejected, he devoted himself to issuing the final and most comprehensive and restrictive bylaw, which included detailed measures for the protection of antiquities after their discovery, such as immediate notification of the authorities and closer communication and cooperation with provincial administrations and the Imperial Museum. Finally, the 1904 bylaw was born out of this tension (Hastaoglou-Martidinis 2010; Issawi 1966).

## The İzmir Archaeology Museum and the Railway Lines

Beginning in the sixteenth century, İzmir was the region's center of attraction, and it became a mediating trade zone between Asia Minor and Europe—particularly between large-scale European traders and relatively local small-scale traders, with the assistance of mostly Greek Orthodox entrepreneurs—especially after the Anglo-Ottoman Trade Agreement of 1838 (the Treaty of Balta Liman) strengthened trade activities in the region (Kechriotis 2010). Starting in the last quarter of the sixteenth century, the demographic character of İzmir became cosmopolitan as a result of the arrival of fluxes of immigrants seeking jobs, Europeans seeking new trade opportunities, and a great number of non-Muslims and people from the Levant who later became mediators with the European and local small-scale merchants (Kechriotis 2010). Residential buildings, trade offices, and consulate buildings were added to the urban topography of the city, giving it a unique and distinctive feeling that differed from typical Muslim cities.

Typical Muslim cities had a signature imperial complex with a convent masjid or congregational mosque at the center, along with its dependencies, including bazaars, bathhouses, or madrasas. Marking the center with such a complex was a reflection of social life as dominated by the mosque, which was the state apparatus (Kafescioğlu 2009). In the landscape of İzmir, however, it was impossible to point to such a center with a mosque; instead, its harbor and Frank Street—running parallel to the shore—were the heart of the city, where dozens of taverns, coffeehouses, and meeting places were located and where Mediterranean worlds met the Atlantic world. On this prominent boulevard, the mostly lavish residences of rich Europeans extended from the water toward the interior, together with residential districts dominated by Greek Orthodox and Armenian communities and their religious buildings. After the completion of the İzmir–Aydın and İzmir–Kasaba railway lines, the V-shape of these lines restricted this area to the interior land and created an encapsulated triangular zone that was densely urbanized, where people, products, and materials flowed from the Aegean Sea to the hinterland and vice versa. Logistically and rationally, the railway line should have connected the interior with the port, but the obstacle of cutting through this densely urbanized section toward the sea, which possibly would have increased construction expenses, led to the two railway lines enclosing the heart of the city with the sea and creating a triangular shape. Consequently, the Basmane railway station and the customs house on the quay were connected by a tram in order to transport materials and goods to their final destination (Bilsel 2009; Frangakis-Syrett 2001; Goffman et al. 1999; Kırlı 2002).

During the late nineteenth century, İzmir enjoyed the privilege of accumulating capital, networks and social life, and a cosmopolitan demographic and urban structure, and it achieved a high level of prosperity in the area. But the last episode of World War I changed the situation in the city dramatically. İzmir was under Greek rule between 1919 and 1922, and on September 9, 1922, the Turkish army took back the city. Between September 13 and 15, the Great Fire literally melted the heart of the city. The perpetrators of this massive incident were never discovered, but regardless of the mastermind behind it, all the major hotels, bank buildings, business units, the sewage system, the public buildings of the Christian communities, and a considerable number of the residential buildings (two-thirds) were completely burned down or seriously damaged in and around the economic center of the city (Kolluoğlu Kırlı 2005; Serçe 1998).

The V-shape of the railways created a natural boundary for the fire zone and the former commercial district of the city. This triangular zone, which the fire turned into a massive black hole, also became the focus of the city's reconstruction efforts after the war and the fire were over. İzmir's crucial position in terms of integrating regional trade into the world market made it a priority to rebuild the city alongside the construction of the new capital at Ankara. The reconstruction of İzmir could not be initiated until 1925 with the massive reconstruction plan of the French urban planners Raymond and René Danger, with contributions from Henri Prost. Although the economic conditions of the postwar period were quite restrictive and repeatedly prompted the municipality to modify the plan, reconstruction continued very actively until the Great Depression finally affected the price of building materials in 1929 (Serçe 1998).

The İzmir Archaeology Museum was one of the buildings to be built immediately despite the postwar economic conditions, and Aziz Ogan, the Museum's founder (1922–1926), led the project. A letter from an unnamed friend of Ogan's summarized quite well the basic reasons for prioritizing the construction project. The author congratulated Ogan on the idea of founding such an institution (*müessese-i irfan*) and emphasized that the lack of a museum in İzmir was a rather remarkable shortcoming. The author was quite annoyed by archaeological sites that lacked guards, like Pergamon, and by the accumulation of art and artifacts in the courtyards of public buildings such as courthouses. After discussing some technical issues, such as the allocation of a budget or the land on which the building was to be constructed, he explicitly mentioned the attempts by the Greek administration to build a museum building in the city. The city had been under the control of the Greek army between 1919 and 1922, and the Greek authorities had been enthusiastic about conspicuously strengthening their presence in the city—which they thought would be permanent. One of the ways in which they intended to do so was by founding a museum institution, which would also symbolize their claim over

Hellenistic archaeological heritage in the region (Aziz Ogan Archive [AOA] 1923). Although the author of the letter regarded Greece's plan as a cover-up while people were being slaughtered and vandalism was taking place around them, he appreciated their valuing of such an institution. The manifestation of the imperial intellectual capacity to appreciate art and artifacts through Western patterns was also a crucial motivation for the founding of the Imperial Museum in Istanbul. In his opening dedication, the Minister of Education, Münif Pasha, promptly expressed a wish to reach the level of the institution's Western counterparts and to promote the spread of further such museum institutions (Cezar 1995); in İzmir, the state could not be outcompeted by "bandits" who were working against the very spirit of such an institution.

Apart from this intellectual and competitive background, there was a basic logistical need to accommodate archaeological finds that fueled the state's ambition to immediately establish a museum under postwar conditions. In the early postwar years, Aziz Ogan, reassigned to the directorship of the İzmir Directorate of Antiquity in 1926, devoted himself to evaluating the damage that had befallen antiquities in the Aegean provinces. Many archaeological teams (e.g. German teams digging in the Aegean region) had stored their finds in the camps at the archaeological sites, and it was reported that these camps had been severely damaged by looting. Although the Greek administration had sent the most valuable finds to İzmir to put together a collection for their planned Asia Minor Museum, many archaeological finds were still left in a rather vulnerable position in the camps at Ephesus, Pergamon, and Sardis (Davis 2000; Radt 2010). Ultimately, İzmir had to maintain the economically and culturally central position in the Aegean region that it had before the war. During the Greek army's short-term presence in the region and, later, during the first years of the young republic and the founding of the city's archaeological museum, İzmir became an important item on the cultural agenda.

Although the letter to Ogan mentioned the plan to build the new museum in the former Jewish cemetery, where the Greek administration had previously begun construction of a museum building using tombstones from Jewish graves, the İzmir Archaeology Museum's limited economic resources prompted a revision of this plan (AOA 1923). The church of Aya Vukla was located on the outskirts of the city center and directly on the V-shaped railway, which meant that its distance allowed it to partially escape the fire. Although the church building


**Figure 2.** The extent of the Great Fire of 1922. Map by George Poulimenos.

did not burn down completely, it was severely damaged and had been occupied by the homeless refugee crowd. Already in the first days of preparations it was known that the building could accommodate the region's rich archaeological sources, which were repeatedly excavated and brought to the city; it was emphasized that constructing a huge building designed specifically to serve as a museum must remain on the agenda. In the report prepared to investigate the suitability of the museum building, it was noted that the location was not really exclusive (*mutena*), but that the proximity of the Basmane railway station (about four minutes' distance) offered the great advantage of minimizing transport costs, which was very tempting for a country suffering from the economic struggles of the postwar period. The report also explicitly emphasized that the current and future excavations and the rich archaeological reserves in the provinces around İzmir would bring a continuous transfer of finds of all sizes to the region, which, in turn, would bring continuous costs; this made it imperative to construct a building that could accommodate the physical needs of a museum (AOA 1924). The plan to found a museum in İzmir to house archaeological finds and the desire to minimize transport costs in the long run were related to İzmir's position as a center where all the region's railway lines converged. Furthermore, the location of this central museum was indirectly determined by the sections of the İzmir–Kasaba and İzmir–Aydın railway lines in the city center, as they represented a natural boundary for the fire zone and protected the church of Aya Vukla from total destruction (Figure 2).

Ogan's dedication resulted in sending out numerous missions to archeological sites in the Aegean region and writing final reports about the archaeological finds and their transfer to İzmir by railway. The advantage of İzmir's developed infrastructure connecting it to its hinterland and the short distance between the museum and the train station motivated the transfer of art and artifacts to İzmir during the 1920s. Ogan's initial intention was to inspect the finds and the local sites himself. However, due to his busy work schedule, he instead demanded inspection reports from Aydın, Saruhan, Denizli, and Menteşe provinces about the finds that might be relocated to the İzmir Archaeology Museum (AOA Undated). In another series of correspondence, packing instructions were sent to the Directorate of Education in order to receive three pieces of marble sculpture unharmed, and the following letters report receiving similar pieces from Denizli and Muğla (AOA 1926). Söke was another province that was directly connected to the railway line, and this infrastructural advantage aided the transfer of collections excavated from Söke, Milet, and Akköy (AOA 1925a, 1925b). The İzmir Archaeology Museum also came to shelter finds stored in the courtyard of government offices: for instance, another set of sculptures was transferred by train from Akhisar to the museum, and the necessary budget was allocated by the Inspectorship of Antiques to İzmir's Directorate of Education (AOA 1929). Salihli was another province whose excavated art and artifacts were discovered by coincidence and ordered to be sent by train to the İzmir Archaeology Museum (see Figure 1).

## Conclusion

The Anglo-Ottoman Trade Agreement of 1838 was an important turning point in the integration of the Ottoman Empire's trade and economy into the world economy. The export of raw materials and the flow of imported European goods into every corner of the Empire increased dramatically thereafter. İzmir's role as the main transfer center for agricultural exports in the Aegean region—a role established in the sixteenth century—became even more important in the nineteenth century as a result of the rapidly growing trade activities in the Aegean and the globalization of European industry. However, the inadequacy of the supply network for supplying European industry with sufficient quantities of raw materials led to a bottleneck, which made inevitable the construction of a railway network as a means of improving the infrastructure. The state's enthusiasm and great hope of increasing agricultural and indirect tax revenues in the region, as well as European investors' awareness of the great profits that could be made from the railway business, created a suitable atmosphere for establishing the railway network in the Aegean region and in the eastern provinces. İzmir had already been a central location prior to its connection to the Aegean hinterland via the Kasaba and Aydın railways, but at the same time, the measures to significantly improve the regional infrastructure further strengthened İzmir's central position. The European teams involved in the railway business—including businessmen, engineers, scientists, adventurers, entrepreneurs, orientalists, and archaeologists—sometimes came to the region with prior knowledge of its archaeological sites, and sometimes their exploratory excavations or accidental discoveries during railway construction triggered the emptying of archaeological finds from Ottoman soil and their transfer to European museums. In the late nineteenth century, these Europeans legally looted a large number of archaeological finds from the Ottoman lands; they benefitted from personal relations with the Sultan or the absence of any kind of bylaw that regulated or required inspection of the rich archaeological reserves of the region. However, objections from the learned elites such as Osman Hamdi Bey and some local governors against such exploitation, as well as their efforts to raise archaeological awareness, created a consensus to issue the first bylaw and the next statutes, one after the other, to fill in any loopholes.

During World War I and the brief presence of the Greek administration in the city, İzmir's central position was maintained in cultural and archaeological terms, and archaeological finds were transferred from the interior of the country in the hope of being exhibited in the future Asia Minor Museum. The Greek army was unable to realize this dream before leaving the city in 1922 upon the arrival of the Turkish army. However, it was crucial for the new Turkish Republic to prove its intellectual ability to appreciate and claim the archaeological heritage in the region, to achieve the archaeological standards of the Western world by founding a museum that would compete with its Western counterparts, and, finally, to not fall below the standards of the Greeks who were vandals (from the Ottoman Empire's perspective) who brutally destroyed its people and the region as a whole.

Ottoman archaeology had gone through a dynamic period in the second half of the nineteenth century, when the influx of Europeans who were mostly connected to the railway infrastructure drained the Ottoman lands, and the related bylaws that protected its antiquities were born out of the chaos they created. The railway lines connecting the inner country with İzmir were the most suitable means for transferring the ancient collections from the inner lands to the İzmir Archaeology Museum.

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# Chapter Fourteen
# All Roads Lead to Beijing: Politics, Power, and Profits of the Roads

Punsara Amarasinghe, Tuna Kalaycı, and Marike van Aerde

The Silk Road has produced fascinating stories. It was a favorite topic of many generations of researchers, who unveiled the contributions it made as one of the most important corridors of movement in human history. The narratives that existed among historiographers of the Silk Road took a different direction when Chinese President Xi Jinping announced his "One Belt One Road" initiative in 2013. In 2015 China changed the name, adopting the "Belt and Road Initiative" (BRI) as the new title for its ambitious project.

The overwhelming economic growth of modern China has surpassed the prosperity of the Spanish Empire in the sixteenth century and even the memories of European industrialization (Shambaugh 2016). The ardent interest of China's state apparatus in succeeding in its mammoth venture of reviving the legacy of the Silk Road reveals the indomitable flare sparking within the nation to become the epitome of a global player. China's rapid economic influence on every continent has given it a greater potential, which is likely to vanquish the hegemony of the United States. It was in 2016 that China displaced the US as Germany's most important trading partner, evincing the rapport between Beijing and Europe. The most important historical reality that cannot be ignored is that Xi Jinping's BRI initiative is not, in fact, China's maiden attempt at expanding its power internationally, as it can claim a long history as a global key player.

It is commonly understood that the Silk Road—in actuality not a single road, but rather a network of myriad routes that spanned continents—was dominated largely by the Chinese presence. The shared narrative is as follows: Chinese influence was at its apex during the Han (206–220 CE) and Tang dynasties (618–907 CE), when it was known as the "Middle Kingdom." The Romans and, later, the Byzantines were eager to acquire the best Chinese silks (hence the name), and silk other commodities arrived via the Silk Road through Central Asia and the Middle East. The archaeological record has left traces that illustrate the Chinese influence via the ancient Silk Road. Also, the (hi-)stories of legendary figures such as Marco Polo, Ibn Battuta, and many other ancient travelers who travelled the Silk Road affirm the abundance of power that China held as a global "superpower" in the past.

However, this normative historical reading of the Silk Road is problematic. The first issue is the prevalent belief in the immemorial Chinese domination of the Silk Road. Neither in the archaeological record nor in textual sources is there any evidence of Chinese dominance over Silk Road trade until late antiquity. Several centuries before the Han dynasty joined the trade networks beyond its borders, multiple complex routes had already formed between East Africa, the Indian subcontinent, the Arabian Peninsula, and the Mediterranean. The archaeological evidence is remarkably scarce; moreover, all the textual sources confirm that China was, in fact, the very last of the ancient empires to join in the trade networks. The Mauryan Empire in India was one of the first, as were Ptolemaic (and then Roman) Egypt, the Kingdom of Aksum, and many pre-Islamic Arabian kingdoms. Simply put, it was actually because Han Wudi, emperor of the Han dynasty, had heard about the trade opportunities outside the walls of the Chinese empire that he opened the Jade Gate Pass (in the Xinjiang region) to allow for trade with international merchants to take place beyond its bounds. Not until later, however, when trade flourished during the Tang dynasty, were foreigners allowed onto Chinese soil.

The second problem is a lack of archaeological evidence to support these grand narratives. There is only one brief textual mention of Roman interest in Chinese silk (by Pliny the Elder)—and no other data thus far confirm this. The lack of hard evidence from antiquity is concerning when it comes to the accurate assessment of the historiography.

Finally, the legendary figures' narratives of the Silk Road all date from the early to late medieval period, much later than antiquity and the Han or even early Tang eras. China did become an important trading power in medieval times—and it was a key partner especially during the Islamic Golden Age (when trade centers stretched from Mali to Samarkand)—but the origin of the networks was not Chinese, and the situation (and power balance) in antiquity was very different.

Thus, our concern is to unpack how and why in much of today's scholarship on the ancient Silk Road we see a shift in focus to China—a projection of the dominance that came to be only in medieval times—and to discover what is leading scholars to overlook or brush over the important differences between the ancient and medieval Silk Road networks. In fact, a very different picture emerges in antiquity when China is concerned.

The recent revival of nostalgia for the Silk Road under the BRI raises some fundamental questions (Cheng 2016). Furthermore, the BRI produces political ambiguities, since the sovereignty of some nation-states along the corridor is now at greater risk as they face China's ambitious mission. In this paper, we seek to examine the political importance of the Silk Road for the BRI and highlight how and why China (mis)uses history to promote its current BRI policies. In a larger sense, this paper will also attempt to document how a historical space can transform into a contested space that is tethered to modern political and economic motives. Perhaps it is by no means an exaggeration to describe the Silk Road as the most important road in global history; it has influenced—and will continue to influence—nations, states, and entire cultures as a project based on complex political agendas.

## In the Beginning

As with any emergent communication and transportation network, there is no single origin story of the Silk Road. About 5,500 years ago, Eurasian steppe nomads domesticated the horse and thereby drastically altered the course of human history (Outram et al. 2009). The Bactrian camel soon followed the same fate, bearing the bulk of transportation between eastern and western civilizations for centuries (Potts 2005). People who utilized these animals naturally contributed to the formation of roads throughout Central Asia. The archaeological evidence suggests that the road network was functioning as early as the third millennium BCE, with further intensification in the second millennium BCE (Kuzmina 2008:108). While these organically developed road networks can be considered the precursors of the Silk Road, two key periods can be associated with its top-down foundation: the Achaemenid period (500–330 BCE) and the expansion of Greek power into Central Asia (329 BCE–10 CE) initiated by the Alexander the Great. The Achaemenid Empire maintained an extensive road network mainly connecting Susa with Sardis to the west, as well as extending further east to Bactra, Kandahar, and India (Colburn 2013:31). An efficient road network was necessary for sustaining this vast empire. The imperial roads were maintained and guarded, and an efficient postal system was established for high-speed communication

(Colburn 2017:875). The second major phase started with Alexander's march, which extended as far east as the Hyphasis River in India (Howe and Müller 2012): "[a] new network of communication connecting West and East emerged in the Hellenistic world and its neighboring areas" (Juping 2009:16). In 43 CE, the Roman geographer Pomponius Mela mentioned the people of "the Silk country" (Kuzmina 2008:2), suggesting that an effective road was already in use and that silk was considered a commodity. But, one should note here the continuous absence of a given name for the road.

According to the current historiography, Zhang Qian's visit to the West in the second century BCE prompted emperor Han Wudi to issue a decree officially opening the Silk Road (Kuzmina 2008:2); yet, this traditional interpretation is open to debate. The decree marked the moment when China opened up to international trade and joined an already-centuries-old network of trade. This was not the beginning of the Silk Road, but rather the moment when China realized its potential and decided to join it. Furthermore, the term itself was coined two millennia later by German geographer Baron Ferdinand Freiherr von Richthofen in 1877. The term appeared in the first of several volumes he published about his stay in China between 1868 and 1872. Although von Richthofen had originally called the road *Seidenstrasse*, it was the English translation (Silk Road) that was adopted in the scholarship (Nobis 2018:723). This European-invented term was deceiving and misleading because none of the textual narratives written by the travelers of this route used it; nevertheless, it became a cultural phenomenon that fed the fashionable nostalgia of globalization (Thorsten 2005:301). As a matter of fact, the Silk Road was not a single road that led from one destination to another. It was rather a network of many unmarked paths connecting across rough geographical regions, such as mountains and deadly deserts. In addition to the famous overland network, the maritime Silk Road, which connected China with different continents beyond its shores, was expanded through many avenues.

The core of the Silk Road, known in medieval times (but not in antiquity) as the Middle Silk Road, connected three cultural, political, and economic superpowers: Iran, India, and China. Eastern Iran happened to be the starting point of the Middle Silk Road, continuing east through Merw and onward to the Gobi Desert. The road connected with the city of Dunhuang in the east and Kashmir in the south, creating a unique blend of geopolitical cultures. Following the Middle Silk Road, the Eastern Silk Road connected to Chinese trade


**Figure 1.** It is impossible to draw a conclusive map of the Silk Road(s); the networks were inherently complex and flexible, including both land caravan tracks and multiple sea routes across the Indian Ocean. To present this system as a linear map made up of primary arteries is rather misleading. Nevertheless, we follow scholarship and present a depiction of the roads.

towns: from Dunhuang to Anxi, and from Baoji and Tianshui to Chang'an. The Western Silk Road extended to the major trade ports in the Mediterranean Sea. From Merw it connected to Mashhad, Tehran, Baghdad, and Palmyra. From there it was again divided into two sub-routes: one led to Constantinople through Aleppo, Antioch, and Tyre, whereas the other route took a southwest direction to reach Cairo and Alexandria via Damascus and Gaza (Figure 1).

The salient feature that prevailed throughout the expansion of the Silk Road was not necessarily, as has been always depicted, trade relations. The Silk Road also paved the path for cultural connections between major political powers (Beckwith 2009:17). Still, it is essential to remember that this connectivity was not always rooted in peaceful engagements; confrontations among the major powers were a frequent occurrence that disrupted interactions along the Silk Road.

For both the Romans and the Chinese, the power politics of the Silk Road were a major obstacle to accomplishing their trade interests, and the Parthians were their primary adversary. In 97 CE, the Chinese ambassador Gan Ying commenced a journey along the Silk Road with the expectation of reaching Rome. The Parthians cut his journey short in Mesopotamia (Whitefield 2019), where he had anticipated embarking for Europe. They did not want the Chinese and Romans to be in direct contact because they were reluctant to undermine their position as middlemen in the Silk Road trade between the two powers, a position from which they garnered massive profits (Beckwith 2009:137). We should note that the *Hou Hanshu [Book of the Later Han]* casts doubt on the accuracy of claims about Parthian motivations.

It was in 115 BCE that Mithridates II, king of Parthia, made a pact with emperor Han Wudi to facilitate trade along the Silk Road. This political alliance guaranteed Parthian prosperity for over two hundred years; their defeat in 117 CE by the Roman emperor Trajan led to the decline of Parthian influence over Silk Road trade. The long-delayed direct contact between the Roman and Chinese empires was eventually accomplished in 166 CE, when Roman emperor Marcus Aurelius dispatched an envoy to China.

## The Revival of the Silk Road and China's Ambition of Global Governance

The nostalgia for the old Silk Road and its heyday was revived after Xi Jinping became the Chinese president. His vision of increasing China's participation in the global governance was a notable factor even before he assumed power from his predecessor. In his own words, "China will work with people of all countries to push the world order and global governance system toward a more just and reasonable direction" (Berlie 2020:42). In pursuit of a new global governance, China needed an ideology and a palpable vision, but the Maoist ideology that had reigned within China was not suitable for aggrandizing its global image.

The revival of the Silk Road legacy under the Belt and Road Initiative (BRI) appears to be China's new narrative. On the one hand, it appears as a pacific project reviving the old tradition of uniting civilizations through trade following the same historic destinations of the old Silk Road; but on the other hand, it challenges the national integrities of the states affected by the BRI in the same way that politics erupted along the old Silk Road. The juxtaposition of these two aspects of the BRI has rendered a sense of skepticism toward the implementation of this project. The skepticism also stems from China's plans for domestic policy: the country aims to circumvent Russia to reach European markets (but see Cheng 2016), to cut commodity transportation times, to reduce its energy dependency by establishing political connections with Central Asian countries, and to politically stabilize its western provinces (Brugier 2014).

*Current Reality*

The political discontent that looms before the Chinese project of reviving the Silk Road is a reminder of the chaotic political order that used to be prevalent throughout the Silk Road of the past. The nomadic tribes who persistently sabotaged trade and the Parthian rivalry with the Romans are just two reminders of the volatile nature of the politics of the Silk Road. The ambivalence of many states about becoming partners of the BRI has clearly hindered the Chinese dream of a new globalization through its Silk Road legacy. Thus far, India has been a strong opponent to the BRI despite its intertwined history with the old Silk Road; its hesitation to becoming a part of the BRI is rooted in its long political conflict with China ever since the Sino-Indian War of 1962. But the most compelling cause of India's boycotting the BRI is a mistrust of Beijing and a belief that it is an indomitable threat to its reginal hegemony (Thaliyakkattil 2019:50). India showed disinclination for the China–Pakistan Economic Corridor, as it was a clear threat to Indian territorial sovereignty. Furthermore, the Chinese presence in the Himalayan territory—mainly in the landlocked country of Nepal—has increased India's suspicion dramatically. Hemmed by Indian influence at large, Nepal has welcomed the Chinese promise of infrastructure development and other benefits as a geopolitical blessing. Given these circumstances, Nepal joined the BRI via the China–Nepal Economic Corridor in 2017. This collaboration raised concerns as India has viewed both the China–Pakistan and China–Nepal Economic Corridors as China's new strategic tools for encircling the country (Schwemlein 2019)

India's antagonism toward the implementation of the BRI in South Asia is a stunning example of the power politics of the roads. Ironically, the old Silk Road had extended its path along the Indian subcontinent, which served as a decisive location for political and economic interests of the time. Ancient Indian cities like Varanasi and Pataliputra flourished along the Silk Road, but at that time India did not have a monolithic political identity to maintain (Frankopan 2015:89). As an alternative viewpoint, one can also suggest that Pataliputra was the main capital of a uniform Indian empire around 300 BCE, at the time of the Mauryan Empire. Under the Gupta

Empire (which mostly coincides with the early Tang era), we also see such a unified identity across most of the Indian subcontinent. And it was especially during these unified periods that trade in India flourished and expanded enormously (Avari 2016; van Aerde 2018). Anyhow, the ambition of becoming a great power, which grew in the Indian psyche in its post-independent era, has always been antagonistic to external influences in South Asia. The doctrine initiated in 1983 by Prime Minister Indira Gandhi particularly emphasized the crucial importance of India for the stability of the region (Dixit 1998). In such a dominating context, the skepticism with which contemporary Indian officials treat the BRI is less surprising.

Besides India's concern of seeing the BRI as a strategic project which would eventually weaken her grip within the region, other serious concerns are arising in South Asia in the aftermath of the BRI's initiation. In particular, the evasive nature of the partnerships between China and the other member states involved in the new Silk Road in South Asia shows how the BRI is gradually becoming a neocolonial project that intends to challenge the territorial sovereignty of its member states. As Xi Jinping's official foreign policy, Beijing has described the overarching agenda of the BRI as a fair project that creates a win–win situation for both China and the other member states. Ostensibly, China appears willing to invest in countries that are desperately looking for foreign investment, and simultaneously it extends assistance in building roads and other infrastructure facilities to the member states of the BRI. The highway development project and the construction of Mattala Rajapaksa International Airport and Hambantota International Port in Sri Lanka are seemingly ideal examples of Chinese bonhomie. But China's ulterior motives were exposed when Sri Lanka was required to issue China a 99-year lease for Hambantota Port in 2017 in exchange for debt relief (Ferchen and Perera 2019). The situation in Sri Lanka exposed just the tip of the iceberg. Sri Lanka, being a part of China's vision for a maritime silk road, sought the indulgence of Chinese debt at the expense of losing its economic sovereignty.

A similar situation is likely to happen in Pakistan with the intensifying Chinese presence. China and Pakistan have maintained a good rapport in the past, and the China–Pakistan Economic Corridor (CPEC)—a pivotal factor in the BRI—has already provided economic benefits to Pakistan, mainly for the transportation network. At the same time, the dominating Chinese presence in Pakistan under the banner of the BRI has increased resentment among the public in Pakistan (Jain 2018:12). Islamabad's inability to negotiate with China has resulted in its reliance on Chinese aid to fund infrastructure development, such as railway lines and harbor projects. However, none of the projects carried out as part of the CPEC has generated employment opportunities for Pakistanis, as Chinese employers have preferred to employ people from their own national background. In 2017 the Chinese consulate in Karachi was attacked by a Baloch separatist group that denounced the Chinese as oppressors in the region, along with Pakistani forces (Jain 2018:18). At this point, we should also duly note that the Diamer-Bhasha dam to be built under the CPEC will displace thousands of people and submerge thousands of rock carvings dating back to the sixth millennium BCE.

The revival of the Silk Road under the BRI has created a dilemma in South Asia as states in the region lose their sovereign rights. Malaysian Prime Minister Mahathir Mohammad cancelled all the BRI projects initiated by the previous government (Jones and Hameiri 2020). Capitalizing on internal state troubles is another aspect of the BRI, which is quite evident in Myanmar. The project China initiated with Myanmar's military government to develop the China–Myanmar Economic Corridor (CMEC) portrayed a holistic picture that provided sanguine hopes for the country's waning economy. However, the number of infrastructure projects started by China in various regions has evoked strong protest from the people in Myanmar, as those projects have harmed the regions' environmental stability. Also, the largest and most controversial project under the BRI in Myanmar is the Myitsone dam, a 6,000-megawatt hydropower project that would have displaced over 10,000 villagers in the state of Kachin. The project was revived in 2019 at the Second Belt and Road Forum for International Cooperation in Beijing, where China promised to provide the government of Myanmar a grant of one billion yuan (about 150 million USD) to improve the livelihood of the people affected by the civil war. But the severe damage caused by the CMEC in certain regions cannot be healed or diminished by way of a financial grant. In particular, the state of Kachin has seen a steepening increase in deforestation, which is attributed to the Chinese-funded road-building project that has further opened a path to transport timber from Kachin to Chinese territory. All in all, these three examples from South Asia—Sri Lanka, Pakistan, and Myanmar—are bitter witnesses to the revival of the Silk Road in the twenty-first century.

Some of the initiative's critics have pointed out that China's increased presence and the expansion of the BRI would undermine the decision-making ability of the participating sovereign states, thereby creating a new type of colonialism. The gravity of the BRI and its influence in the state apparatuses of its partner states are akin to the way in which, in the colonial era, the British East India Company trapped princely states in the Indian subcontinent before subordinating India by force. However, in examining the reality of the history of the Silk Road, a primary factor ever since its beginning has been China's ability to acquire the greatest profit. According to the economic historian Andre Gunder Frank (1992), China was an economic heavyweight in the era of the old Silk Road, and the entire global economic order was Sino-centric until the period of European colonialism. The ancient Silk Road network provided great momentum to the Chinese economy, and, most importantly, the political fragmentation along the Silk Road was based on Chinese dominance over smaller states. Subordinate states in East Asia provided tribute to China, and, in doing so, they acknowledged the political authority of China. Frank (1992:89) pointed out that the "Chinese civilization through the Silk Road provided a common intellectual, linguistic and normative framework in which to interact and resolve the conflicts." The modern avatar of the ancient Silk Road legacy and China's contemporary attitude toward the state parties in the BRI are both reminiscent of its historical superior status (as perceived by the Chinese). The notion of the global governance of Xi Jinping and his flair for a China-centric globalization has generated dozens of practical questions. Furthermore, the broadness of the BRI and the questions arising from it regarding the sovereignty of its participating states and potential threats to the environment are not mere rhetorical quibbles to ignore. The above-mentioned examples that have already stemmed from South Asia raise concerns about the objectivity of the BRI.

## Using Archaeology as a Means of Legitimacy

The field of archaeology has a long-standing association with colonialism; throughout the nineteenth century, it harbored and, to a certain extent, fortified the motives of Western imperial missions. After increasing its capital through labor exploitation and rapid colonial expansion, nineteenth-century Victorian England was obsessed with remaking itself in the image of Greco-Roman antiquity. The predilection that pervaded the minds of British administrators affirmed that the British Empire reflected the same virtues practiced in ancient Rome (Laurence 2001). The archaeological expeditions led by British archaeologists in Ottoman-ruled Greece and divided Italy received rather welcome attention in Britain, where they were often seen as evidence that the British Empire was the successor of Greco-Roman grandeur, as expressed in historical studies as well as artworks of the time (see Kucich 2006). For French colonial archaeologists, the parallel between their colonial quest and their Roman legacy was still visible in North Africa, as they had colonized the entire region. David J. Mattingly (2013) has pointed out how zealously British and French archaeologists drew similarities between the colonial possessions of their countries and the Roman Empire. In that context, archaeology was used for the purpose of self-aggrandizement throughout the colonial era.

It is ironic that the twenty-first-century revival of China's interest in invoking its past and in seeking archaeological traces of the ancient Silk Road follows the same ambition that European colonialists held in the nineteenth century. Through its actions, the Chinese government is asserting its claim over the origins of the Silk Road; yet, China was the last to join the networks in antiquity, and it was only in medieval times that Chinese trade became more dominant. This reality is contrary to the narrative of Chinese hegemony over the Silk Road from time immemorial. To create this narrative, Beijing has led a massive campaign through the BRI to revise the Silk Road archaeology across Asia and toward Africa. The geopolitical trajectory of China's usage of archaeology is grounded in the conspicuous motive to gain legitimacy for the BRI through evidence stemming from the past. China's technical support for preserving Buddhist archaeological sites in Pakistan is just one of several examples that reveals China's fascination with the past as a tool to legitimize its ambitious project. The 2018 cultural agreement between China's Minister of Culture, Luo Shugang, and Pakistan's Minister of State for Information and Broadcasting, National History and Literary Heritage, Marriyum Aurangzeb, was intended to consolidate the longstanding historical ties between the two countries that had derived from the Silk Road legacy (Storozum and Li 2020:71). It is worth noting that Pakistan's efforts to restore its archaeological research on the Silk Road saw a sudden revival after Xi Jinping's visit to Pakistan in 2015, when the Chinese leader overwhelmingly focused on the China–Pakistan

Economic Corridor as an essential feature of the overall success of the BRI. The technical and financial support China promised to Pakistan in order to preserve its archaeological heritage was received as a gesture of camaraderie by Prime Minister Imran Khan. But, from a critical perspective, one can make a strong contention that China's passionate effort to aid Silk Road preservation archaeology is a strategy oriented toward civilizational legitimacy. The same level of enthusiasm has been brought to Africa, as China considers African countries to be crucially important members of the BRI. The revival of China's interest in tracing its historical roots to the African continent has created a new discourse about Zheng He's maritime expedition to East Africa in the fifteenth century (Lin 2011:23). Zheng He's naval expeditions under the Ming dynasty denote the maritime strength possessed by the Chinese before Europeans envisaged it; revisiting these expeditions makes clear China's growing interest in Africa, as well (Wekesa 2015:117). The granting of financial support to preserve Silk Road archaeology symbolizes Beijing's self-aggrandizement as the rightful custodian of the ancient Silk Road, and Beijing is likely to use this support as a powerful tool to strengthen the objectives of the BRI.

### *Academic Discourse around the BRI*

At this point, we would like to open a parenthesis for academic work related to the BRI. Due to the intricate nature of the topic, our focus is on the environmental impact of the new Silk Road project and the scholarly work built around it. We intentionally choose the environment as a theme because it has a better chance of obtaining scientific consensus across the globe. However, we investigate these BRI-related environmental works not for their scientific integrities and validities, but rather for the ways in which their authors support their scientific narratives. We provide lengthy quotes in the hopes of reducing our own bias.

The brief literature review suggests that most of the environmental work related to the BRI comes from Chinese scholars. A thematic issue in *Environmental Earth Sciences*, which is published by Springer, aims to find "harmony between the environment and humanity" and explores the "balance between environmental protection and economic growth" due to the Silk Road initiative (Li et al. 2017). All the authors in the thematic issue agree that the new Silk Road will have detrimental effects in the countries through which it will pass, but especially in China itself. Its impacts, however, should be mitigated via sound science and the cooperation of participating countries because the project will bring "immense economic benefit to the undeveloped northwest part of China and Eurasian countries, especially central Asian countries" (Zhang et al. 2016:938–939). However:

> The countries of Central Asia need to recognise that the economic success of the proposed new "Silk Road Economic Belt" hinges on their ability to develop programs that can ensure the region's water resources are managed in a sound and sustainable manner.... External pressures from neighbouring Russia and China are likely required to make this happen [Howard and Howard 2016:1].

In fact, China should play the leading role and help other countries mitigate the environmental impact of the BRI, since:

> … the New Silk Road could become a great "river of knowledge" connecting China and Central Asian countries such as India and Pakistan, with the Middle East and Europe. As the seed to this initiative, a research institute needs to be established under the auspices of the Chinese central government that would be responsible for conducting, managing and supervising pioneering research in support of the New Silk Road project. This institute could be based in Xi'an, where the road starts, with subbranches of the parent institute created in other countries as the road grows and the "river of knowledge" develops [Li et al. 2015:7270].

In their work, our colleagues assume—but do not show—that the new Silk Road will bring economic benefits to Eurasia. The assumption stems from the success stories of the historical Silk Road, and thus scientific work is finding refuge in historical narratives; it appears that the fantasy of the BRI has already become concrete in scientific circles. Furthermore, since it is inevitable that the BRI will be realized, the "smaller" countries of Central Asia must find ways to mitigate the environmental impacts of the mega-infrastructure project. China (and Russia) will need to police these mitigation efforts, since in their current status these countries will be unable to accomplish the task themselves. Finally, the last hegemonic move will come from academia, whereby China will provide the necessary knowledge and expertise to address the potential environmental crisis that it will create. The Chinese state apparatus is indeed destabilizing postcolonial studies (Vukovich 2017).

It is also claimed that the BRI will help participating countries converge their energy efficiencies (EE). However, in order to provide a stable groundwork for the BRI, scientists should "clarify whether the initiative will narrow the gaps in EE among the member economies or not, and also provide practical information for policy makers in China and the other [BRI] countries" (Han et al. 2018:113). The authors conclude that their study "cannot estimate empirically the impact of the [BRI] on EE convergence directly due to the nascent status of the [BRI]. However, there is no better way to predict the impact of the [BRI]. In future, when the [BRI] is in effect, conducting an empirical test of its impact on EE convergence would be a highly valuable contribution to all concerned" (Han et al. 2018:121). Therefore, the reader is expected to rely on these scholars' intuition.

Such inferences do not surprise the reader, as it is common for higher education and research to follow dominant state ideologies (see Chomsky et al. 1997). Kamola (2014) uses an Althusserian analysis to show how higher education in the US underwent structural transformations that served the needs of daily—but also global—material practices envisioned by the neoliberal doctrines of Thatcher and Reagan. A subject (an academic subject in this case) produces an imaginary relationship thorough "repetition of particular actions within the context of structured material apparatuses" (Kamola 2014:523). However, since there is no single ideology and different apparatuses have the potential to produce multiple ideologies, one should talk about not *an* imaginary relationship, but rather *relationships* (Kamola 2014:523). What makes the Chinese academic knowledge-production peculiar is the fact that it is saturated with nationalist ideas from the state, intellectual, and popular domains (Wu 2016). Yet, the BRI narrative is overtly transnational and points at a future unified region. Thus, it is no surprise that there is great skepticism toward the BRI across the globe.

## A Concluding Theoretical Framework

China's use of the Western-coined term "Silk Road" is unusual as it intends to evoke positive images of the past and to promote an understanding of prosperity and connectivity (van Noort 2019:1). This aim, however, is based on uncertain socioeconomic, political, and cultural narratives, as discussed throughout this paper.

The first issue is the mechanism the Chinese government deploys in order to broadcast a positive image of the BRI. The mechanism selectively constructs the past; the BRI is a prime example of how archaeology can be used to legitimize the endeavors of modern states (Harrison 2013). Most of all, the political landscapes of the historic Silk Road and the BRI are drastically different. The Silk Road ran through four empires (Han, Parthian, Kushan, and Roman), which stretched between the Pacific and Atlantic Oceans. These empires provided some sense of security within their borders and had mutual agreements through which all parties benefited from trade, one way or another. Modern-day China, on the other hand, negotiates single-handedly with a series of nation-states by way of an entirely different modus operandi. As a matter of fact, the self-claimed romantic universalism spearheaded by China must deal with the issues generated by the governments of India and Pakistan, which are heavily motivated by nuclearization. The new Silk Road landscape also includes the contested territories of the oil-rich Caucuses and Iran, one of the major "Axis of Evil" countries (Thorsten 2005:303). As a geopolitical project, the BRI is fueling the struggle between powers in the region within a constantly shifting framework. For local regions, the fallout from this struggle is immense. For instance, China intended to build a deep-water port in Crimea that bypassed Russia in order to deliver commodities to Europe. The project was halted when Russia annexed Crimea from Ukraine in the aftermath of the 2014 Ukraine revolution. Ukraine had agreed to be a part of the BRI in 2013 (Brugier 2014); however, in 2015 Russia agreed to integrate the Eurasian Economic Union (EUU) with the BRI (Cheng 2016).

The emergence of a China-centered globalization is another objective behind the gigantic project of the BRI, with its overarching characterization as the Chinese method of initiating a "peaceful rise" or "Harmonious Society," contrary to Western colonialism's use of harsh military strategies (Bijian 2005). The Chinese vision posits a utopia that is intended to be built upon a past filled with a self-proclaimed nostalgia—a nostalgia that was mainly idealized through Western orientalism, and which China has forged as suitable for its project. But it is quite palpable that this depiction is antithetical to the real geopolitical strategy that China has been using in the member states of the BRI. The loss of territorial rights to repay Chinese debts and the other undue influences of the BRI are much akin to a new type of colonialism in the twenty-first century, which is rather paradoxical to the narrative China promotes of the Silk Road as a peaceful project connecting the world (Rahman 2019). The conspicuous reality of the BRI is leading toward China's globalization, and the usage of the Silk Road romance seems to have embodied China's leading role as a dominant player in the historical narrative. However, in fulfilling this mission, China has embraced a past created by the West and has shown an eagerness to use the archaeological traces of past roads to enhance its modern legitimacy. As an example, the way in which China uses its soft-power strategies to reduce the perception that it is the dominant actor in the BRI is based on its attempt to portray the historical links between China and other states via the Silk Road of the past. Nevertheless, this premise appears problematic, as the so-called roads of the past cannot be suitably applied to the present projection of the BRI by virtue of the geopolitical discontents around it.

This image also generates a new kind of orientalism. As Nobis (2018:728) succinctly states, China produces a "utopian future by extensively relying on a non-existent, and thus, utopian past—a past created by Richthofen, Verne, Marco Polo, and their likes. Interestingly and symptomatically, the Chinese project of this silk global utopia draws to the past, which is the invention of Western Orientalism." We claim that through this self-orientalism, China falls into the trap of creating an East–West divide, while at the same time creating an image of a shared destiny that will be generated by the new Silk Road project (van Noort 2019:18). The problem is further complicated by the fact that archaeological data pertaining to the ancient trade networks (up to the Han Empire) are still misread or wrongly interpreted by historians like Beckwith and Frankopan, as well as by the Chinese authorities. We make an observation similar to the work of Yan and Santos (2009): China—once under the gaze of the Western sociocultural system—is now producing a new gaze, a new representation of the past, which one may label a self-orientalizing discourse. In making the new past, the strategy is to legitimize the civilizational romance that China is the paternal state that continues to nourish all the other states. The annals of Chinese history are a far better witness in proving China's infatuation with its dominance over other states, as historically the country portrayed itself as a Middle Kingdom wherein states in the periphery beyond the Chinese empire were seen as subordinate (Ruskola 2013). The Chinese interest in spreading this civilizational narrative to the member states of the BRI is just a reminder of China's attitude toward its neighboring states in antiquity. For example, the new Silk Road diplomacy that China aptly uses to accomplish its grand objectives for the BRI consists of patronizing academic institutes and financially sponsoring pro-Chinese think tanks in the member states.

On the other hand, China's enthusiasm to revive the historical links with BRI member states denotes the subtle way in which it has been utilizing the archaeological space in a politicalized project. The Chinese attempt to create narratives of the past exaggerates its historical role in the Silk Road. Such an attempt, driven by sheer ambition for power, may result in accelerating the distance between the West and East Asia. The kaleidoscopic history that China reverently glorifies in parallel to its ambitious BRI project essentially needs a focus on the shared destiny of the Silk Road, rather than relying on China's own selective historical narratives.

The BRI is a problematic project. Its future socioeconomic, political, and cultural consequences are unknown, while the Chinese state hegemony continues to spill over into Eurasia in multiple domains, including academic. Nevertheless, the BRI is not unique in the sense that state hegemony operates and produces fictive images. In general, the public perception considers roads to be connective infrastructures that herald improvements in mobility, economy, and political integration (Enns 2018). Furthermore, roads help in the creation of imaginative geographies of security in contested landscapes (Ojeda 2013). The BRI carries these historical and archaeological imaginations to transnational levels in the twenty-first century.

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# Chapter Fifteen
# Landscape, Legends, and Legacies on Australia's Birdsville Track

Rosemary Kerr

Roads form part of the physical and cultural landscape. They are constructed as much in the imagination—through journeys and representations—as by material fabric and engineering, and they embody multiple layers of history, meaning, and symbolism. Meanings evolve within particular historical and cultural contexts, and they are shaped by the physical environment and interactions with human and non-human actors (Gibson 2015:417; Kerr 2019:2). Historian Peter Dedek (2007) argues that roads have both a material and symbolic history. In his cultural history of America's Route 66, one of the world's most famous roads, Dedek (2007:2) describes the road as a "state of mind," evoking images, ideals, and experiences, and argues that in driving the route, one encounters "multiple layers of memory, history and myth." Dedek points to the route's symbolism and association with prominent American cultural tropes, including that of the "Wild West," in explaining its iconic status. Its roadside architecture of neon-lit diners, motels, and gas stations evokes the heyday of the twentieth-century American road trip (Kerr 2019:223). It has been celebrated in popular culture including music, novels, film, and television.[1]

While there is perhaps no road as famous as Route 66, this chapter examines the Birdsville Track, which has been described as "Australia's

[1] Much of the roadside architecture along Route 66 was inspired by imagery of "cowboys and Indians," including the Will Rogers Motor Court in Tulsa, Oklahoma, the Wigwam Village in Holbrook, Arizona, and Tee Pee Curios in Tucumcari, New Mexico (Dedek 2007). The road was immortalized in John Steinbeck's novel, *The Grapes of Wrath*, and became associated with the Depression-era "Dust Bowl" migrants' flight from adversity toward promise and opportunity in the "West." It features in Jack Kerouac's (1957) classic novel *On the Road* and has been celebrated in the song "(Get Your Kicks on) Route 66;" a television series, "Route 66" (1960–1964); and numerous feature films.

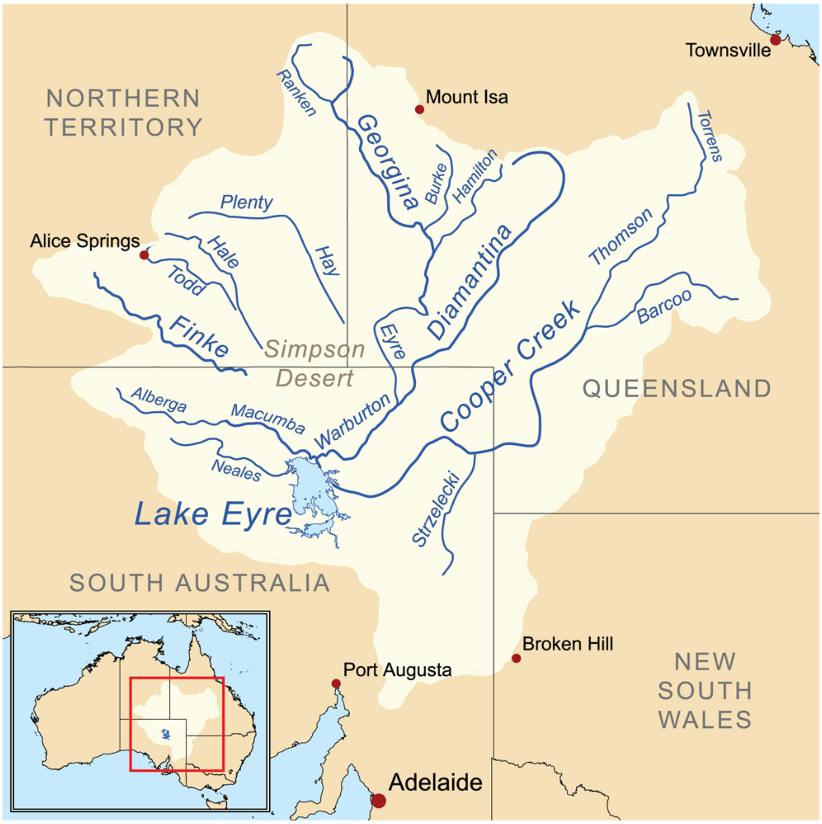


**Figure 1.** Locality map. Map by Kmusser (https://commons.wikimedia.org/wiki/File:Lake_eyre_basin_map.png).


**Figure 2.** Map of the Birdsville Track. Adapted map by Summerdrought (https://commons.wikimedia.org/wiki/File:Birdsville_Track_110216.svg).


**Figure 3.** View of the Birdsville Track ("The Gap, Mungarannie to Mira Mitta Section") by E. L. Walpole, circa 1930. Photograph courtesy of the State Library of South Australia (B47089/85).


**Figure 4.** The Birdsville Track after realignment and grading. Photo by Summerdrought (https://commons.wikimedia.org/wiki/File:Birdsville_Track_sign_0789.jpg).

most legendary road" (Sheedy 1993:2). Traversing just over 500 km (310 miles) between Birdsville in southwest Queensland and Marree in South Australia (Figure 1 and Figure 2), it developed as a traveling stock route in the nineteenth century. Situated in one of the driest, most inhospitable regions of the continent, the track's physical environment contributes greatly to its legendary status. Until the 1960s, the track itself was ill-defined and barely distinguishable from its surrounding landscape of stony plains and drifting sandhills (Figure 3). Today, after grading and realignment, it is a popular four-wheel-drive tourist route (Figure 4). Tourism and heritage interpretations, however, focus on a narrow and relatively recent phase of the track's history, celebrating the drovers, pioneering settlers, and outback mail carriers who battled the harsh conditions. Those stories reinforce powerful national mythologies, particularly the bush and pioneer legends,[2] while "forgetting" or marginalizing others.

As valuable cultural resources, roads and routes can tell us much about the heritage of a locality, region, or nation. Which routes are identified, how they are interpreted, and which meanings are privileged have important implications for a nation's understanding of its past (Kerr 2019:8–9). Internationally, the heritage community is beginning to recognize the importance of identifying, preserving, and interpreting "cultural routes" as heritage resources and as part of national and regional tourism strategies. A "cultural route" encompasses multiple layers of meaning based on the dynamics of movement, exchange, and interaction over a long period of time, across a wide geographic

[2] Central to the Australian bush and pioneer legends is the idea that movement and mobility across a frontier environment shaped the character of the nation and its people. In the late nineteenth century, artists, writers, and poets attempted to define a distinctive national culture. In doing so, they promoted a vision of a so-called "real" Australia that was based on city dwellers' romanticized ideal of a rural and outback landscape. Russel Ward's landmark thesis, *The Australian Legend*, first published in 1958, argued that it was the tough, resourceful, "nomad tribe" of itinerant bush workers of the nineteenth century—the shearers, drovers, boundary-riders, and rouseabouts—who came to represent most powerfully a distinctive Australian type, embodying the qualities of courage, resilience, pragmatism, and a love of freedom and the wide open spaces (Ward 1977:245). The related "pioneer legend," defined by John Hirst (1978:316), celebrated "those who first settled the land, as pastoralists or farmers" as well as the explorers who preceded them, braving hardships, "subduing the land and battling the elements."

region, and among diverse cultural groups (Comité Internacional de Itinerarios Culturales 2008; UNESCO World Heritage Committee 1994).

Drawing on descriptive travel writing, film, tourism literature, cultural anthropology, and heritage studies, this chapter examines the track's multi-layered history, the "construction" of its legendary status, and current issues in the management and interpretation of its cultural heritage. The approach is informed chiefly by the concepts and methodologies of cultural history—qualitative research based on the analysis of texts in context.

The historians Raymond Williams (1983:90) and Lawrence Levine (1988:33) have defined "culture" as a process: dynamic, not static; and "the product of constant interaction between past and present." The Birdsville Track reflects a dynamic and ongoing process of movement and interaction between tangible and intangible elements, past and present, including the physical environment, technology, history, travelers' experiences, and representations in popular culture (Kerr 2019). By exploring the track as a cultural route and by taking a longer view of its history, this chapter recovers less well-known or "forgotten" stories from other cultural groups, including Aboriginal peoples, German missionaries, and Afghan cameleers; stories that collide, overlap, and intersect. Such an approach allows for more holistic and dynamic understandings that may enhance tourism, preservation, and interpretation and, ultimately, provide a richer, more nuanced version of the route's and nation's history and the stories we pass on.

## The First Journeys

The Birdsville Track lies in the remote Lake Eyre Basin region of Central Australia. It is bounded by and partly traverses the Sturt Stony, Simpson, Tirari, and Strzelecki Deserts (see Figure 1 and Figure 2). It is occasionally subject to flooding of Cooper Creek and the Diamantina River. Beneath the ground surface is the Great Artesian Basin, the world's largest subterranean water basin extending over Central Australia and northeastern Australia, giving rise to a series of mound springs along its margins (Bell and Iwanicki 2002:17).

Like many Australian roads and highways, the Birdsville Track roughly follows an Aboriginal trade and ceremonial route. The original inhabitants of the region belonged to a number of "tribes" or nations that are identified by their language groups, including the Arabana, Wanganuru, Guyani, Dieri and closely related Dirari, Namani, Karanuru and Yaluyandi, and Yawarawarga (Hercus 1977:55). Water sources were vital to human habitation here, and the Aboriginal names of several places along the Birdsville Track with the suffixes "anni," "manna," and "ninna"—such as Mungeranni, Kopperamanna, Dulkaninna, and Killalpaninna—signified places where water was to be found (Historical Research et al. 2002:11; Kerr 2019:226).

For Aboriginal peoples—one of the world's oldest continuous living cultures—the entire Australian landscape is understood as a network of stories. Legends that tell of Creation Ancestors' travels and exploits explain how the landscape and its major topographical features, including water sources, came into being. These "songlines" enable their custodians to navigate the country and find food, water, and shelter. They form important routes of communication along which people, goods and knowledge flow, often across vast distances, and are celebrated in cycles of songs, stories, and rituals (Kerr 2013:76; Kerwin 2006).

The Mindiri Emu story united peoples from a wide region and refers to sites in the vicinity of the Birdsville Track. The Emu's long journey began at Mirra Mitta Lake, continued south to Port Augusta before doubling back to Mungerannie (now the approximate halfway point on the Birdsville Track), and eventually led to the previously unknown fresh water of the Coongie Lakes, northwest of Innamincka (Horne and Aiston 1924:40). The story was celebrated in the Mindiri ritual, which comprised a series of ceremonies in which people gathered from the country embraced by the Emu's path. The preliminary Idigaru ceremony was celebrated at the Mirra Mitta salt lakes or "Rat-Place," while the final main ceremony took place at Koonchera Waterhole, near what is now the "Outside" or "Wet Weather" Track, to the north of Clifton Hills (Hercus and Sutton 1986:187, 192; Kerr 2019).

Kopperamanna, in Dieri country close to the track near Lake Hope, was a great trading center. The name means "Root-Hand"—as all fingers lead to the hand, so all roads lead to Kopperamanna. There, the Wanganuru and Dieri exchanged ochre and hardwood for goods unobtainable in their own region. Birdsville and Goyder Lagoon were key meeting places for trading *pituri* (tobacco plant) and the highly prized red ochre, which was associated with the blood of the Creation Emu (Horne and Aiston 1924; Mulvaney 2002:4–5). The route known as the Birdsville Track is thus at least partly related to a complex network of journeys that had powerful significance for Indigenous peoples long before the arrival of Europeans changed their way of life forever (Kerr 2019:227).

## Traveling Stock Route

The water sources that defined much of the route's significance for Aboriginal inhabitants also determined its development in the colonial era. In the 1850s, with the aid of Aboriginal guides and informants, European exploration parties located springs of water along the periphery of the Great Artesian Basin. The springs defined an inland route for the movement of stock, providing important watering places on the way to the country beyond (Kerr 2019).

From the 1860s, pastoralists established cattle and sheep stations throughout northern South Australia and the lush Channel Country of southwest Queensland. Birdsville, situated just over the Queensland border near the main crossing place of the Diamantina River, developed as a store depot and township from the early 1880s. Stations between Marree and Birdsville included Lake Harry, Clayton, Dulkaninna, Etadunna, Mulka, Cowarie, Mungerannie, Mount Gason, and Clifton Hills. The Birdsville Track, originally known as the "Queensland Road," carried mobs of cattle with their drovers and stockmen, as well as produce, supplies, building materials, and mail to and from the stations and railheads (Litchfield 1983).

Unreliable water supplies made it a treacherous journey for men and beasts, and so from the mid 1880s to the early twentieth century the South Australian government funded the drilling of bores at intervals of about 30 miles (50 km) along the track, to provide more regular watering points, thereby considerably lessening the hazards of the track and further defining its route (Ferber 1995:28). Along the Birdsville Track today, several stone cairns—of Aboriginal and European origin—are visible, some of which mark water sites or act as survey trigonometrical points and route markers (Kerr 2019:228; Sheedy 1993:38).

## Conflicts, Collisions, Intersections

Inspired by concern for the welfare of the Cooper Creek Aborigines, following news of the ill-fated Burke and Wills expedition of 1861,[3] two groups of German missionaries established themselves near the Birdsville Track in 1866 and 1867: the Moravians at Kopperamanna, near Lake Hope on Cooper Creek, and the Lutherans at Lake Killalpaninna, about eleven miles west of the track. The Moravians did not stay long, discouraged by severe drought and confronted with hostility and resistance by the Dieri peoples, whose meeting grounds were close to the mission site. The Lutherans and, later, lay missionaries continued at Killalpaninna Mission—subsequently named Bethesda—until the outbreak of World War I. Kopperamanna became an outstation to the mission, which also operated as a sheep station (Litchfield 1983).

As pastoralists moved in, Aboriginal peoples were forced off their traditional lands, and many lived at the mission or on stations. Some worked as stockmen and station hands or managed stations while trying to maintain something of their traditional way of life, despite the missionaries' attempts to forbid this. Acts of resistance against the invading people and animals that encroached on their lands, polluting waterholes and abusing Aboriginal women, often brought violent retribution. At least three major massacres are documented in the region, all coinciding with great ceremonial occasions, when large numbers of people had come together. The massacre at Koonchera Waterhole on Clifton Hills Station occurred around 1885 as people gathered for the Mindiri ceremony. There, police killed hundreds of Aborigines in retaliation for the spearing of a small bullock (Hercus and Sutton 1986; Historical Research et. al. 2002; Kerr 2019).

Despite the devastating impact of European invasion, there is evidence that Aboriginal cultural traditions continued well into the twentieth century. R. B. (Bruce) Plowman spent five years as parson at Beltana, then Oodnadatta, from 1912 to 1917. The third volume of his published diaries, *The Boundary Rider* (1935), relates his travels by horse and buggy along the Birdsville Track. Plowman's account

[3] Robert O'Hara Burke and William John Wills led an expedition organized by the Royal Society of Victoria in 1860–1861 to explore inland Australia, crossing the continent from Melbourne in the south to the Gulf of Carpentaria in the north. Seven members of the party, including Burke and Wills, perished, and only one man survived. Local Aborigines of the Cooper Creek region tried to assist the men.

reveals the layering of stories and journeys along the track and the ongoing use of the route by Aboriginal inhabitants. He documented the continued importance of the *pituri* plant, found only in the district north of Birdsville, with which the Aborigines made a narcotic. Couriers were sent from hundreds of miles away to barter for this crucial article of trade. The Birdsville Track thus remained a vital communication route for Aboriginal peoples, albeit in ways that appropriated the evolving means of transport. For example, messages were passed between people at various stations via other travelers on the track. On one occasion, an Aboriginal man asked Plowman to convey a letter stick to "Jimmy," who was working at a station near Farina, asking him to send clothes, which, again, would be transported via the track (Kerr 2019; Plowman 1935:266–267). Plowman recorded further evidence of cultural intersections when he observed that each morning and evening at Killalpaninna mission station, a church service was held in the Dieri dialect, attended by a congregation—including a number of white children—who were able to speak English, German, and Dieri (Plowman 1935:215).

By the 1920s, as the missions closed, and with their numbers further depleted from the influenza outbreak following World War I, most of the remaining Aborigines had regrouped near Marree and on various pastoral station camps, including Mungerannie. Many, whose original territories were further north, did not return because the area held too many traumatic memories (Hercus 1977:53; Kerr 2019).

## Afghan Cameleers

In the late nineteenth century, another group of travelers added their footprints to the track. Camels and their "Afghan" handlers—mainly from what is now Afghanistan or parts of Pakistan and India—were brought to Australia by pastoralists, as camels proved more reliable than horses in the harsh desert environment. By the 1880s and 1890s, Afghans owned and operated most of the camel carrying businesses working the Birdsville Track, including several major operations based at Marree and the date plantation at Lake Harry, and they also hired camel teams to others, including the Birdsville coach service and the German missionaries at Killalpaninna. The camels carried all manner of supplies: cases of whiskey, bar iron, bags of chaff, fencing material, building materials, furniture, food, tanks for rainwater storage, as well

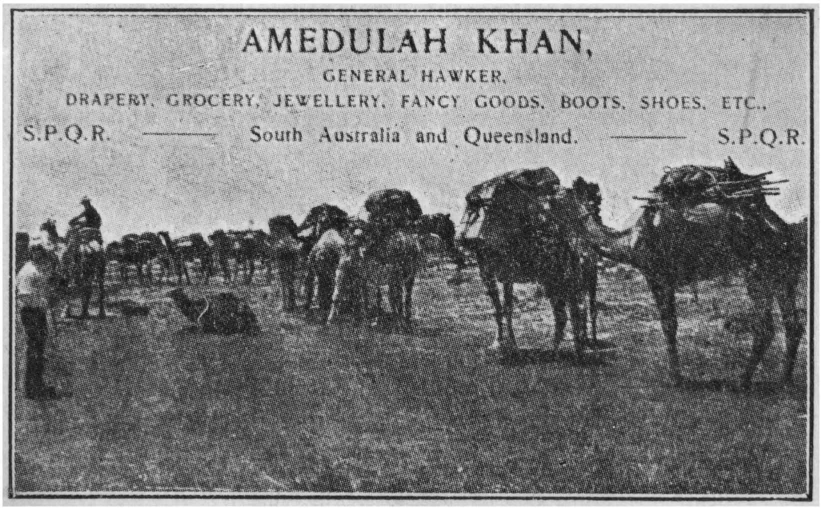


**Figure 5.** Camel train of an Afghan hawker, Amedulah Khan, circa 1901. The letters S.P.Q.R. in Australia indicate a license to buy and sell Government items. Photograph courtesy of the State Library of Queensland.

**Figure 6.** The Afghan mosque in Marree, circa 1884. Photograph courtesy of the State Library of South Australia (B15341).

as equipment for bore drilling. A few Afghans worked as hawkers or mobile grocers, selling food, clothing, and household goods (Figure 5; Kerr 2019; Stevens 2002).

With the Afghans and their camels came further cultural tensions, as they competed with and threatened the survival of the European horse and bullock teamsters. Camels could endure the desert conditions better than their competitors, and their handlers' total abstinence from alcohol made them more reliable than their Australian counterparts. The Afghans' strange appearance, dress, language, and culture—and even stranger animals—were met with distrust and derision. They set up rough makeshift camps and, later, "Ghantowns." Marree was the northernmost and most important railhead for all activity in the central regions of Australia; hence the largest and longest-surviving Ghantown developed there, comprising about two dozen corrugated iron dwellings and a mosque (Figure 6). Separated from the rest of the town by the railway line, Ghantown shared the eastern side of the line with Aboriginal camps, while the white population lived on the western side (Farwell 1948).

The Aboriginal peoples of the area regarded the Afghans, like the Europeans, as outsiders. The Arabana peoples called the Afghans *Abiganas*, meaning "white fellows with hair-string," referring to their turbans (Hercus 1981). Relations between the races, however, were not always hostile; many of the Afghans eventually formed relationships and marriages with Aboriginal and European women, and some Aboriginal men worked with Afghan camel teams (Kerr 2019; Stevens 2002).

From the 1920s and 1930s, motor transport began to challenge the camel's dominance. According to George Farwell (1950:9), when motor trucks first began to compete with the cameleers, the latter sometimes spread broken glass on the track to cut tires, and they often fought with the truck drivers. Some of the Afghans turned to hawking to survive, but by the end of World War II many had left the country, leaving their camels to run wild. A few Afghans and their descendants remained around Marree. Some found employment as truck drivers, traveling virtually the same route as their forebears, finding the nomadic lifestyle and camaraderie appealing (Stevens 2002). The Afghans' legacy and impact on inland Australia is recalled in the naming of the famous "Ghan" railway route between Adelaide and Alice Springs (Kerr 2019:231).

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**Figure 7.** The Birdsville Track through Dulkaninna (Blazes Well section) by E. L. Walpole, circa 1930. Photograph courtesy of the State Library of South Australia (B47089/12).

## Trucks on the Track

When motor vehicles arrived, they altered travelers' relationship to the track and its physical nature. The "Outside" Track developed as an alternative route around Goyder Lagoon, as vehicles could not cross the lagoon (Dobre and Dobre, 2003:5). While trucks were faster, more comfortable, and able to carry more weight than horses or camels, they encountered their own particular hazards. The track itself consisted of little more than two parallel wheel ruts, which often vanished under drifting sand (Figure 7). Travelers had to negotiate steep sandhills, where traction was difficult, and deceptive gibber plains that were really just a thin crust of earth over sand, where a car or truck would sink to its axles (Beckett 2000; Kerr 2019; Stevens 2002).

## "The Back of Beyond": Constructing Legends

During the motoring era the Birdsville Track gained greater popular attention. A number of works published from the 1930s onward about life in the region and traveling the track helped to publicize it and to construct both its notoriety and a particular version of its history.


**Figure 8.** Tom Kruse with his mail truck in The Back of Beyond. Photograph courtesy of the State Library of South Australia (B47089/57).

*Walkabout* magazine, published by the Australian National Travel Association from 1934 to 1974, featured several articles about the track. Descriptive travel writing was one of the most popular literary genres in Australia at this time. Narratives by writers including Bruce Plowman (1935), Ernestine Hill (1937), Francis Ratcliffe (1938), and George Farwell (1949, 1950) focused on the physical challenges of traveling the track and celebrated characters such as drovers, people living on the remote stations, and the outback mail carriers (Kerr 2019:232).

These works fed into the fascination with the outback and the promotion of the so-called "real" Australia by travel writers and others, which began in the interwar years and continued after World War II (Kerr 2019). As most Australians were settling in the cities and suburbs, there was revived interest in and nostalgia for a national "type" epitomized by bush and outback figures and a sense among writers, artists, and filmmakers that it was essential to capture this Australia before it disappeared (Waterhouse 2005:267–268). As Kristin Weidenbach

(2003:138–139) states, the Birdsville Track was the stage whereupon visions of the "real" Australia and its legends could be enacted by the people living and traveling along it.

Journalist and travel writer George Farwell was one of the track's most prolific exponents. He published several articles in *Walkabout*, as well as books, including *Traveller's Tracks* (1949) and *Land of Mirage* (1950), the latter based partly on his journey up the track with the police patrol on camels in the 1940s and 1950s. Farwell wrote in *Land of Mirage* (1950:192):

> The Birdsville Track has developed a folklore of its own over the years. Like the folklore of ancient Europe, its heroes are usually those who defy the elements, the malice of fate; enlarged and legendary figures whom you would hardly recognise if you met them over a modest drink. That is as it should be in a land where man is dwarfed by the mighty, tidal forces of nature, and yet asserts his independence.

For Farwell, the "pioneering" drovers and mail carriers were the heroes who had "made" the track and its folklore. In *Land of Mirage* (1950:106), Farwell introduces the most famous mailman of the Birdsville Track, Tom Kruse (Figure 8), who drove the mail run from 1936 until 1957:

> He swung down from the cabin of his heavy, time-worn six-wheel truck, smiling expectantly. Big and broad-shouldered, with bare feet, trousers rolled up… he greeted us so casually that you would never suspect he had travelled two hundred and fifty exhausting miles in a day and a night.

In 1954, the Shell Film Unit (Australia) produced a documentary, *The Back of Beyond*, which followed Kruse on one of his fortnightly journeys delivering mail and supplies by truck to the isolated stations between Marree and Birdsville. The film captured the public imagination in Australia and overseas, winning awards at international film festivals and receiving widespread media coverage. It has subsequently been screened on television and at film festivals and has become established as a classic Australian film (Kerr 2019; Williams 2002).

Scripted by the literary editor of *The Bulletin*, Douglas Stewart, the influence of earlier works—particularly Farwell's *Land of Mirage* (1950)—is evident. In the film, as in most texts, characters like Kruse embody the tough, resourceful, resilient image of the bushman and pioneer. He battles treacherous sand dunes, sandstorms, and mechanical difficulties, traveling through a landscape dotted with constant reminders of death and decay: the bleached skulls of dead animals and the ruins of long-abandoned homesteads and missions. Kruse ultimately emerges triumphant over the landscape, while Aboriginal and Afghan figures are relegated to cameo roles and represent quaint reminders of a fading or "crumbling world," in Farwell's words (1950:28). By romanticizing characters like Kruse, who exemplify the Australian bush and pioneer legends, these works effectively rewrote the track's history, marginalizing and overlaying other histories, such as those of Aboriginal and Afghan inhabitants.

The droving parties encountered by Farwell and seen in the film provide a contrast between the past and present and represent another "vanishing race" which would soon be replaced by motorized transport. The Birdsville Track was improved by grading and realignment from the early 1960s, and a more definite route was defined. A federally funded program to improve the "Beef Road" network signaled the end of the droving era and the beginning of stock transport by road trains. From this time onward, the Birdsville Track was transformed from a stock route to a road (Historical Research et. al. 2002:54; Kerr 2019). While the improvements have considerably lessened the route's challenges and dangers, certain legends of the past do not fade easily, as current efforts to promote and interpret the track indicate.

## Tourism and Heritage on the Track

Today, the Birdsville Track is a popular four-wheel-drive tourist route, and the main track is drivable in about two days, even with a standard vehicle. The Mungerannie Roadhouse is the only place on the track that serves food and lodging and screened *The Back of Beyond* for many years. One of Tom Kruse's trucks stands as a memorial in Marree township (Johnson and de Courcy 1998; Kerr 2019).

The Great Australian Outback Cattle Drive is a South Australian tourism initiative to give city dwellers the chance to experience droving life. It was held on the Birdsville Track first in 2002 to celebrate the "Year of the Outback" and then again in 2005 (Lewis 2005). It is now held every second year along the Oodnadatta Track, and the five-week drive attracts Australian and international tourists. The official Tourism Australia website promises, "You can trace the trail of Australian pioneers who forged their way through these raw, powerful landscapes. Meet modern-day droving legends and feel like one yourself, after a day herding 500 head of cattle from horseback" (Tourism Australia 2015). The Australian bush and pioneering legends remain alive and well (Kerr 2019).

Interpreting the Birdsville Track is problematic. It was historically difficult to define physically, with few remaining sites and a multi-layered history. In 2001 Heritage South Australia and the Australian Heritage Commission jointly funded a survey to identify places of significance to state or local historical heritage along the Birdsville and Strzelecki Tracks. The study was also intended to contribute to developing a regional heritage tourism strategy for the Lake Eyre Basin. As with most road-related heritage studies, the focus was on identifying remnant physical or archaeological sites within a 50 km radius of the tracks. Indigenous cultural heritage was not included, except where it related to "contact history." This was largely because of the troubling categorization of Indigenous (or pre-contact), "historic" (or post-contact), and natural (or environmental) heritage, which are each managed under separate legal and administrative structures, making an integrated approach difficult (Kerr 2019; Leader-Elliott 2002).

Sites related to the Birdsville Track recommended for listing on the South Australian or Queensland Heritage Registers for their historical and archaeological significance include the former Afghan quarter at Marree, which is the only one in Australia with significant fabric surviving. It consists of intact and ruined houses, a mission hall, outbuildings, and date palms. The Marree Mosque site comprises an expanse of dried mud-earth floor and stump posts and associated camel yard—the remains of one of three "mud and bough" mosques built by the Afghan community. Other significant sites include the ruins of mud-brick and timber buildings of Kopperamanna Mission and the Koonchera Waterhole massacre site (Historical Research et. al. 2002:263, 276, 297).

While these listings and their accompanying documentary research go some way toward representing non-European cultural heritage along the track, they are not widely available to the general public. They also do little to address what Lyn Leader-Elliott (2002:38) has described as the "startling lack of awareness of Indigenous connections with outback country" and the poor representation of Indigenous cultural heritage in tourist literature and on the ground (Kerr 2019; Leader-Elliott 2002).

In 2005, interpretive panels were installed at sites along the Birdsville and Strzelecki Tracks "to promote and protect South Australia's outback heritage and to enhance the tourist experience in this remote region" (South Australia Department for Environment and Heritage 2008). The only sites "interpreted" along the Birdsville Track, however, were the former date plantation at Lake Harry, the ruins of Mulka Store and Homestead, and the *M. V. Tom Brennan* ferry that was once used to cross the Cooper Creek in flood. The stories evoked remain primarily those of the European pioneers, rather than revealing the other journeys and layers of meaning which contribute to the rich cultural landscape embodied in the Birdsville Track (Kerr 2019).

Most importantly, by focusing on individual sites and narrow historical time periods, heritage and tourism interpretations fail to capture the significance of the Birdsville Track route as a whole, which is greater than the sum of its parts. As Erin Gibson (2015:431) has also demonstrated in her study of a wagon road in British Columbia, the meanings of a route and places along it are created by the dynamics of movement—overlapping, colliding, intersecting interactions between people and place over time. Much of the route's significance derives from intangible elements—the multiple stories woven onto and through the landscape.

The Koonchera Waterhole near the Birdsville Track, for example, is a semi-permanent fresh waterhole, with no identified material fabric of European cultural heritage. Ironically, it is recognized as nationally significant for its natural value as a birdlife habitat. Yet, it is a place of immense spiritual significance for Aboriginal peoples as a site associated with the Creation Emu songline and rituals. It is possible that the ill-fated Burke and Wills expedition camped at the waterhole, and its supply of fresh water surely influenced the establishment of the nearby Clifton Hills pastoral station. Aboriginal peoples continued to meet at the waterhole for ceremonies into the late nineteenth century, while the massacre which occurred there in the late 1880s is representative of the violent impact of colonialism. When the Birdsville Track was rerouted in the twentieth century for motor vehicles to avoid flooded creek crossings, the "Outside" Track took travelers closer to the Koonchera Waterhole and nearby Koonchera Dune. The harsh desert environment of the stock route that claimed the lives of humans and animals throughout its history and contributed to its legends continued to pose dangers in the modern era. Graves near the Koonchera Dune mark the final resting place of the Page family, all five of whom perished in 1963 when their car broke down and they tried to walk for help.

Viewing the Birdsville Track as a "cultural route" better captures the dynamic stories of movement and exchange, as well as the process of interaction between past and present, tangible and intangible elements. The crossing and overlays of foot and hoof prints, wagon tracks, and wheel ruts are evidenced in the hymns sung in English, German, and Aboriginal languages at the Killalpaninna mission and in the Ghantowns and mosques built at Marree by Afghan cameleers, whose descendants drove trucks along the route that their forebears trod with camels. Aboriginal peoples did not disappear, but rather continued to live and work along the track as stockmen on horseback, later appropriating Europeans' means of transport to continue to travel and connect with their communities. Aboriginal stockman George Dutton's most vivid memories of traveling the track on packhorse in the 1910s were of meeting up with his "mob" at various stations along the route. For his friend, Myles Lalor, who worked along the track in the 1950s, the present-day track was unrecognizable, its new alignment bypassing many of the stations. Lalor's comment, "the Birdsville Track doesn't follow its road now…" (Beckett 2000:83), illustrates the shifting nature of the road and memory as it is continually made and remade.

The process continues today as tourists are keen to engage with the landscape and pioneering heritage of the region and to experience a sense of adventure in driving or droving along the Birdsville Track. Perhaps the desire to test themselves in this environment is a way of connecting with powerful national foundation mythologies, aligning their own journeys within that narrative and creating new stories to pass on. Yet, we need to find better ways to tell the more complex and often less comforting stories.

## An Alternative Approach? The Canning Stock Route Project

An innovative project to reinterpret the history of the Canning Stock Route in outback Western Australia is instructive as a positive example that produces more complex, nuanced, and often confronting interpretations of such important cultural routes. The Canning Stock Route Project (2006–2013) was a joint initiative between the National Museum of Australia and FORM, a Western Australian non-profit cultural organization.[4] It employed the mediums of art, film, photography, oral history, cultural artifacts, and interactive media to tell the story of the stock route from the perspective of the Martu Aboriginal peoples and their descendants, whose country it crossed and who lived and worked along the route. While the European history of the route is well documented and highlights the heroic feats of pioneers and its importance to the pastoral and mining industries,[5] Aboriginal voices reveal the impact of displacement and mistreatment at the hands of explorers, surveyors, and droving parties—but they also tell of survival, resilience, interaction, adaptation, and continuity. Public outcomes of the project included a website, publications, a major exhibition that toured nationally and internationally, a digital application, and interpretive signage (Kerr 2018, 2019:218).

A central part of the project was an ambitious "Return to Country" trip held over six weeks in 2007. Camps were set up at key places along the stock route, where artists could spend time painting their Country in their own Country. Some of the vast amount of material generated by the project was curated for the *Yiwarra Kuju* (One Road, Many Stories) exhibition, first presented at the National Museum of Australia in July 2010. The exhibition presents a vision of the Country intersected by the stock route. It is laid out geographically, and visitors move through it learning about the Country through paintings, stories, songs, dances, film, and photography, which explore the themes of Country, water, Dreaming, family, history, and movement (Acker 2015:181–182, 195). A sand drawing by Billy Patch, titled "True Map of Canning Stock Route Country" (2008), redrew

[4] It should be noted that the author was not involved or connected in any way with the Canning Stock Route Project but draws it to the readers' attention as an outstanding example of a collaborative and multidisciplinary approach that could be instructive for future projects. More information about the project can be found at the Ngurra Kuju Walyja – One Country One People – Canning Stock Route Project website (http://www.canningstockroute-project.com) and by searching for the "Canning Stock Route Collection" on the National Museum of Australia's Collection Explorer (https://collection-search.nma.gov.au).

[5] The Canning Stock Route runs across approximately 1,850 km of desert country from Halls Creek to Wiluna in Western Australia. It was named after Alfred Canning, who surveyed the route in 1906–1907 to transport cattle from the East Kimberley region to supply beef to the goldfields and Perth.


**Figure 9.** Interpretive signage of the Canning Stock Route. Photograph courtesy of Publik.

the stock route as overlaying and intersecting with a series of grid lines symbolizing the cultural topography of the desert, including water sources, and its songlines (Blair and James 2016:81–82).

On the stock route itself, local Aboriginal communities and artists collaborated to develop culturally appropriate information about the region to enrich tourists' experiences. Interpretive signage, created with the design firm Publik, features the words "Yiwarra Kuju" in letters rising from the ground to form an entry statement, welcoming visitors to the track and symbolizing the connection that the traditional owners have with the land (Figure 9). The aluminum panels with interpretive information are inscribed with an artistic interpretation showing the stock route's linear north–south trajectory overlaying, bisecting, and intersecting with the swirling, interconnecting songlines running east-to-west (Kerr 2018:20; Publik 2018). One of the most insightful revelations of the project was that in Martu history and paintings, "the stock route is simply a thin [and relatively recent] overlay on the profound and timeless reality of their living homelands" (Johnson and Davenport 2011:340). Such a multidisciplinary, cross-cultural, collaborative approach, therefore, not only offers new ways of capturing the multi-layered stories associated with the route, but also challenges the way we see the route itself, its landscape, and its visual representations.

## Conclusion

The Birdsville Track case study highlights the nature of "the road" as a cultural landscape and the complex interrelationships between tangible and intangible elements—including landscape, memory, history, and mythology—in "constructing" its meaning and interpretation over time (Kerr 2012:328–329). Viewing the track as a "cultural route" reveals stories of interactions and exchange between diverse cultural groups. Interpretations that imagine roads and routes as spaces where meanings are not static, linear, or progressive, but rather dynamic, intersecting and overlapping, can lead to a richer understanding of those routes as well as the cultures that produced them (Kerr 2019:250).

It is clear that efforts to interpret the track, and indeed other roads and routes which form an integral part of the nation's cultural heritage, need to reflect more nuanced stories from multiple perspectives. But how can we best tell those complex and sometimes uncomfortable stories? Perhaps multidisciplinary approaches and cross-cultural dialogues—including archaeology, history, anthropology, geography, linguistics, art, literature, and film—and incorporating digital technologies for mapping and interpretation could change the way we see the landscape, recover "hidden" or "forgotten" cultural landscapes, and create more meaningful legacies.

As Amarasinghe, Kalaycı, and van Aerde discuss in this volume, roads are political as well as geographic spaces whose interpretation often relies on a "selective construction of the past." For Australia and other settler colonial societies, race relations and debates over the interpretation of history are never far from the surface, and the nation has not yet fully come to terms with its past. Redressing the silences, exclusions, and selective memory at play in official interpretations could enhance "truth telling" and thus contribute to the ongoing process of reconciliation between Indigenous and non-Indigenous Australians.

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