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The Spatial Ordering of Nabataea: An Integrated Analysis of the Geography, Architecture, and Morphology of Nabataean Petra

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Environmental Dynamics

by

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Abstract

The Nabataean city of Petra is well known for its sandstone architecture and rock-hewn funerary landscape. Over the last few decades, numerous studies examined their history, culture, art, and architecture. The few studies that assessed the urban space of Petra focused on the functional properties of individual architectural forms and their nominal placement within the overall landscape. This study focused on the spatial configurations of architecture as relational to the dynamics of Nabataean politics and ritual where shifts in social order manifested similar shifts in spatial order which in turn produced and reproduced forms of social order. The production of space within Petra’s urban milieu was analyzed as relational to the social forces that sought to reproduce the power and legitimacy of the prevailing political authority. Borrowing from recent theoretical frameworks where landscapes may be assessed through experiences, perceptions, and representations, it was possible to develop an innovative and practical set of spatial analyses that assessed the functional, political, and ritual properties of the environmental dynamics of Petra’s landscape in order to elucidate the planning strategies implemented by Nabataean authorities in establishing new forms of political and spatial order. The functional properties were determined by analyzing the structural arrangement in relation to their topography including their accessibility and water networks. The perceptual properties of structures were assessed through visibility analysis and the modelling of viewsheds and isovists. The representational properties of structures were assessed through the implementation of horizon diagrams to model the visible sky, solar pathways, and structural orientation. This study found that the spatial ordering of Nabataean Petra occurred through i) the functional ordering of movement and flow of people and water that legitimized the perceived control of both, ii) the framing of new forms of political institutions within previously established spatial domains of ritual, iii) the exclusive control of elevated urban spaces and the cooperative relationships between elevated institutions, iv) and the cosmic ordering of significant ritual spaces and institutions in order to portray new representations of political constitution. The results of this study demonstrate clear efforts by Nabataean authorities to implement planning strategies that spatially ordered Petra’s landscape towards establishing and constituting new forms of social order.
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Dedication

For Hannah, Declan, and Donovan
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I. **Introduction**

Upon visiting the site of Petra, Jordan one is immersed in a realm of spatial experiences associated with the myriad of rock-hewn sandstone architecture lining many of the cliff faces. The juxtapositions of the torrid temperatures in the open desert air is in contrast to the cool breezes flowing through the narrow wadis and the ease of the mostly downhill entry into the main valley in opposition to the gruelling uphill exit. During their trek into the long, narrow gorge known as the Siq, visitors are forced to pause and visually consume the massive and impressive Khasneh al-Fahroun, one of the first tombs en route to the valley. Continuing through the Siq, the visitor passes numerous tombs seemingly haphazardly arranged along and into the cliff faces, the massive rock-hewn theater to the west, until finally exiting into the mostly open valley in full view of the Wadi Musa and the main Colonnaded Street. Immediately one is struck again by the experiential and perceptual contrast of the spatial ordering of the main street - its orthogonality quite familiar to Western conceptions of urban formalities. From the top of the street (the eastern node), the city appears in full view, ordered in a quaint and structured manner akin to the Hippodamian layouts exported throughout the Hellenistic world after Alexander’s conquests (Kostof 1990).

From a visitor’s vantage point looking outward across the Colonnaded Street in Petra, one is given an impression of coherence - an ordering of space. This ordering appears in strong contrast to the myriad of tombs lining the cliff faces throughout much of Petra. For the visitor experiencing this space entering from the Siq, the entirety of the experience is framed within particular contexts. Unless the visitor is made aware of the numerous so-called “high places,” or the elevated platforms and their associated religious significances located at key points of elevation throughout Petra, the visitor remains in ignorance. The same lack of understanding holds true of the second largest rock-hewn structure in Petra, the Monastery (ad-Deir) located beyond the street to the west atop the Jabal ad-Deir. Accessing this point requires crossing the full extent of the main street through the highly religious temenos, until finally ascending a rock-hewn staircase to the northwest to the plateau in front of the Monastery.
Figure 1.1: Photo of the Khasneh al-Fahroun. Note that the viewer must pause at this point in the Siq before changing orientation from the west to the north to continue towards the main valley (image source: author).
Figure 1.2: Photo depicting an example of the haphazard arrangement of facades along the cliff face of Jabal Madbah in the outer Siq (image source: author).

Figure 1.3: Photo of the Colonnaded Street demonstrating a spatially different focus on orthogonality (image source: author).
Experientially, the routing of the visitor from the entrance of Petra, through the valley, the street, and the temenos, was spatially ordered as profoundly as the water the Nabataeans masterfully channelled throughout the city. Perceptually, entirely new forms of order were rendered in profound and demanding ways where the viewer was forced to conceive of a new way of thinking about Petra’s environmental dynamics. In other ways, the viewer was specifically restricted from perceiving entire institutionalized spaces, such as the numerous high places and the Monastery, where order was conceivable to a select few. The ordering of Nabataea emerged out of fluid social relations that were dynamic and related to politics and ideology and multiple scales.

Figure 1.4: Photo of the Monastery and its secluded location atop Jabal ad-Deir (image source: author).

While their origins are far from conclusive, the Nabataeans were clearly of nomadic origin; pastoral nomads who were able to gain control of key connections in the emerging trade networks that spanned the desert region. This particular tribe was able to negotiate inter-tribal relations to a point of forming a sort of
tribal confederacy that was finally situated at Petra (Wenning 2007; 2013) while simultaneously forming geopolitical relations between Ptolemaic Egypt, Judaea, Achaemenid Persia, southern Arabian polities such as Saba, and later Rome, and Parthia (Bowersock 1994). Their presence and power is attested at sites throughout the Negev desert in southern Palestine, the Sinai, the northern Arabian peninsula, Hijaz mountains and coastline, the Transjordan Desert east of the Wadi Araba extending northward to the Ajlun Highlands and the more fertile Syrian Hauran.

The formation of confederations, or states, out of multiple tribes is inherently tied to the ability of tribal elites to adhere to or route accepted ideology and societal values (Caton 1990). Within Hellenistic contexts, ideological discourse often manifested in the form of discrete religious spaces, such as the Acropolis, or the temenos that were often framed within the experiential and perceptual core of the city, often atop the most visible hill or mountain (Kostof 1990; Gates 2003). Transplanting the notion of city formalities from the Greek world into previously nomadic contexts was likely a difficult endeavor and certainly one that occurred late in their overall history under Aretas IV (r. 9 BCE-40 CE). The spatial production of Petra was clearly based on the ideological discourses manifested in the previously established funerary architecture. The establishment of new spatial orders in Petra was likely viewed as oppositional to these values, especially following a time when Aretas’ ascension appears to be controversial and contested. And yet Aretas reigned for nearly 50 years. Perhaps the answer as to how their political authority remained constituted in Petra and throughout Nabataea lies in their ability to produce spatial representations of new orders of established ideologies.

The scope of this study is to investigate how the vast arrays of experiences, perceptions, and representations manifested various forms of spatial order through the environmental dynamics of social relations within Nabataean Petra. Here the relationship between social action and the spaces created by powerful agents were interactive components in reproducing socio-spatial relations over time. Within Nabataean Petra these interactive components were inherently bound to politics and ritual. Politics was a public affair acted out in the rhetoric of public architecture and space. So too was the Nabataean ritual in the sense that “ritual spaces are distinguished from other constructed environments in that they are public, special, and unique” (Moore 1996: 139). Much of the analysis and discussion herein is from social and
spatial theories of political authority and space, borrowing from the practical analytical domains of political authority outlined by Adam T. Smith in *The Political Landscape* (2003). In this view, authority is understood to be encompassed by the underlying components of i) power, the ability to direct and control the actions of others at multiple scales, and ii) legitimacy, the ability to “generate the allegiance of subjects” (2003:108). Additionally, space is understood to be relational, multiplicitous, and in a constant state of becoming (Massey 2006). Considering these ever-changing relations, authority must produce and reproduce spaces in order to reproduce the underlying components of political authority at multiple spatial scales. Within these practical domains of spatial analysis - experience, perception, and representation - I developed a series of empirically rooted innovative methodologies that focused on the ordering of Nabataean space within functional, political, and ritual social domains.

This study may be compartmentalized into multiple parts. First, I contextualized Nabataea, especially Petra, through its physical geographies (chapter two) and Nabataean historical and political narratives (chapter three) focusing on the productions of the territorialization and the regime at Petra. Second, I assessed the predominant trends in urbanism research borrowing from a wide variety of social science disciplines including assessments of the urban or spatial studies of Petra (chapter four). This approach provided a foundation from which to derive a relational socio-spatial methodology relevant to Nabataean urbanism at Petra (chapter five). Once implemented and analyzed (chapter six), I discuss the relational spatial dynamics of experiential, political, and ritual order at Petra (chapter seven) and included implications of this study and recommendations for future research (chapter eight). The thrust of this study was to integrate empirically rooted yet theoretically centered analytical methodologies in order to investigate the relational properties of social and spatial order in Nabataean Petra as manifested in spatial forms of experience, perception, and representation.
II. Study Site

The geographical context of Petra provides interesting information about the production of landscapes within this region. In order to understand how Petra’s urban landscapes related to the functional, perceptual, and conceptual components of socio-spatial production in Nabataea, it is important to gain a clear sense of the physical geographies of Petra and the region, the climate, the political and economic geographies through which the city was instantiated, the general layout of the city, and a practical understanding of its architecture. These are used to provide context to the succeeding chapter that explores the social narratives of Nabataea by way of its geopolitics, territorial productions, and institutions.

In the modern era Petra is located within the Ma’an Governorate of the Hashemite Kingdom of Jordan about 300 km south of Amman at approximately N 30° 19.718 E 35° 26.329. With an elevation averaging about 900 m above sea level, Petra features a highly diverse terrain of mountains and valleys (wadis) that afforded the Nabataeans unique possibilities with regard to water capture techniques and a geologic past that produced fine malleable sandstone that permeates the site lending to its abundantly red appearance (Paradise 1998). The physical geographical ecumene of the Nabataeans encompassed regions throughout the Transjordan, where their capital at Petra was situated just east of the Wadi Araba, the eastern bank of the Jordan Valley and the Jordan River floodplain, the Negev desert in Palestine, the northwestern portions of the Arabian peninsula including the Tihamah coastal regions along the Red Sea and the Hijaz, and the more fertile regions of the Syrian Hawran (Bowersock 1990).

The most common set of physical barriers within this region of the Near East was the Wadi Araba-Jordan Rift valley. This is a seismically active geologic system that runs north-south (~015°N) from Lake Tiberias (ie. the Sea of Galilee) through the Dead Sea and the Wadi Araba, to the Gulf of Aqaba (Paradise 1998). This system was commonly used as a physical division between provinces and kingdoms along its western bank (ex. Judaea, Idumaea) and those along its eastern bank (ex. Moab, Nabataea) (Bowersock 1990). The width of this rift maintains increased variance from the north averaging around 5 km to the south at around 20 km (Rababeh 2005). In the north the Jordan River meanders through the rift connecting Lake Tiberias to the Dead Sea cutting through old Pleistocene lake bed deposits (Held 2006).
In the Wadi Araba, the southern portions of the Jordan Rift Valley, the depression is broadest and consisted historically of riverbeds that extended southward into the Gulf of Aqaba. The heat increases within the Araba itself encouraging pedestrian traffic to traverse the region in parallel to the wadi rather than descending into the wadi itself. In antiquity, there were a few break points for crossing the Wadi Araba into the Negev desert to its west. Gaza was a major trade port located along the Mediterranean Sea coast in Palestine in the western Negev. Accessing this city from the Transjordan east of the Wadi Araba was exceedingly difficult. Petra emerged as a central junction point by the second century BCE for goods moving from the Arabian peninsula, via the Hijaz region, through Petra and the Wadi Araba to the port of Gaza (Negev 1966; Bowersock 1994).

A. **Climate**

Flanking the Wadi Araba-Jordan Rift along the eastern side is the Highland Belt. These uplands range from the Yarmuk River in the north to the Gulf of Aqabah in the south. Due to orographic lifting, the majority of the moisture arriving from the Mediterranean Sea is precipitated in this belt. Historically the Highland Belt “has always served as the core of settlement, development, and culture east of the Jordan Valley” (Held 2006:328). Within this belt are five sub-regions that are divided by climate, agricultural, topographical, and geological variability. These regions are i) the Ajlun Highlands ranging from the Yarmuk River to the Wadi Zarqa, which receives the most water (600-750 mm/yr), maintains a highly dense population, and hosted cities of the Decapolis like Gerasa (ie. Jerash) during the Nabataean period; ii) the Balqa (or Amman) Highland, with its rolling hills maintaining significant populations since it hosted the cities of Ammon, Philadelphia, and modern as-Salt and Amman; iii) the Southern Balqa, sometimes called the Karak Plateau, is flanked to the south by the Wadi Mujib and was home to Moab (at Kir Hareseth), Madaba and Mount Nebo, and Nabataean Dibon; iv) the Shara Mountains, where the aridity increases to an extent that dramatically decreases the existence of settled villages and is where Petra and its iconic Nubian red sandstone lies; and iv) the Hisma, the mostly arid Nubian sandstone landscape that affords few villages apart from the famous Wadi Ram (Held 2006).
While the Highland Belt receives nearly all of the rainfall east of the Jordan Valley, there is a precipitation gradient that exists in the amount of rainfall from north, which receives the most annual precipitation and is home to the more densely populated communities and forms of agriculture; to the south where Petra averages about 130 mm of annual precipitation. Climate and weather data records are not available for much of the history of Petra. Fortunately, the nearby town of Wadi Mousa has enough to give some clue of the history of the climate in Petra, the mean annual precipitation totals approximately 130 mm and occurs primarily from November through March, with most precipitation recorded as rain. Subzero temperatures are infrequent and mostly occur at night. Temperatures can range from 6° to 12° Celsius in January and can rise to between 15° to 32° Celsius in August (Paradise 1996). Considering that much of the area is protected by high cliffs, valleys, and wadis much of the area is not affected by climatic erosion. Most of the winds that occur in this region of Jordan do not strike the valley of Petra directly. This protection has enabled much of the area to sustain the integrity of its archaeological landscape (Paradise 1996).

B. Natural Resources & Trade

It is difficult to ascertain the wide variety of goods and resources that flowed through the Nabataean region. It is clear that gold and silver were common features of the Nabataeans whose acquisition and wealth often gained the attention of Greek and Roman officials and military leaders long before their monumental establishment at Petra (Graf & Sidebotham 2003). Gold crowns were crafted as gifts in 17 AD by Aretas IV for Germanicus and Agrippina with “lighter” ones to others in attendance at a banquet (2003; citing Tacitus, Annals 2.57), ostensibly held in Petra (Pearson 2011). Indications of luxurious tradecrafts appear throughout the kingdom in the Negev at Mampsis and Oboda (Patrich 1984; Goldman 1996; Negev 1997), not to mention the discovery of unworked amethyst beads within Petra that were likely exported to Ptolemaic Egypt (Graf & Sidebotham 2003; citing Meredith 1957; Johnson 1987:75-78). While the Nabataeans were central to the overland trade routes associated with the incense trade (Bowersock 1994), it is possible that they themselves exported “from their own kingdom a number of valuable items normally associated with south Arabia” (Graf & Sidebotham 2003:72; Strabo Geog. 16.4.26).
Additionally, the Nabataeans likely engaged in mining activities. Small deposits of gold are often found scattered throughout the northern Hijaz associated with what appears to be early mining settlements (2003; Kisnawi 1983). Copper mining activities at Wadi Faynan were conducted alongside highly effective water management techniques that reduced the likelihood of soil erosion, a system more effective than the later Roman/Byzantine approaches that led to desertification in area (Barker 2002). Bitumen was also a common resource extracted specifically from its natural source in the Dead Sea (Taylor 2007). Technological innovation and engineering increased the water surpluses throughout Nabataea alleviating pressures on more traditional sources such as oases and springs (ayn) (Rababeh 2005).

![Map showing known Nabataean trade routes throughout the region during the first century CE.](https://example.com/map.png)

**Figure 2.1:** Map showing known Nabataean trade routes throughout the region during the first century CE. (Paradise 2011: used with permission)
The physical geography of the region directly influenced the effectiveness of the Nabataeans to position their unique role within Hellenistic economic contexts (Bowersock 1994). It was through their ability to master the incense trade networks within harsh arid environments that enabled them to accumulate the surpluses that gave way to their affluent society in the first century BCE. These networks were likely borrowed from previously rendered nodes developed by others such as the Qedarites (see discussion below). Neighboring the western side of the Wadi Araba is the rocky Negev desert, which was an important geographical region of the Nabataeans early in their history. In fact, one of the earliest references for their existence refer to their contact with Antigonus in Gaza where they offered a branch of an incense tree (Wenning 2013:12). Predominantly a desert region, the terrain of the Negev hosts a series of cross-folds and basins with the highest point of elevation at 1033 m (Held 2006).

In some of the rocky outcrops in the Negev emerged some of the more important Nabataean sites were stopovers and connection points between Petra and Gaza. Apart from Gaza, many of the more significant sites include Oboda, Elusa, Mampsis, Nessana, and Be-ersheva (Erickson-Gini 2006). Economically the most significant of these was Gaza with its important port. Historically and geographically the site of Oboda is geographically centered within the Negev along the Petra-Gaza trade route and culturally tied to the Nabataean religion through a potentially deified king (arguably Obodas III) (Alpass 2013). A much longer trade route is believed to exist from the port of Aila (modern Aqaba) at the Red Sea to Gaza via Nessana (Erickson-Gini 2006).

To the south, the Arabian Peninsula is vast in comparison to the regions occupied by the Nabataeans. The relevant portions mostly resided within the narrow coastal plain along the Red Sea known as the Tihamah, which traverses the full length of the peninsula along the coastline, the Hijaz mountainous region, and the Arabian Shield. The Tihamah is relatively thin in the northern portions, sometimes only a few meters in width gradually increasing farther south (Held 2006) where Nabataean presence during their maritime trade existed such as the famous but elusive port of Leuke Kome (Graf & Sidebotham 2003). Natural harbors are rare along the coastline (Held 2006). The Tihamah is lined by a mountainous barrier known as the Hijaz Mountains with peaks averaging 2100 m and lines the western edge of the Nubian-Arabian Shield. The Hijaz maintains an elevation gradient from north (lowest) to south (highest).
The ancient Nabataean town of Hegra (modern Mada'in Saleh) is located along the confluence of the lower northern Hijaz Mountains and the Nubian-Arabian Shield providing it an appearance similar to the red sandstone in Petra. In the southern portions of the Hijaz, rainfall is highest with averages ranging 300-500 mm annually and historically facilitated trade connections between the Nabataeans and Asir, Najran, and Saba in this region (Graf & Sidebotham 2003; citing Zarins 1981; 1983; Stucky 1983). Mostly consisting of metamorphic rock perched along a massive plateau, the Arabian Shield spans much of the peninsula and hosts numerous volcanic features, faultlines, and occasional mountainous outcrops (Held 2006).

In the northern Arabian Peninsula, trade extended east of Petra through the oasis of Dumat al-Jandal at al-Jawf, located about 300 km east of Petra. This was an important node en route to Charax in the Parthian Empire (Graf & Sidebotham 2003). This node also served as a nexus of networks departing from the northern Highland Belt (the Ajlun Highlands) through the important geographic depression known as the Wadi Sirhan. This important wadi makes up a portion of the Eastern Desert whose shallow depression served trade purposes historically for caravans and Bedouins migrating to southern portions of the Parthian Empire and the Persian Gulf. Historically al-Jawf served as a capital for the Qedarites and “a series of north Arabian queens in the Neo-Assyria era” (2003:70) and was likely a stopover for Nabonidus during the Babylonian invasion of the Arabian peninsula that ended with the establishment of a temporary capital at Tayma to the south (2003).

C. The Geographies of Petra

As part of the Wadi Araba rift system, Petra formed through years of faulting, erosion, and weathering of the Cambrian sandstone and the pre-Cambrian basement layers that were exposed following the removal of the capping Cretaceous limestones linked to the rift’s seismic activity (Paradise 2013). The resulting sandstone cliffs in the valley consists of the “Ram Group [a] stratigraphic sequence begins with the Salim at the bottom, overlain by the Cambrian Umm Ishrin, Ordovician Disi and Umm Sahm at the top” (2013:178). The Umm Ishrin sandstone is the stratigraphic base that permeates the more famous portions of Petra with its rustic, red-toned appearance and is while the Disi sandstone capping the stratigraphy is “a coarse-grained distinctive light beige, cream to white color, and spheroidal” producing the series of “domes
and hummocks on the ridges and cliff tops” throughout Petra (2013:178; Bender 1974; Barjous & Jaser 1991).

**Figure 2.2:** Model of the geologic cross section of the sandstone layers at Petra (Paradise 1996).

The physical terrain of Petra is a blend of gradual and sharp wadis and mountains. The Nabataeans took full advantage of its physical variability by shaping gravitational forces in the form of water catchment technologies. Its most obvious rendering within the gorge of the narrow Siq, the primary entrance and exit point to the east of the valley of Petra whose meandering separates the northeastern mountain Jabal Khubtha from the southeastern Jabal Madhba. When the Siq widens abruptly, not coincidentally at the location where the famous Khasneh al-Faroun was carved, it shifts northward to join with the Wadi Musa. Along its northward trajectory the Nabataeans carved a highly clustered number of monuments and tombs, not to mention the expansive theater embedded in the Jabal Madhba.
Figure 2.3: Isometric view of the topography of Petra.

Around the north side of Jabal Khubtha is the narrow channel Wadi Muthlim which provides a small, albeit rarely used entrance to the northern portions of Petra meeting with the relatively open and shallow Wadi Mataha. It is this confluence of systems that Paradise (2011) suggests was capable of producing a significant flash flood event where the Wadi Mataha meets the Wadi Musa at the city center. Throughout the Wadi Muthlim and the Siq, are a series of niches, betyloi, and cult sites (Nehmé 2013). There are so-called ‘high places’, open ritual spaces that were common throughout the Near East during the Hellenistic period (Bowersock 1990), that are located atop Jabal Khubtha, Jabal Madhba, and Jabal ad-Deir (Brünnow & Domaszewski 1905; Dalman 1908; Robinson 1930). Along nearly every mountainside and wadi listed above are Nabataean funerary monuments and tombs, niches, or markings of some kind, not to mention the monumental structures that makeup the areas closest to the Wadi Musa. According to Nehmé (2003), the collective monuments in Petra may be summarized as:

“3,197 monuments… subdivided [into]: 1179 rock-cut chambers, 628 monumental tombs, 516 small religious monuments, 188 cisterns, 118 banqueting rooms, 101 shaft tombs, twenty-two wine presses, thirty-four nefesh, groups of nefesh or niches including a nefesh, and seven temples or possible temples… The remaining 404 are divided into numerous categories…: aqueduct, arch, basin, water channel, caravanserai, church, dam, fort, fountain, gaming-board, wash-basin (forty-three), niches prepared to receive the springer of an arch (eighteen), obelisk, offering cup,
It is along the east-west flow of the Wadi Musa that the main Colonnaded street of Petra was built including the vast majority of its free-standing civic and religious architectural structures. The main street ends at the temenos where the confluence of wadis enters the narrow Wadi Siyagh where it meanders between the relatively small Jabal Habis and the second largest mountain Umm al-Biyarah to its south, and Jabel Meisarah and Jabal ad-Deir to its north. The water flow continues until reaching the braided Wadi Araba systems to the west of Petra. Due west of Umm al-Biyarah is Jabal Haroun, already a famous pilgrimage site in the Hellenistic world for its religious significance within Judaean history as the fabled tomb of Moses’ brother Aaron (Taylor 2007). What remains within Petra today is an interesting array of architectural history encompassing structures from Edomite, Nabataean, Roman, Byzantine, and even...
Crusader contexts. To better understand the social geographies surrounding what led to the production of many of these materials, it is important to focus on the political and historical narratives of Nabataea.
III. Political Narratives of Nabataea

The social narratives of the Nabataeans is inherently tied to the place of Petra and its emergence as their economic capital city which was highly influential in their geopolitical successes. The city itself became synonymous with the splendor and wealth of Nabataean trade. The city not only represented economic success but in many ways produced it. The multitude of spaces that were initially a repository for economic surplus coalesced into what Yi-Fu Tuan (1977) identified as a sense of place. In this implementation place “refers to how specific locales become incorporated into larger worlds of human action and meaning” (Smith 2003:11). Between the third and first centuries BCE there is a clear discernible transition of the Nabataeans from nomads and pastoralists to city-building urbanites. During this time of social transformation the city itself was repositioned as a powerful representation of Nabataean identity. An identity that was bound to the local geographic contexts and urban aesthetics of Petra in a time when city-building was heralded as a significant political act following in the footsteps of Alexander the Great. Petra served as a socially transformative flagship that constituted internal political changes (or conflicts) and geopolitical affiliations. It was home to powerful and wealthy elites and a number of stratified social institutions. The act of placemaking is inherently tied to the temporal relationships as “place and placemaking root the past in the surrounding landscape” (Smith 2003:12). The land itself was uniquely produced to hold the social memories of Nabataean identity in the plethora of tombs and facades throughout the city. Taken all together it was a multi-scalar and multi-temporal representation of Nabataean identity and its spatial production was far more than a backdrop to political activities and in many ways legitimized them.

The scope of the following chapter is meant to elucidate and ascertain the various social elements that were involved in the place-making of Nabataean Petra that produced specific spatial practices within the city. To accomplish this, it is imperative to assess the regional historical contexts that led to the seemingly sudden appearance of the Nabataeans in the historical and archaeological records, address the on-going debates and challenges in understanding the geographic and ethnic origins of the Nabataeans, and finally situate the social forces that led to physical manifestations and manipulations of the resulting urban fabric of Petra leading up to Roman annexation in 106 CE. Much of the focus herein pertains to i) the
geopolitical reconfiguring of political spatial dynamics within this geographical region by examining inter-state or inter-polity relations, ii) the emergence of Nabataean identity as manifested in early authoritarian spatial practices throughout the kingdom of Nabataea, and iii) the spatial ordering of its social, especially political and religious, institutions within Petra.

The social history of Nabataea may be characterized as a broad network of interrelated (sometimes urban) nodes that was heavily reliant on interconnectedness and mobility. In the Bab as-Siq, the primary entrance and water-hewn passageway into Petra, a relief was uncovered in 2003 characterizes this mobility by depicting a nomadic tradesman leading a camel (Graf & Sidebotham 2003). This and the numerous terracotta figurines of camels that are still being discovered are physical representations of a cultural connection to the prevailing economic system in this desert region (Anderson 2005). Like many of the societies situated within the Transjordan just prior to the 3rd century BCE, the primary mode of socio-economic production rested firmly within broadly spatial geopolitical trade systems (Graf & Sidebotham 2003). The expansive desert regions yielded little accessibility to the mostly sedentary societies of Mesopotamia, Asia Minor, southern Europe, and northern and eastern Africa. While external conquests were conducted by the Babylonians, Achaemenid Persians, the Hellenistic Greeks and the Romans by the first century BCE, the harsh physical geographies mentioned in the previous section kept their frequency to a minimum (Taylor 2007).

Cultural traditions firmly rooted within desert environments rose to prominence by providing the necessary connections between major trade groups. For example, the Edomites in the Hijaz emerged as economic conduits between Arabian-Mesopotamian-Egyptian geopolitical matrices and groups in the Arabian peninsula. Powerful trade cities, such as Tayma and Didon, developed as primary nodes for social interaction and economic and cultural exchange, and by extension social history and space due to their relative economic situations along the few accessible trade routes and their proximities to known oases (Parr 2003; Graf & Sidebotham 2003; Anderson 2005; Taylor 2007). After a series of geopolitical struggles and conquests by the Babylonians, Persians, the Hellenistic political turmoil following Alexander the Great's death, and the expansive Roman Empire, groups like the Qedarites and later the Nabataeans themselves emerged due to these multi-scalar geopolitical oscillations that greatly influenced these desert
trade relations as connections increased in areas between the Mediterranean, the Persian Gulf, and the Indian Ocean (Taylor 2007; Wenning 2013).

The so-called “Nabataean Period” (ca. 312 BCE to 106 CE) appears to overlap two of these major oscillations directly influencing the Near East - the Alexandrian and subsequent Hellenistic kingdoms (ca. 323 - 63 BCE), and the Roman colonization efforts of the Near East beginning with the arrival of Pompey in Judaea in 63 BCE ending with the annexation of Arabia by Trajan in 106 CE (Bowersock 1994; 2003; Anderson 2005; Taylor 2007; Alpass 2013; Wenning 2013). Still, simply identifying contemporaneous, and mostly Western societies does little to shed light on the complexities of social relations that influenced the place-making of Petra. This excludes the possibility that historical memories of previous occupiers, extensive trade groups to the north, south, and east, or relatively minor contemporaneous groups of whom many were potentially important components in Nabataean socio-spatial production during their developmental periods. Previous groups like the Edomites and the Qedarites, the previous incursions of powerful empires like the Assyrians, the Babylonians, and the Achaemenid Persians, the neighboring Levantine political and religious oscillations that eventually gave rise to the Hasmonaean kingdom in Judaea, the competitive relations between Judaea and the Minaeans located in the Arabian peninsula all should be considered as relational to the construction of Nabataean identity. A relational identity consisting of a multitude of groups that established a thriving kingdom acquiring territory throughout the Negev, the northwest portions of the Arabian Peninsula, much of the Transjordan, and southern portions of the Hauran in modern-day Syria (Bowersock 1990, Taylor 2007). Therefore a brief discussion of these shifts in Near Eastern economic relations is warranted considering that these relations of connectedness and mobility, as discussed below, remained a central component in the establishment of the Nabataean Kingdom and the place-making of Petra.

A. Geopolitical Considerations

An investigation into the geopolitical contexts of the region that precluded or were contemporaneous to Nabataean occupation yields important insight into the spatial negotiations that took place to define and delineate some of the territorial frontiers of Nabataea. Also, contextualizing the state, or polity, of Nabataea both temporally and spatially elucidates the relational socio-spatial forces that
influenced the shaping of Nabataea and by extension the capital city of Petra - the primary focus of this study. Additionally, it “includes not only the delineation of defined territories within which sovereignty is confined to the apparatus of a single authority, but also the creation of political identities” (Smith 2003: 26). Political authority necessitates identity construction, especially one that is tied to the physical landscape which is accomplished by the authoritarian binding of their “identity with land through the demolition of prior commitments and the development of a constructed memory of landscape” (2003: 26-7). The establishment of a spatial territory and social identity is inherently oppositional in that relations between polities within a given ecumene were (and are) often defined in contrast to one another “through the demarcation of difference, hegemony, exclusion, and inclusion” (2003: 115). These demarcations often cross multiple scales exerting influence in even the smallest of structures or cultural representations. What follows is a discussion of the geopolitical contexts that contributed to the emergence of a Nabataean political authority and cultural identity and their influences in initializing territory, kingship, and the city of Petra.

For much of the history covered in this study, the political geographic regions of the Negev, the Transjordan, and the Hijaz were characterized by their relation to foreign imperial programs. The inhabitants of Edom, situated in the Transjordan east of Wadi Arabah and south of the Dead Sea, encompassed a client polity of the Neo-Assyrian empire (Anderson 2005). The main caravan cities of Tayma and Dadan in the Arabian peninsula paid tribute to Babylonian rulers and eventually became primary nodes in the trade networks connecting southern and northern regions of Arabia (Parr 2003; Wenning 2013). The confederation of ‘Arabs’ called the Qedarites served as the conduit of trade and exchange between the Persians and their provinces in Egypt and Palestine and operating throughout much of Northern Arabia, the Transjordan, and the Syrian Hauran (Knauf 1989; Zayadine 2001; Anderson 2005; Wenning 2013). Even some of the larger nomadic tribes were documented in paying tribute to the Persians. Following in the footsteps of Alexander, the Seleucids attempted to lay claim to the trade routes that were ultimately taken over by the Nabataeans (Bowersock 1994; Taylor 2007), not to mention the internal and external conflicts among and between Jewish and neighboring non-Jewish polities or among the various tribes and kingdoms throughout the Arabian peninsula attempting to monopolize on highly valuable trade routes (Graf 2003; Taylor 2007).
Parsing these multivariate conflicts, occupations, empires, and client relationships remains exceedingly difficult.

Much of the region in this study, beginning around the 13th-14th c. BCE, belonged to Edom; a mostly desert dwelling society initially appearing in the historical record through inscriptions found in Egypt of Pharaoh Rameses II where they are mainly depicted as “nomadic pastoralists and marauders” (Taylor 2007). In biblical texts, the story of Exodus of the Israelites depicts the Edomites as a “unified people with a centralized government… [where] the ‘king’ of Edom refused Moses’ request for the Israelites to pass through his land, and that the Edomites ‘marched out with a powerful army’ to make compliance more certain” (2007). Interestingly, no archaeological evidence exists to support a centralized authority as early as the supposed Exodus (dated around 1270 BCE), which as Taylor points out “has to be said that some scholars doubt that [the Exodus] happened at all” (2007). What is more likely is that Judaean scribes, writing in the 7th c. BCE, retroactively depicted early Edomite society through the lens of 7th century Edomite political centralization. The Egyptian references to early Edomites as nomadic pastoralists have held truer to archaeological evidence (2007).

By 732 BCE, after King Tiglath-Pileser II extended Assyrian control over Edom, Judah, and their neighbors, researchers find written documentation of the names of “kings at Ammon, Moab, Ashkelon, Judah and Gaza, and King Qosmalak of Edom” (Taylor 2007). Although Edom and its neighbors were consumed within the Assyrian empire, Edom remained largely autonomous eventually bringing a “level of political and economic stability that enabled the Edomites to enjoy the greatest prosperity they had known”, likely due to emerging trade routes connecting the empire to parts of Egypt, Arabia, Syria and Asia Minor. Many of these trade routes can be seen in later accounts of Nabataean wealth and prosperity (2007).

By the end of the 7th C. BCE, the Assyrians and their empire gave way to the second Babylonian Empire. In 587 BCE, King Nebuchadnezzar sacked Jerusalem taking hostages of Judaean leaders back to Babylon. Interestingly, outside of biblical sources, there is little evidence to suggest that Edom played any role in this event since they remained an independent state by avoiding annexation. Regardless, Judaean sources believed that the Edomites were at fault and held serious blame with “vitriolic prophecies of doom” (2007):
“For my sword… shall come down on them, and upon the people of my curse… and the streams thereof shall be turned into pitch, and the dust thereof into brimstone, and the land thereof shall become burning pitch. It shall not be quenched night nor day; the smoke thereof shall go up for ever: from generation to generation it shall lie waste; none shall pass through it for ever and ever… And thorns shall come up in her palaces, nettles and brambles in the fortresses thereof: and it shall be an habitation of dragons.” (Isaiah 34: 5-13, as cited in Taylor 2007)

Identifying historical sources about Edom is problematic as many sources are either biased in favor of a particular group, such as the problematic references in the Old Testament (Knauf-Belleri 1995), or an empire, such as the Neo-Assyrian and Neo-Babylonian annals (Anderson 2005). What is clear is that the Edomites in their later periods (c. 8th/7th centuries BCE) possessed an army, a centralized political authority led by a king or ‘deputy’ (see 1 Kings 22:47), a capital city at Busayrah and a number of other notable cities and towns such as Tell el-Khaleifah, Tawilan, and Umm el-Biyara (Knauf-Belleri 1995; Anderson 2005; Bienkowski 2013; Wenning 2013). The social structure of Edom was likely a mixture of nomads, pastoralists, and sedentary inhabitants loosely organized as a tribal confederation with a monarchy (Bienkowski 2013; Wenning 2013). The social scheme was likely “heterarchical (horizontal) not hierarchical (vertical)” where “[e]ach tribe continued to control its own area and had its own power base” (Bienkowski 2013: 27). For this type of political structure, the social model of “tribal kingdom” was proposed (LaBianca and Younker 1995; Younker 1997; LaBianca 1999; Knauf 1992; Knauf-Belleri 1995; Bienkowski and van der Steen 2001; Bienkowski 2007; 2009; 2013). Bienkowski explains this structure and:

“suggests that, historically, the basic unit of subsistence in the southern Levant is the tribe, which derived its unity not from a territorial identity but from a sense of extended kinship… The tribes in the Iron Age of the southern Levant would have been kin-based, partially range-tied and nomadic, and partially land-tied and settled, with a mixed economy of pastoralism, agriculture, trade, protection and copper-mining, the balance changing according to circumstances” (2013: 27)

According to Anderson (2005) this flexibility was necessary due to the nexus of environmental limitations and the “fluctuation in pressures (economic and military) at the hands of neighboring powers” (2005: 23). The most significant fluctuation was the formal annexation of Edom into the Neo-Babylonian empire under Nabonidus following the destruction of Busayrah (Taylor 2007) when the stress on Edomite sedentarism resulted in a return to mostly nomadic styles of living (Knauf-Belleri 1995).
Busayrah, following this model, may be viewed as a tribal center rather than a formal capital city (Bienkowski 2013). It was an area where elite groups resided and monumental structures were built. The plethora of settlements throughout Edom appear to demonstrate different aspects of culture; only a few of these settlements may be said to be wholly Edomite. Instead these settlements, including Umm al-Biyara in what is later Nabataean Petra, demonstrated different assemblages of pottery and patterns of settlement (Bienkowski 2002).

Nabonidus, Nebuchadnezzar's successor and the last king of Babylon, destroyed what little remained of Edom in 552 BCE during his campaign south across Arabia to the cities of Tayma and Dedan (Parr 2003) taking up residence in Tayma for nearly 10 years (c. 552-543 BCE). The Edomites themselves, however, remained even though their rulers and kings lost their legitimacy and disappeared, likely due to direct rule from Babylon until 539 BCE when the Babylonian empire fell to the Achaemenid Persians. After the sacking of remaining Edomite nodes and settlements, Nabonidus continued his campaign through the Hijaz. This is when “we get our first indication that conditions there were changing” (2003). At this time there were a number of trade centers, most notably Tayma and Dedan (modern al-Ula), located at important oases. Nabonidus laid siege to a number of these centers and Tayma was repurposed as a “seat of government of the Babylonian empire” including the monumental construction of a “palace comparable to that of Babylon itself” (2003: 32-3).

Tayma and Dedan (c. 6th century BCE), and others like Dawmat al-Jandal, provide useful examples of how the caravan and trade cities in northern Arabia and the Hijaz responded to or were produced by foreign political authorities. These nodes became material expressions of the nexus of multiple cultures spanning multiple geographic scales. The Assyrians and the Babylonians attempted to control these principal nodes located on the vast and expansive trade network of mostly aromatics and frankincense that traversed the Arabian peninsula connecting the Indian subcontinent with the Mediterranean (Bawden et al. 1980; Bowersock 1994; 2003; Parr 2003; Anderson 2005). According to records of the Assyrians under Tiglath-Pilesar III, Tayma was already paying tribute to empires as early as 736 BCE (Anderson 2005: 29; citing Bawden et al. 1980: 71). During the Neo-Babylonian incursion and occupation by Nabonidus in 555-544 BCE, Tayma was spatially reconfigured to reflect the social values of
political and religious elites. A palace, temple, and numerous other functional structures were constructed in the city (Parr 2003; Anderson 2005), including a “stone plaque/cube [that was] found at the site… showing mixtures of Egyptian, Arabia[n], and Mesopotamian iconography” (2005: 29 fn 85; citing Bawden et al. 1980: 85). Additionally two stelae were discovered with inscriptions that demonstrate a linguistic overlap with mentions of both Mesopotamian and Egyptian names; they are associated with religious sculpture and iconography (Parr 2003).

The town of Dedan is especially revealing about how localities responded to the oscillations of imperial control and environmental influences. Located in “one of the most fertile valleys of the Hejaz” (Parr 2003: 33), this oasis town was well established and known as a significant node in the Arabian trade network by the time of Nabonidus. In fact, references in the Old Testament’s books of Isaiah and Ezekiel, which may be contemporary to Nabonidus’ campaigns, discuss its relationship to the distant Phoenician city of Tyre located along the Mediterranean coastline (i.e. modern Lebanon). After the decline of the Babylonian empire it “seems likely that an independent Dedanite kingdom emerged” (33). The Achaemenids refer to a governor of Dedan, whether the “governor [was] acting on behalf of the Persian rulers or on that of a more local king… is unclear” (33). What is clear is that a centralized authority in northern Arabia was often defined in the spatial imagination of foreign powers by its primate city. By about 400 BCE another independent emerged known as Liyan that encouraged trade between Minaean merchants from south Arabia, tribal groups in northern Arabia and the Hejaz, and traders across the Red Sea into the Nile Valley. Dedan was a central node in connecting trade networks from the southern groups of the Arabian peninsula to northern groups (2003). Trade between Arabian and Egyptian groups increased during this time and following the establishment of the Greek Ptolemaic dynasty in Egypt, “there are strong hints of Egyptian political and cultural influence at Dedan” (33).

The Achaemenids “exercised only light control” focusing mainly on trade routes and ports in the southern Arabian peninsula. The geographic reach of the Achaemenids spanned across the Transjordan into Egypt, Palestine, and possibly some northern regions of Arabia (Anderson 2005; Ackroyd 1990; Graf 1990; Mildenburg 1996; Hoyland 2001; Briant 2002). A small area located in the northwestern portions of Edom became the Persian province “Idumaea” and Edomite settlements dissipated as routes shifted and
prosperity dwindled and likely returned “to a life on the move” (Taylor 2007; Knauf-Belleri 1995) migrating into areas in Judah (the Yehud province) and northwestern Arabia (Parr 1982; 2003; Wenning 2007). In fact “[f]or the first time in history, the whole area from the Aegean to India was unified under one government” (Retso 2003: 235).

The structuring of the Achaemenid state was hierarchical and less totalitarian than their Assyrian and Babylonian predecessors. Their territory was “supra-national” tolerating “the existence of a large number of local states and tribes” (Retso 2003: 235). Counteracting the problem of administering such broad landscapes with towns or cities spread apart enough to prohibit effective communication and transportation in the mostly desert regions, the Achaemenids set up a “mildly invasive” system of political units called satrapies (Anderson 2005: 20). In the most distant satrapies the administration primarily consisted of local leaders and residents. Although it is worth noting that Egypt was controlled and inhabited more directly by Persian expatriates (2005; Briant 2002). While the political geography of the satrapies may give an impression that entire territories were ruled with fixed boundaries, these boundaries were fluid in many areas and were defined nominally by their previous imperial delineations and less by physical borders (Anderson 2005). The primary focus of authority therefore was centered in urban areas, cities, and settlement nodes.

B. The Nabataeans and Tribal Origins

Bruce Trigger (2003) classified two practical categories of states: city-state and territorial state. Examining the spatially broad political structures of Edom, Qedar, and Nabataea alongside the spatially nodal political structures of Tayma and Dedan demonstrates a clear distinction in the management, and by extension spatial practices between city-states and territorial states. In Nabataean studies, a number of researchers and scholars attempted to classify the type of state that Nabataea was or came to be as an essentialized form (Knauf 1988; 1989; 1992; MacDonald 1991). Knauf (1992) suggested that Nabataean society was structured in a manner that is best described as a "Bedouin state," where the various sub-tribal groups may be characterized and measured chronologically by their use of the camel. This then frames the Nabataeans within a particular "phase" characterized by the competitive advantage as related to the ability to fight from the saddle on a camel. Combining this particularist framework alongside Western notions of
Bedouin tribes as organized militarily and mobilized along economic urban centers, Nabataean state formation resulted from increasing social stratification where a particular tribal group (i.e. the Nabataeans) ascended through accumulation which were validated primarily by tribal religious perspectives. This elite group resulted in a familial royalty from where a king (or leader) arose as the central figure (Alpass 2013).

The origins of the Nabataeans are still debated and little is known about their arrival in the former Edomite territorial, or if it was an “arrival” at all (Healey 2001; Schmid 2001). In a society with little to no written records during their Hellenistic contexts, reconstructing origins has proven difficult, resulting in numerous theories and controversies. For the purposes of this research, placing the multitude of geographic perspectives with regard to Nabataean origins is important since it may yield clues as to the Nabataeans’ perspectives on urbanism and space. Considering that the Nabataeans may or may not have existed in the region of Petra prior to their monumental building programs (~1st c. BCE), the planning of Petra is best understood within these various cultural, historical, and geographic contexts.

Some scholars suggest continuity between the Edomites and the Nabataeans demonstrating material and cultural overlap while others have concluded that their origins may have been in northwest Arabia, south Arabia, northeast Arabia near the Arabian Gulf, or even Mesopotamia (Parr 2003). These are all based on various pieces of evidence, often linked to religious or philological analyses. From what is known, the Nabataeans, by the 4th c. BCE, were present and active as nomadic pastoralists throughout the northwestern portions of Arabia, both the east and west sides of the Wadi Araba, and as far north as the Dead Sea and the Syrian Hawran (2003). However, their settlement in Petra proper arguably occurred later towards the end of the third century BCE, according to recent archaeological evidence (Wenning 1987; 2007). To answer this elusive question, scholars have analyzed from technological, linguistic, and religious grounds.

One of the earliest arguments was from Nelson Gleuck (1965) who argued that Nabataean water management techniques demonstrate a possible origin in the southern-most parts of the Arabian Peninsula. The complexities in technology, engineering, and overall architecture imply that these methods were inherited from well-established urban centers located in southern Arabia (1965). However, Parr (2003) points out that recent archaeological evidence suggests that there were water conservation schemes
similar to Nabataean efforts throughout the northern Arabian Peninsula prior to the Nabataeans like those found in Tayma. These irrigation techniques were likely imported into the region after Nabonidus’s repurposing discussed above. Also, Parr (2003) continues by arguing “neither is there anything in the religion or language of the Nabataeans to suggest direct south Arabian influence; none of the major south Arabian deities are found in the Nabataean pantheon” effectively removing modern-day Yemen origins as a possibility, however influences by way of trade may have been possible.

Still others suggested that philological analysis reveals more clues. Milik (1982) argued for origins in northeastern Arabia on the grounds that an inscription in Palmyra shows a “god of Sabu” termed “the Fortune God of the Nabataeans” relating the Nabataeans to a place called Sa’bu (Parr 2003). David Graf (1990) argued against this by illustrating the weak arguments connecting these two and pointing out that there are too many textual “emendations” to be persuasive (Parr 2003). Interestingly, Graf (1990) continued by arguing that the Nabataean homeland “was in the region of northeastern Arabia adjacent to the Persian Gulf” and that “the Mesopotamian region is where the search for Nabataean origins must begin” since there is at least a “possibility that the Arabic dialect used by the Nabataeans crystallized during the period of imperial Aramaic and in the Syrian-Mesopotamian region.” Graf does not argue against the idea that the Nabataeans were in fact “Arabs,” but instead indicates a migratory presence throughout northeast Arabia and part of the Arab communities of Mesopotamia based on documented dialectical shifts that contributed to the Nabataean language.

Early references to the Nabataeans have often been confused with other similar linguistic names/references. Bartlett (2007) points out that some of these might mention “Nebayoth,” which is found in biblical sources but studies have concluded that these were not the Nabataeans, nor were the *na-ba-a-ti/nbyt* of Mesopotamian/Taymanite sources (Abu Taleb 1984, as cited in Bartlett 2007). Incidentally, Graf aligned himself with the previously discounted perspective that the Nabataean (NBTW) were the same as the Nabaitai of Assyrian chronicles and the Nebayoth of the Old Testament. It seems, however, that a recent article by Bowersock (2003) has not disqualified the Nabaitai from Assyrian chronicles completely stating, “linguistic considerations guarantee that they were not the Nebayoth mentioned in the Bible, although they might conceivably be the Nabaitai of Assyrian chronicles.”
When Herodotus visited Egypt in the mid-fifth century BCE, he reported that he had “been told of the religion of the ‘Arabians,’… Alilat. Likely a Greek rendering of al-Ilal ‘The Goddess’ (Knauf 1989; Parr 2003). This reference with the definitive “al” is indicative of a southern Arabian dialect, shortly after used in Nabataean Arabic script concluding some to claim that these “southern Arabs” were potentially “proto-Nabataeans” (Knauf 1989).

Some still argue that “several [Edomites] stayed in the area… even intermarried” with the Nabataeans posited by scholars demonstrating religious references to the god Qos, an Edomite deity, in the Nabataean pantheon (de Geus 1979, Bartlett 1990; Ball 2000; Taylor 2007). However, Parr (2003) argues that “[Qos] is probably of Arabian origin and his veneration wider than just in Edom.” Researchers have attempted to use Qos as the direct link between the Edomites and the Nabataeans demonstrating little distance between Edomite society and the later Nabataean society (de Geus 1979, Bartlett 1990). Others (Bartlett 1979, 1990) argued that they are remnants and transformations of Edomite society who developed a different political structure. de Geus (1979) continued this argument by demonstrating links between pottery designs in Nabataean societies and their similar counterparts in Edomite pottery discoveries dated to several centuries earlier. Parr (2003) responds to these proposals stating that “Petra would have been devoid of settled communities, although descendants of the Edomites might well have still been pasturing their flocks [after the destruction of Edom]… [but] whether any element of Edomite culture survived strongly enough to have influenced the Nabataean nomads is… extremely doubtful."

Parr continues by discussing how there is no traceable evidence of linguistic similarities in Edomite-Nabataean dialects nor in the “material culture – nothing links them.” With the “material culture,” Parr is referring to the pottery similarities discussed above. These “affinities,” Parr argues, are “completely untenable” in that “Nabataean pottery is exclusively influenced by the Greco-Roman world.” The theory that garners the most support from Nabataean scholars is that the Nabataeans were Arabian merchants who migrated north into the Hijaz region just prior to Alexander’s conquests during the twilight of Persian quasi-control (Bowersock 2003, Parr 2003). Likely drawn to the most common trade town centers like Tayma and Dedan, these Arabian merchants would have "seen... established towns, with
defensive walls, public buildings, monumental sculpture and inscriptions, and (probably) irrigation technology” along with “royal houses and political organization” (Parr 2003). Parr (2003) states that these encounters must “have played a large part in the Nabataeans’ lives.” Arguably, this perspective could be true regardless of the original location of the Nabataeans.

C. Initializing Nabataean Territory & Authority

What is clear is that since at least the Iron Age (Bienkowski 2013), the production of space in the political territories discussed above largely depended upon whether movement and trade was possible within this region. The frontiers of territory shifted radically depending on the cooperation or conflict between domestic and neighboring tribes. Territories across Arabia and the southern Levant were not bounded political units in space, but rather spatial manifestations derived from fluid social relationships that shifted in the wake of cooperation or conflict and was discernible by the accessibility of pathways between nodes (i.e. cities and towns) all within an ever-changing network of socio-economic relations. The ability to control these networks enabled the initialization of elite groups and social stratification due to the concentration of surplus within these nodes.

If it is possible to conclude that, like the Qedarites and the Edomites before them, the Nabataeans emerged from a network-based system of economic exchange that proved successful and necessary within this geographic region, then some attention should be given to how the Nabataeans negotiated the frontiers of this territorial network. These negotiations are difficult to surmise due to the lack of evidence available today. Nevertheless, recounting the rather episodic political narratives that resulted in the social stratification of the Nabataeans, by way of their kings, yields important clues. The geographical movement, or lack thereof, of elite groups between nodes within territorial domains often indicates properties of state-like systems (Trigger 2003) and assessing these may indicate further attributes regarding spatial production.

Spatially, the Nabataeans initially appear in the documentary record in 312 BCE after a demonstration of their defensive capabilities following a confrontation with Antigonus (the One-Eyed), Alexander’s successor (2003, Taylor 2007). According to Diodorus Siculus (via Hieronymus of Cardia – compiled three centuries later), Antigonus aspired to continue his conquests of the Near East, following in
the footsteps of Alexander, by extending his power into “the land of the Arabs who are called Nabataeans” (as cited by Bowersock 1994). Although the various possibilities as to the motivations of such an incursion have been argued elsewhere (Billows 1990), there is general agreement that the Greeks were looking to make considerable economic gains from an assault on the famous wealth of the Nabataeans (Pearson 2011). Arriving while a majority of the Nabataean male population were elsewhere for a “national festival” (Diod. 19.95.1-2), Athenaeus, one of Antigonus’s generals, assailed an unguarded “rock” where the Nabataeans’ most valuable possessions were kept, including a safe haven for their women and children, and seized sizeable amounts of “frankincense, myrrh, and silver” (Bowersock 1994).

For this particular study, what is interesting to note in this portion of Diodorus’ historical narrative is the apparent Nabataean establishment at a “rock” (as cited by Taylor 2007) that is described as “exceptionally strong, though unwalled” (Bowersock 1994) having “only one path to the top, and on this they stored their most valuable possessions” (Taylor 2007). As we will see later in this study, it has been generally assumed that this “special rock” with only “one path to the top” was at Umm al-Biyarah (or ‘mother of cisterns’) (Bowersock 1994, 2003; Parr 2003), which “towers nearly 300 m above” much of the center of Petra (Taylor 2007). However, as Dr Fawzi Zayadine (1999) points out, Hieronymus describes this event as having occurred “300 stades (about 54 km) from the Dead Sea, while Petra is more than 100km from it” (as cited in Taylor 2007). This may indicate that this skirmish occurred not in Petra, but instead in either Khirbet es-Sela or Bosrah in the east Wadi Arabah (Negev 1976; Bartlett 1990; Zayadine 1999; Wenning 2007) or even to the west of Wadi Arabah (Retso 1999). The “special rock” in es-Sela also contains “cisterns, houses and sacred niches of the great god Dushara” (Taylor 2007).

Upon the Greeks’ return home, they paused carelessly to establish a camp after having to move quickly along especially unfamiliar terrain (Taylor 2007). Ultimately, the Nabataeans returned from their assembly to find the aftermath of the raid and immediately began pursuing the Greeks. A surprise attack of an "8000 strong force" (2007; Diod. 19.95.3-5) enabled a decisive victory over Athenaeus’ infantry: “most… they slaughtered where they lay; the rest they slew with their javelins as they work and sprang to arms… all the [4000] foot-soldiers were slain” (as cited in Taylor 2007).
This event sheds light on some little discussed details of Nabataean annual practices. The establishment of an annual “national gathering” where Nabataean tribes were “accustomed to meet, some to sell goods and others to purchase things that are needful to them” (Diod. 19.95.1) demonstrates one of the earliest attempts to organize the multitude of Nabataean tribes within a single geographic location. The reason I can reasonably assume that the majority of the Nabataeans attended this occasion is also based on Diodorus where he claimed both that the “[the Nabataeans] are not much more than ten thousand” (19.94.4) and that there were “no less than eight thousand in number” during the counterassault on Athenaeus (19.95.5). Therefore, the majority of known members of these tribes were apparently in attendance or nearby the national gathering. Also, while the location of this gathering is still unknown, it is clearly near the so-called “rock” considering the ability of the Nabataeans to pursue Athenaeus and his men “at top speed” (19.95.4).

Finally, it is still unclear as to when this gathering took place except to say that Athenaeus was aware of when this occurred deciding to attack after “waiting for this season”(19.95.2). Therefore it is not unreasonable to assume that the Nabataeans were gathering at or near Petra, especially if the ‘rock’ was actually located at Khirbet es-Sela, and that the national gathering was such a commonly known event that attracted geographically distant tribes to a specific location during a specific season. This allows me to conclude that this season was likely a function of a solar and/or lunar calendrical event considering the need for geographically universal measurement.

After the Nabataeans returned, demonstrating literacy to the Greeks, the Nabataeans sent a letter to Antigonus, written in Aramaic, justifying “self-defense.” Antigonus responded by sending his son Demetrius (the “Besieger of Cities”). Demetrius arrived at the “special rock” with a Nabataean stronghold waiting. After a day of attempted siege on the rock, Demetrius withdrew (Bowersock 1994, Taylor 2007). Afterwards, the Nabataeans willingly sent an emissary, possibly one among the eldest (and wisest) to argue for their claims of “self-defense” along with “the most precious of their products” as gifts (as cited in Taylor 2007).

Another aspect worth noting is that in most of these historical descriptions, the Nabataeans are often referred to by Diodorus as “Arabs” and “barbarians.” Most of the accounts demonstrate countless
events of underestimating the Nabataeans via this Othering (see discussion in Anderson 2005). Parr (2003) discusses this stating “It has been argued that it reads in many respects very like the stereotypical portrait of the nomad, sometimes laudatory, sometimes disparaging, often found in ancient literature.” In fact, Plutarch wrote a biographical piece on the Life of Demetrius where he explains that “by his cool and resolute leadership he so overawed the barbarians that he captured from them 700 camels and great quantities of booty and returned in safety” (Taylor 2007). Retso (2003) proposed that the terms "Nabataeans" and "Arabs" were literary devices that were Western indications of social categories where Nabataeans were synonymous with sedentary/peaceful groups in the region and Arabs were military, warlike people. Bosworth (2002) reads Diodorus’s account as “a tension between liberty and empire and between nomadism and civilization” (cited in Pearson 2011). Some scholars still dismiss this idea (Bowersock 2003; Mouton 2006; Pearson 2011).

Still, while the Nabataeans do not appear to conform to a so-called ‘settled’ lifestyle in the late 4th c. BCE, it is clear that socio-economic developments were well underway where the Nabataeans had amassed considerable wealth and a formidable military (Pearson 2011). Regardless of the obvious misrepresentation of the realities of Arab and/or Nabataean society, one can easily conclude that an “othering” of the Nabataeans took place in the ancient literature that was institutional throughout Graeco-Roman sources. Relying on these sources for direct historical information about the social complexities of Nabataean society should remain questionable.

Later references indicate that the Nabataeans maintained a semi-permanent presence in the Syrian Hauran as early as 257 BCE. Through the accounts of Herakleides, found in the Zenon papyri (PSI 406), who documented an exchange between a Nabataean group and two individuals who sold slave-girls as prostitutes (Hackl et al. 2003). Additionally, another reference from the Zenon archive referred to the name "Malichus" who was presumably located in former Moab not far to the south, which was a name known to be used later by some of the kings of the Nabataeans. It not only places the extent of Nabataean trade as far north as the Syrian Hauran but also potentially indicates that these Nabataeans may have been "semi-permanent residents acting in an economic capacity" (Pearson 2011:9).
In recent years additional evidence from the Milan papyrus (epigram AB 10, *P.Mil.Vogl.VIII* 309) references the appearance of a Nabataean ruler or "king of the Arabian (fighting) horsemen" (Graf 2006; Hackl et al. 2003; Pearson 2011) during the early 3rd century BCE. Pearson (2011) points out that the use of the term *basileus* to refer to a Nabataean leader was an echo of Hellenistic monarchs who assumed this title usually following a "kind of major victory or diplomatic achievement" (10). Whether such an achievement may be applied to this Nabataean *basileus* is unclear but what is clear is that this evidence, combined with those from the Zenon archive and yet another inscription recently published from the Damascus museum (Milik 2003; Pearson 2011), demonstrate that the Nabataeans established a functioning kingship by the mid-3rd century BCE. Although lacking the common markers of Hellenistic kingdoms, such as coinage, pottery, and more importantly, permanent structures, the Nabataeans were “recognized as such in the wider Hellenistic sphere” likely “in response to the exigencies of war and trade organization” (2011:11; citing Abduljabbar 1995).

Little is known about the early kings of Nabataea, but what is known comes from external geopolitical relationships and engagements with the Greeks, the Romans, the persistent quarrels with Hasmonean and Herodian dynasties of Judaea, and contestations of tribal territory in the Hijaz (Knauf 1989; Bowersock 1994; 2003; Taylor 2007). History is mostly silent on kingship in Nabataea until the altercations mentioned in the Book of Maccabees in the Old Testament (2 Macc. 5.5-10) referring to a Nabataean (tyrannical) king Aretas, seemingly referenced in the geographic context of the Syrian Hauran where the high-priest Jason sought refuge with a king Aretas after being driven out by Menelaus (Bowersock 1994). This event likely occurred around 168 BCE following the 5th Syrian War (201-195 BCE) where the Seleucids conquered Coele-Syria from the Ptolemies. During this time the Seleucids were entering an expansionist period for both territory and client control, especially over the Jews (Pearson 2011). Eventually this “famously led to the Hasmonaean Revolt under Judas Maccabeus” (2011:12). In the Zeno Archive in Egypt (mid-3rd century BCE) (Bowersock 2003) and in the Book of 2 Maccabees 5.8 (160 BCE) there are references to a king Aretas I “of the Arabians.” This is corroborated by an inscription at Elusa, a trade town in the Negev on the way to Gaza that confirmed a "king of the Nabataeans" named
Aretas (I or II) dated to the mid-2nd century BCE, c. 168 BCE (Negev 1975; Elliott Jr. 1982; Anderson 2005).

The name of Aretas, generally understood to be Aretas I and the initial monarch on scholarly lists of kingships in Nabataea, represents the earliest example for the introduction of royal institutions by the Nabataeans. This appears to be corroborated in an inscription at the site of Elusa in the Negev stating “This is the place which Nuthairu made for the life of Aretas, king of the Nabataeans” (Cantineau 1932:44; cited in Bowersock 1994), dated to the first half of the second century BCE (1994). The identification of a king Aretas at two geographically separate locations indicates the growing influence of a monarch on a sparse, but growing kingdom.

From the Jewish historian Josephus, it is clear that the Maccabees were apparently on good terms with the Nabataeans enough for Aretas to assist their endeavors to attempt to free imprisoned Jews in cities like Bosora, Bosor in Alema, Chasfo, Maked, and Kamain (Josephus, AJ 12.335-6; cited in Pearson 2011). The Nabataeans apparently held enough geopolitical prestige to be sought after for assistance by the Maccabees. Some three years later (160 BCE), as mentioned in 1 Maccabees and corroborated by Josephus, the Maccabees look to the Nabataeans for the safe storage of goods until an “Arab” brigand - the “sons of Amaraios” (Josephus, AJ 13.7-11) ambushes them en route (Bowersock 1994; Taylor 2007; Pearson 2011).

Peason (2011) identifies two significant components of these events: “first, they provide us with further evidence of the continued presence… in the Hawran… and we can also be confident that the Nabataeans… had by no means established any kind of stable political control over [the region] as a whole” (12-13). The existence of the Nabataeans in the Hauran with such geopolitical clout coupled with the reference to Aretas in the distant Negev, especially the placemaking practice at Elusa, suggests the growing importance of a mobile, semi-nomadic king maintaining a wide geographic region. The additional presence of other Arab groups in the Hauran that were displayed in stark contrast by Josephus to the Nabataeans exemplifies the multiplicitous identities of similar tribes still occupying the region. In fact, the “Nabataeans themselves had to cope with the marauders who inhabited the lava plateau of the Leja’ and
the mountainous terrain of the Jebel Druz” (Bowersock 1994:20) and “[i]t also speaks to the fluidity of political control in the region” (Pearson 2011:13).

During the expansionist campaigns of the Hasmonaean king Alexander Jannaeus north into the Golan and along the southern coast of the Mediterranean, the port city of Gaza was attacked which was considered an especially important component of the Petra-Gaza trade route. The residents of the, until this time, independent port city appear to expect Aretas II of the Nabataeans to come to their aid (Josephus AJ 13.360). While Aretas II clearly decided against this idea, leaving the Gazans to fend for themselves, it illustrates the growing tensions between Alexander and the Hasmonaean Jews and the Nabataeans.

Aretas II “must have been an energetic expansionist” (Bowersock 1994:22), being the first Nabataean king to mint autonomous coinage. This minting process follows an increasing trend during the late 2nd century BCE, mirroring similar programs by the Hasmonaeans, which emerges as a direct result of the declining influence of the Seleucids and Ptolemies in the Near East. The bulk of these coins were discovered in the southern portions of Jordan and the Negev and were likely used to finance increasing military operations for the sake of expansion efforts (1994; Pearson 2011).

Following the siege of Gaza, a Nabataean king by the name of Obodas I emerges and continues the expansion programs, focusing on the (re)acquisition of lands in Moab and Galaditis from the Hasmonaean kingdom by way of Judaea around 87-86 BCE with Obodas emerging victorious at a battle in the vicinity of a village called Cana. Shortly afterward, and likely as a direct result of the battle, Obodas I died and Aretas III continued rule and expansion into Syria (Bowersock 1994; Pearson 2011).

Aretas III eventually invades and captures Damascus, supposedly “[i]n response to an appeal from the citizens of damascus, who found themselves threatened by the rugged and predatory Ituraeans of Anti-Lebanon” (Bowersock 1994:25). During this temporary, yet 15 years long stint of Syrian rule, Aretas III minted several coins bearing his image - the first Nabataean to do so - with lettering oriented towards the local Greek/Syrian populations. The bulk of these coins remained within the Syrian north and were meant to...
be a localized currency to reinforce the legitimacy of Nabataean rule in Damascus, leading to Aretas III’s epithet “philhellene”, and demonstrating the perception that Aretas was attempting to fashion himself in line with previous Seleucid rulers (1994). Damascus was used as a “staging ground” to attack Judaea, defeating Alexander near Adida, but withdrew shortly thereafter upon coming to terms with the Hasmonaeans (Pearson 2011; citing Josephus BJ 1.103, AJ 13.392). By 72 BCE, however, the king of Armenia unseats Aretas III from Damascus and by 63 BCE, Syria was captured by and declared a province of Rome.

Early in Aretas III’s rule, Obodas I was deemed significant enough to hold a place among the gods, being included within the Nabataean pantheon and syncretically included in a number of religious references for centuries. Supposedly he was buried in a town that bore his name called Oboda, or modern-day Avdat, located in the Negev. What is important to note is that, under Obodas and extended under Aretas III, placemaking was likely perceived to be a religious act. Writing in about the sixth century CE, Uranios demonstrated that Obodas likely consulted oracles on at least one occasion in the case of the site of Auara (modern Humeima in southern Jordan), which was founded by his son Aretas III:

“For Aretas set out to investigate the oracle, which was ‘to seek a place auara’ - that is ‘white’ in Arabic or Syrian. When Aretas had arrived and was keeping watch, there appeared to him an apparition, a man clothed in white riding a white camel, and when the apparition disappeared, there appeared spontaneously a craggy hill, firmly rooted in the earth. There he founded a town.” (Uranios; quoted in Oleson 1998)

Whether a religious act or not, what is important is that Obodas and Aretas III exemplify the early territorializing and urbanizing of their growing Nabataean kingdom by the beginning of the 1st century BCE. During a “time when the Nabataeans were seeking to define their territory.. a more settled population would have been seen as desirable” (Taylor 2007:48).

The complex relationship between the Nabataeans, the Hasmonaeans, and those in Damascus, and the subsequent rule of the Nabataeans at Damascus, illustrate the various social and environmental contexts within which Petra would emerge as a center of power. The foray into Damascus for 15 years demonstrates the geopolitical and economic awareness of early Nabataean rulers, especially Obodas I and Aretas III and was a primary example of how the powerful frontier nodes of trade networks were constantly
renegotiated by geopolitics. After the removal of Aretas III at Damascus, Petra emerged as an important location pertaining to the internal divisions within Judaea. Following the death of Alexander Jannaeus, his widow Alexandra-Solome briefly takes control of Judaea where her death leads to internal divisions between her sons Hyrcanus II and Aristobulus. When Hyrcanus was defeated at Jericho by his brother, he fled and, under the advice of an Idumaean named Antipater, took refuge at Petra in 67 BCE, still under Aretas III (Bowersock 1994; Pearson 2011). Interestingly, Antipater married a prominent Nabataean woman named Cypros (Taylor 2007) and they held some significance with Aretas III and the Nabataeans. Due to that influence, Aretas decided to lead a large military force against Aristobulus at Jerusalem winning decisively, most likely in exchange for the return of twelve cities still under the control of Judaea that were never returned under Alexander Jannaeus. These cities were Medaba, Naballo, Libias, Tharabasa, Agala, Athone, Zoar, Orone, Marissa, Rudda, Lussa, and Oruba (Josephus AJ 14.18).

From Gaza, Damascus, Jerusalem, and the twelve cities mentioned by Josephus, we begin to form a framework of urbanism that was an important component of what became Nabataean urbanism and the negotiation of nodes required for territorial construction in this region. While prior to the Nabataean presence in Damascus Petra appears to be little more than an afterthought, it is clear that Petra was important enough to become the default location for Nabataean leadership by the end of Aretas III’s reign. During the invasion of Jerusalem, it is at Petra where Antipater hides his “half-Nabataean children… One of these sons was Herod, the future king of Judaea” (Taylor 2007:52). It seems that, regardless of the earlier attempts to reposition the Nabataeans at Damascus, Petra clearly became the defining location of Nabataean authority by 67 BCE (Wenning 2007; 2013).

Just as Aretas III was negotiating the power dynamics of the Nabataeans’ most recent victory in Jerusalem, the forces of Pompey were handling the final remnants of what was Seleucid Syria by way of Armenia. Pompey sent a general named M. Aemilius Scaurus to Damascus who continued on to Judaea having heard of the growing divisions between the Jewish brothers and the latest advances of the Nabataeans. Looking to maintain a “delicate balance of power” (Pearson 2011:22), one that the Romans were capable of controlling, Scaurus sided with Aristobulus and marched against Hyrcanus and Aretas defeating them near Papyron (Josephus AJ 14.33; cited in Pearson 2011). Still, it appears the motives of
Nabataean advancement and Aretas’ strategic economic engagement in Judaea to regain the twelve cities mentioned earlier, was a successful endeavor (2011). This “event also marks the last time the Nabataeans would be able to enjoy this kind of freedom of movement in Syria” due to Roman consolidation (2011:22). Following the annexation of the Syrian province by Pompey in 64 BCE, the former holdings of cities like Moabitis, Ammonitis, and Galaaditis by both the Hasmonaeans and the Nabataeans were “freed from both, and their independence was recognized in an area later known as the Decapolis” (Taylor 2007:53).

The next challenge for Pompey was to decide how to engage relations with the politically divided Judaean kingdom and the recently defeated Nabataean kingdom, both of whom held hostilities towards one another. Annexation was likely too costly and allowing complete independence to both proved problematic as conflicts would likely continue. Pompey began a march towards the Nabataean kingdom to sort out relations with Aretas before deciding how to handle the internal conflicts within the Hasmonaean dynasty and the growing tension among the increasingly vocal Pharisees who sought to remove the Hasmonaeans altogether. During the march towards, presumably, Petra, Pompey received word that Aristobulus led a revolt to secure a stronger position within Judaea. Outraged, Pompey abandoned his plans against the Nabataeans, returned and gained control of Jerusalem, removed Aristobulus, and placed Hyrcanus in a new position of ethnarch, effectively removing any possibility of kingship from Judaea and transforming it into a client-state of Rome. After placing a legate named Piso in Jerusalem, Pompey returned to greater Roman matters elsewhere in 62 BCE leaving the Nabataeans both independent and a kingdom and the Syrian province in the hands of Scaurus (Bowersock 1994; Taylor 2007; Pearson 2011).

By the end of 63 BCE and through most of Aretas III’s reign, it is clear that the Nabataeans established themselves not only as a major political and economic component in Hellenistic geopolitics but also as a shaper of the spatial dynamics necessary in network territorialization. Even prior to the formation of Nabataean monarchy, the Nabataeans were documented at primary nodes throughout trade networks in the Negev, the Transjordan, and Syria operating in tandem with a number of additional “Arab” tribes (Retso 2003). During their politically formative years, their king predominantly mobile and was documented throughout these regions with inscriptions in the Negev and Syria. Nabataean expansionist efforts were even conducted in Damascus for nearly 15 years to fill power vacuums leftover from the failing Seleucid
dynasty and it is there that we see a city playing a crucial, and spatially fixed role in the construction of Nabataean political power in order to legitimize authority over a foreign populace (Pearson 2011). Therefore, by the middle of the first century BCE, with the confiscation of a series of economic nodes throughout the Negev, the Transjordan, and Syria, and the validation of occupation through conflicts and agreements between Judaea and Rome, the stage was set for a centralized regime in Petra that may be spatially ordered to fit a newly emerging polity of Nabataea.

D. The Polity of Nabataea

Whether real or imagined, the role of political authority within the context of the entire polity (or nation in modern terms) is to present a sense of oneness, or spatial collectiveness that lends itself to what Benedict Anderson (1983) aptly described as “imagined communities” in which “commonalities of sentiment and history create attachments to place among a community of subjects” (Smith 2003: 152). Following Pompey’s settlement of Syria in 63 BCE, many designate this juncture as a turning point for Nabataea as becoming a client-state of Rome (Sartre 1979; Braund 1984; Kasher 1988; Bowersock 1994; Hackl et al. 2001; Wenning 2001; see rebuttal in Pearson 2011: 24-41). In recent years, however, some suggest that cooperative independence was more likely. This suggests that the Nabataeans were afforded a certain level of sovereignty, with the exception of Aretas IV’s controversial ascension (discussed below), while geopolitical affairs or conflicts were often mediated through Rome (Pearson 2011). Therefore, it is important to shift attention herein towards the relationship between the Nabataean regime, which recently reoriented itself in Petra following the ousting from Damascus, and its subjects and how this was negotiated through spatial relationships within the polity of Nabataea “that bind political communities in place” (Smith 2003: 152).

When Aretas III took control of Damascus, he issued and minted silver coins in Greek with the epithet ‘philhellene’ (“lover of Greek culture”) as a signal to the locals about the direction of his newly founded, however brief, rule in Syria (Anderson 2005). Following the Pompey’s settlement in 63 and the ascension of Obodas II in 62, who reigned briefly for three years, Nabataean coinage was issued that depicted only Nabataean script on one side and an an eagle on the coin’s reverse which “calls to mind not Rome, but rather the coinage of Ptolemaic Egypt, the last of the Hellenistic kingdoms” (Pearson 2011: 29).
The inscription reads “Obodas, the king, king of the Nabataeans” (Meshorer 1975; quoted in Pearson 2011: 28). A new direction for the monarchy of Nabataea was established and the numismatics were the most commonly used tool to distribute this message to subjects within the polity. The message being “continuing Nabataean independence in the wake of Roman inroads in Syria and Judaea, and their two abandoned attempts on Nabataea itself” (Taylor 2007: 55). Obodas II reigned only three years.

Malichus I ascended to the Nabataean throne within this emerging identity under a barrage of inter-polity conflicts between Judaeae, Nabataean, and tribal politics and imperialist efforts between Roman and Ptolemaic Egypt under Cleopatra VII. As with the numismatics, where only a single silver issue minting was discovered in the twenty-sixth year of his reign in 35 BCE (Kropp 2013), the conflicts allowed for little in the way of political investment in the physical landscape under Malichus I. In 55 BCE Gabinius, the successor to the Syrian Roman governor Scaurus, led a successful expedition against Malichus and the Nabataeans. These events were followed by the Roman civil wars between Pompey and Julius Caesar in 49 BCE. Followed by continued conflict between Cassius and Brutus against Mark Antony and Octavian (ie. Augustus) with Augustus claiming victory at the Battle of Actium in 31 BCE. Throughout the Near East, the Nabataeans and Judaeans were preoccupied with determining geopolitical ties between Octavian and the more famous Mark Antony, and by extension Cleopatra VII in Egypt, or Cassius and Brutus (Taylor 2007).

Additionally, Cleopatra had territorial aspirations in the eastern Mediterranean in both Judaea and Nabataea, often using Antony’s authority over Judaea’s client-state relationships with Rome to increase tensions between Judaea and Nabataea (Josephus, AJ 15.92; Pearson 2011). Conflicts took place at the city of Dium, called Diospolis by Josephus, with Herod claiming victory, followed by another at Canatha (Qanawat) with a Nabataean victory. It appears that these military oscillations were part of Cleopatra’s territorial aspirations to weaken both states in order to acquire them in future campaigns. While the Judaeans were primarily acting as client-states of Rome and responding to potential outcomes, the Nabataeans appear to be balancing future geopolitical partnerships as an independent state rather than a client-state (Pearson 2011). This is important in that it later influences how both near eastern states align
their monumental building programs within the rhetoric of geopolitical production (ie. Herodian-Roman) or inter-polity and inner-polity production (ie. Nabataean-Herodian-Arabian/Nabataean).

Malichus’ authority appears to be established primarily through geopolitical and military engagements with Cleopatra and Marc Antony, the various quarrels and occasional brutal victories (especially near Philadelphia in 31 BCE) against Herod, and shortly thereafter with Emperor Augustus (formerly Octavian). In Malichus’ final act in the geopolitical realm, immediately following the battle of Actium, he set ablaze Cleopatra’s fleet near the Suez. Pearson (2011) views this as “an opportunity for the Nabataean king to advertise his power to his own people” (34). A “weapon frieze” found at Petra may allude to this event in Nabataean historical memory (2011: 34 fn. 162; Schmid 2009; Lyttleton & Blagg 1990; Malichus I died within the same year and following Cleopatra’s and Antony’s infamous suicide in 30 BCE, Augustus annexed the new province of Roman Egypt and Herod was confirmed as a client-king of Judaea including Samaria and the cities of the Decapolis (Bowersock 1994; Taylor 2007). Malichus I was less concerned about the production of polity cohesiveness as much as the validation of the territories as they existed during the time of Aretas III. The polity, as far as the territoriality and the negotiations of frontier networks were concerned, were well established. Malichus was primarily focused on legitimizing this control in geopolitical terms. His successor Obodas III, however, shifted his focus inward towards polity cohesiveness.

Following the death of Malichus was the reign of Obodas III (30-39 BCE) who “did not care much about public affairs, and particularly military affairs (this is a trait common to all the Arabian kings)” (Strabo Geog. 16.4.24). Many of the narratives surrounding Obodas refer to his possible posthumous deification (see Cantineau 1932; Negev 1981; Bowersock 1994; 2003; Healey 2001), the steady flourishing of Nabataean-Roman trade following the pseudo-successful Nabataean-guided expedition of Aelius Gallus throughout Arabia Felix (Strabo Geog. 16.4.23-24, 780-82; Healey, Schmitt-Korte, & Wenning 1997; Bowersock 1994; Taylor 2007; Pearson 2011; Kropp 2013), and his controversial death and successor as told by Josephus (Antiq. 16.293-299, 355-350) regarding Syllaios and who later came to be known as Aretas IV. Less attention was given to his construction projects, especially the “several substantial temples throughout Nabataea” (Anderson 2005: 155). It was under his reign that the Qasr al Bint (aka Qasr Bint
Far’un) was constructed in Petra and possibly a temple at Oboda (Negev 1997) in the Negev, and the temple to Baalshamin at Seeia. All of which were “likely indicative of a policy in which the important trade routes to Gaza and Egypt were afforded greater security” (Anderson 2005: 155). It would appear, at least by the time of Obodas III, the nodes of networks, especially throughout the Negev region, were secured primarily through the production of religious spaces and identity construction stemming from the primary node of Petra.

Allegedly in the later years of Obodas’ reign (12-6 BCE), his administrator Syllaios was likely in charge according to both Strabo and Josephus. His initial entrance into Roman geopolitical theater began when he acted as guide for the military expedition of Arabia Felix by Aelius Gallus, the Roman prefect of Egypt, in c. 25 BCE. For the purposes of this study, the geographical implications of this expedition are important. In the early imperial Roman era, The expedition was meant as both an exploration of the Arabian peninsula and to locate the source of the aromatics trade routes originating from southern Arabia (Bowersock 1994; Graf & Sidebotham 2003; Taylor 2007). The expedition set out from the Nabataean port town of Leuke Kome (Strabo’s “Leuce Come”), whose location “is still a matter of debate, the most likely candidate for the site appears to be the region of Kuraybah-’Aynunah on the northwest coast of Saudi Arabia… near the Straits of Tiran” (Graf & Sidebotham 2003: 67) through Hegra (modern-day Mada’in Saleh) to Arabia Felix. Gallus, under the “treacherous” direction of Syllaios (Strabo 16.4.24), took six months razing numerous towns and cities, many with established kings, along the way (Strabo Geog 16.4.24) such as: Ararene, Najran (kingdom of Ma’an), Asca/Nesca, Nestus, Athrula (modern Baraqish), Magusus, Caminacus, Labaetia, and Caripeta (Pliny NH 6.32.160). Finally the Roman expedition laid siege to Marsiaba (modern-day Marib in Saudi Arabia), the capital of the Sabaeann kingdom, but after six days and “for want of water desisted” (Strabo Geog 16.4.24). Interestingly, a river was, and is still, located with a dam on the opposite side of the city (Taylor 2007). It took the Romans only two months to return to the Nabataean frontier town of Hegra.

Here we see a glimpse into the territorial practices of Nabataeans throughout the Arabian peninsula with regard to trade and inter-polity relations. While many source viewed this as a failed expedition on the part of the Romans, neither Augustus nor Rome officially portray it as such. For the Nabataeans, the
situation appears to end favorably considering that most of the land routes connecting Nabataea to Arabia Felix were profitable already by 25 BCE and the expedition increased their security (Pearson 2011) especially if we consider that by the middle of the first century AD, the majority of these routes shifted to sea routes along the Red Sea connecting at ports such as Leuke Kome which greatly reduced the geographic costs associated with the harsh overland routes (Graf & Sidebothom 2003: 67). I propose that this was a prelude to the shift towards greater maritime trade, which post-dates a rather dramatic demonstration of maritime force by the Nabataeans on Cleopatra’s fleet mentioned earlier. It is also after this time, when the many competing polities of southwestern Arabia were razed, that Nabataea begins its steady increase in wealth and stronger investments in architecture.

During the reign of Obodas III, Petra came to be considered along a completely new form of discourse among outsiders, especially Strabo who referred to the city as the “metropolis of the Nabataeans”. Strabo appears to view the Nabataeans as “sensible people” and “exceedingly well governed” who were living in a cosmopolitan city where “many Romans and many other foreigners sojourning there” (Geog. 16.4.21). Monumental tombs, such as the so-called Obelisk Tomb were likely hewn near or within Petra during the early first century BCE (Wenning 2013). Outside of these few rare monumental pieces of public architecture, one of the earliest forms of monumental construction within Petra was the Qasr al-Bint. In its current form, construction likely began during the reign of Obodas III (Lyttleton 1974; McKenzie 1990; Larche & Zayadine 2003), likely replacing a previous version of the sanctuary (Taylor 2007). Still standing today at 23 meters, this freestanding structure was likely the “principal sanctuary” for Petra and was used as the model for many of the sanctuaries throughout the Nabataean polity (Kropp 2013: 281). Geopolitically, the sanctuary borrows from Hellenistic styles (McKenzie 1990) and the so-called ‘Parthian palace’ at Assur (Kropp 2013). Within Nabataea, the Vitruvian architectural principles outlined by Vitruvius in De Architectura during the building programs of the Roman Augustan period (c. 27 BCE - 14 CE), was ubiquitous throughout the Hauran at sites such as Seeia, Dibon, and Khirbet el-Dharih (Segal 2013). As a new wave of wealth was entering kingdom, so too was a new direction for the polity of Nabataea heading towards a monumentality that favored the ubiquity of institutions centered at Petra. Social institutions, new and old alike, materialized in the physical landscape throughout the polity.
Following the Battle of Actium in 31 BCE, much of the land in the Hauran (including Seeia) in southern Syria was handed over to Zenodorus, whose father held control of the land area until Antony took the land as a gift to Cleopatra. The Nabataeans, under Obodas III, then purchased control of the land from Zenodorus (Bowersock 1994: 50). After Zenodorus’ death in 20 BCE Herod, the then client-king of Judaea, “appreciated the importance of this territory for the security of the northeast corner of Judaea” and petitioned Augustus to gift him with the “whole of the Golan” that included the Jabal al-Druze (1994:50; Millar 1993; Josephus AJ 15.360). A large swath of Nabataean territory was lost to Judaea by Roman decree. Obodas, presumably Syllaios responded by encouraging the tribes that lived within the Trachonitis (the Leja) to rebel against their landlords in 12 BCE while Herod was away (Bowersock 1994; Millar 1993). When the rebellion was quelled many of the tribal elite found refuge in Nabataea and set up camp from which to continue attacks against the Judaean polity and some of the cities in the administratively mysterious Decapolis which tentatively encompassed cities like Scythopolis, Pella, Abila, Dium, Adraa, Gerasa, and Philadelphia and was surrounded by both kingdoms (Millar 1993). Herod petitioned the Roman governor C. Sentius Saturninus for assistance in 9 BCE to enter Nabataea and attack the camp. During this proxy conflict between Nabataean forces and Jews, Syllaios was en route to Rome to speak with Augustus and accuse Herod of killing over 2500 Nabataeans without the approval of Rome (Bowersock 1994; Taylor 2007). Along the way, Syllaios stopped at Miletus and Delos and dedicated an inscriptions to Dushara, both in Nabataean and in Greek, invoking the Nabataean god Dushara’s protection “for the life of Obodas” (Bowersock 1994; Cantineau 1932: 122).

To complicate the situation, Obodas III dies and according to Josephus an enigmatic ‘Aeneas’ ascends to the throne in Petra who later changed his name to Aretas (AJ 16.294). In an epistle sent to Augustus, Aretas claimed that Syllaios was a usurper who had i) killed Obodas, ii) controlled Obodas while he was alive, iii) committed adultery with Arabian wives, and iv) and bought and bribed his way into power so as to purchase the kingship of Nabataea (Josephus AJ. 16.296; see discussion in Anderson 2005: 158-165). While still in doubt, Augustus received testimony from the Herodian advocate Nicolaus of Damascus, who “was ultimately responsible for Augustus’ decision to confirm Aretas on his throne” (Bowersock 1994: 52). Syllaios returned to the kingdom and appears to carry out a series of political
assassinations, one of which was targeting Herod (Josephus AJ 17.3.1-3). Ultimately as Strabo explained he was returned to Rome where he was judged and beheaded (Geog. 16.4.24).

There are many discussions as to why the name ‘Aeneas’ would appear at all in Nabataean contexts, especially with regard to royalty as is it “certainly not a dynastic name among the Nabataeans” (52). The name itself held powerful meaning to Augustus and Roman mythology as it alludes to the mythological founding and divine legitimizing of the Rome. It could also be a literary embellishment on the part of Josephus (Anderson 2005). Regardless, after ascension the name is clearly changed to Aretas and takes his place in the line of kings as Aretas IV. It is still unclear as to whether Aretas was the son of Obodas III, which seems unlikely given the controversy surrounding his ascension in the first place. Bowersock (1994) suggests that he might be a blood relative of the former King Malichus I.

According to Strabo, there was at least a brief period where Nabataea was a dependent kingdom of Rome where he states that those “who dwell in Arabia Felix are the Nabataeans and the Sabaeans. They overran Syria before they became subject to the Romans; but at present both they and the Syrians are subject to the Romans” (Geog. 4.16.21). It is unclear whether the Nabataean Kingdom entered a brief client-kingdom relationship with Rome or whether their independence was established from the beginning of Aretas’ reign. As Bowersock points out, there were others cases in which a client state relationship was established for only a brief period before being granted independence, such as the case of the Commagene (1994). Additionally there appears a brief gap (c. 3-1 BCE) in the coinage of Aretas who is lauded for issuing greater than 80% of all coinage minted by the Nabataeans (Meshorer 1975: 41; Bowersock 1994; Taylor 2007). This also coincides with two potentially related events: i) the death of Herod in 4 BCE and ii) a popular revolt in Judaea that followed Herod’s death that was quelled by the Romans with the aide of Nabataean reinforcements (Bowersock 1994). Afterwards, for reasons still unclear, Augustus appears to recognize the independence of Nabataea and the rightful rule of Aretas IV. This is potentially corroborated by a dedication to a Nabataean king, arguably Aretas, in an inscription found on the Capitoline in Rome (Taylor 2007).

By this time, the geographic boundaries of the polity of Nabataea were primarily defined as relational to formal Herodian territories, the Roman province of Syria, and the oases in the northern Arabian
peninsula, and beginning with Obodas III these boundaries were often defined by Roman decree. Apparently there was even a consideration by Augustus to award Herod with the whole of Nabataea (Bowersock 1994). Following the loss of the Hauran to Herod, the Nabataean polity stretched as far north as Bostra while the Herodian kingdom “covered Idumaeia, Judaea, Samaria, Galilee, … Batanea, Auranitis and Trachonitis, as well as a stretch of territory on the east of the Jordan and the Dead Sea” and shortly after included Peraea (Millar 1993: 38). The boundedness of territories was inherently tied to the legitimizing decisions of Roman administrators and the cooperation of neighboring polities. The challenge for the political regime of Nabataea was to legitimize the rapidly changing territorialization within the framework of their newly emerging surplus-driven identity. The minting of coinage was a common methodology, but so too was the manifestation of public architectural programs that were ubiquitous representations of a formal political apparatus initially centered upon the Qasr al-Bint, under Obodas III, and continued to solidify into a spatially centered regime at Petra under Aretas IV. Aretas IV is arguably the most influential person in Nabataean history and the majority of the more complex, monumental structures, tombs, facades, and urban spaces were either initialized or completed under his reign (9 BCE - 40 CE). While his reign did not establish the settled, centralized regime at Petra, which was likely underway in the latter years of Obodas (see discussion above), he certainly defined, refined, and epitomized it both socially and spatially over the course of his reign.

Following Herod’s death in 4 BCE, there was confusion over his wills leading to his sons which set “Archelaus as king [of Judaea], and Herod Antipas and Philip as tetrarchs” (Millar 1993: 41). Antipas inherited Galilee and Peraea, and Philip the Gaulanitis, Trachonitis, Batanea, and the city of Paneas (1993). Almost immediately a revolt occurred to which Archelaus responded with force just prior to make a case before Augustus to argue his claims; Antipas followed shortly thereafter (1993; Pearson 2011). Aretas IV sent both cavalry and infantry to support the legate of Syria, Quinctilius Varus, who responded to Archelaus’ plea for assistance (Millar 1993). Josephus explained that the Nabataeans met Varus at Arous and marched with the legate to Sampho during which time they “plundered,” “burnt,” and “slaughtered” all in their path until finally burning the town of Emmaus under direct order by Varus, supposedly acting out of “hatred for Herod and his friends” (Josephus AJ 17.290). Pearson (2011) argues that this likely took place
“after the campaigns against Arous and Sampho” (citing Josephus BJ 2.76) and that the “Nabataeans were at this point acting at least semi-autonomously, and probably unsupervised” (44). Just as the Nabataeans did with Aelius Gallus throughout the Arabian peninsula, Aretas used the guise of Roman intervention in Judaea as means to continue to destabilize the neighboring polity, which is contrary to Millar’s (1993) claim that the Nabataeans were a dependent kingdom assisting the Romans.

Throughout the polity of Nabataea, Aretas further initialized territoriality by rapidly increasing urbanization efforts throughout numerous important nodes in the Negev such as Oboda, Mapsis, Nessana, Elusa, and Sobata; in the Syrian Auranitis at Bostra which became both an important trade link between the kingdom and Damascus and also later became the capital of the Roman province following the annexation of Nabataea (Arabia Petraea); and in the Hijaz and Hegra including the issuing of a special coin commemorating the frontier city (Bowersock 1994; Meshorer 1975: 53-4). Most of the water management systems that the Nabataeans - now famous for in Petra and throughout the Negev - were likely constructed during this time (1993; Ortloff 2005). Additionally, while Philip was granted the Trachonitis, it is possible that Aretas IV kept a careful watch over the previously held territories, especially nodes with Nabataean traditions such as Sweida, Kanawat, and Seeia in the Hauran (Bowersock 1994). At Seeia, there are inscriptions that denote the initial construction of the temple of Dushara in year 33 BCE, clearly a Nabataean deity. While under Jewish control, three inscriptions were dated to the time under Herod (c. 23 BCE) in the temple of Baal Shamin, Philip (c. 29 CE) in the temple of Dushara, and King Agrippa is mentioned explicitly in another (c. 41-44 CE). What is important is that all of these inscriptions were written in Nabataean script and only one later inscription (c. 53-93 CE) was written in Greek (Segal 2013). Seeia is an example as to how the geographic territories of the Near East, regardless of how discretely defined they may be by Roman decree, are not coterminous with the cultural realities in situ.
An example of this territorial problem emerged succinctly during hostilities between the Nabataeans and the Jews in c. 34 CE. From the Nabataea perspective, inter-polity politics between Nabataea and Judaea continued at a steady and generally stable pace once the uprising was quelled in Judaea in 4 BCE, in part due to the fact that Herod Antipas was married to Aretas IV’s daughter Phasaelis (Kokkinos 1998). This marriage lasted until 27 CE when Antipas divorced Phasaelis in favor of his half-brother’s daughter Herodias and with Herod’s permission, Phasaelis fled to the fortress of Machaerus just east of the Dead Sea near the Nabataean city of Madaba (Josephus AJ 18.109-122). It is difficult to say if the events are connected, but supposedly about seven years later Aretas took punitive action against
Herod Antipas and invaded the Syrian territories (Bowersock 1994). It is more likely that the event with Phasaelis was merely implemented as internal pretext for conflict as the timing coincides with the death of Philip (Pearson 2011). Millar (1993) suggests that this period (c. 33/34 BCE) was a complex and dynamic time of border disputes between the two polities that finally “resulted in a regular war” (54). Much of the conflict focused on the Syrian territories and Aretas was successful in regaining control. The Roman legate of Syria, Lucius Vitellius who was at the time stationed in Antioch, was ordered by Tiberius, the emperor of Rome, to amass troops to invade Nabataea. Setting out from the Mediterranean coast at Ptolemais the legion stopped briefly at Jerusalem for a Jewish religious festival, possibly Passover (Millar 1993). Tiberius fortuitously dies and the proposed campaign was dropped altogether (1993).

This illustrates both the fragility of Roman control of the southern kingdoms of the Near East, especially Nabataea, during the time of Aretas IV (Millar 1993), as well as the continued territorial aspirations of the Nabataean regime well into the first century CE. It is worth noting that there is a strong possibility that Aretas’ invasion made it as far as Damascus, and perhaps was the primary goal following in the footsteps of his namesake (i.e. Aretas III) (Bowersock 1994). Confirmation of this possibility, however, relies on a single source in the Biblical New Testament relating to the story of Paul who was lowered down in a basket over the walls of Damascus. An unknown, and much debated ethnarch (Starcky 1964; Knauf 1983; Bowersock 1994; Taylor 1992; Millar 1993; Kennedy 1996) was apparently keeping watch over the city in the name of King Aretas (2 Cor. 11.32-3; Acts 9.23-5). Regardless, for the purposes of this review it should be clear that the geographical imaginations of Nabataean authority lend themselves well to such a view that Damascus was a primary motivator.

The coinage during the reign of Aretas IV also signaled shifts in the perception of the polity and the identity of the Nabataeans as rendered by the regime. Since Aretas III’s foray into Damascus and the few issues of coins depicting his image with the epithet philhelle, the images of kings consistently showed him wearing the diadem, a headband that symbolized a sovereign authority. This was an Hellenistic import beginning with the brief Nabataean occupation of the Greek city of Damascus. Obodas III was the first to begin the adoption of the laurel wreath during the last five years of his reign, but still the diadem was used alternatively until during Aretas IV the wreath emerged as the standard. Some scholars note this to be an
acceptance of Roman influences and dominance (Kropp 2013; citing Wenning 1993; Hackl et al. 2003; Schwentzel 2005). Kropp (2013) argued that the diadem was still used, but was maintained underneath the laurel wreath in Aretas IV, Malichus II, and Rabbel II and in fact shows “three distinct bands” in a “rather unexpected” style “only seen on Parthian kings and dynasts, starting with Mithridates III (57-54 BC)” (67). Additionally, in the early issues of Aretas he was commonly featured with a military appearance similar to Hellenistic kings (2013; citing Schwentzel 2005; Laube 2006), while in later issues including those of subsequent Nabataean rulers, the king was depicted wearing “Parthian royal costume” (67). Pearson (2011) adds that the regular use of the epithet for Aretas IV, ‘lover of his people,’ while possibly attributed to Hellenistic titles (Meshorer 1975), might also have been common among Parthian royalty (46; citing Morkholm et al. 1991: 31). This is indicative of a changing perception that shifts the geographic imagination of the Nabataeans away from the historically rooted Alexandrian-Hellenistic- Western focus and more towards the Achaemenid-Parthian-Eastern region. Little is known about the Parthian Empire, or more would be discussed in detail here (Goldschmidt & Davidson 2012), but Anderson (2002; 2005) provides compelling comparative analysis that links architectural styles between Hegra and Achaemenid Persia (i.e. Parthia).

In 40 CE Aretas IV died and was succeeded by Malichus II (40-70 CE). For much of Malichus’ reign little documentation exists until tensions increased within Judaea that resulted in the Jewish War (66-74 CE) during which time in 70 CE the Temple of Jerusalem was destroyed (Taylor 2007). In the early days of the revolt in Judaea it is worth mentioning that the new Jewish leadership began minting coins emphasizing their independence from Rome, including the depiction of the temple cult on silver coinage pulled from the resources of the temple itself (Deutsch 2012). Malichus was among the four kings listed by Josephus who sent military support on the side of the Romans during the conflict, specifically 1000 cavalry and 5000 infantry (BJ 3.68; Millar 1993: 72). It is still unclear as to why the Nabataeans participated in the conflict as it is generally agreed the kingdom was not a client state of Rome at this time (Bowersock 1994; Taylor 2007). Pearson (2011) argues that the failure of quelling the revolt in Judaea on the part of the Romans would result in instability in the region, especially with regard to trade, which was a highly motivating factor on the part of the Nabataeans (67).
Leading up to the Jewish War, this period of Nabataean history is often cited as one of decline, initially due to the reduction of silver content in the coinage issued during this period and finally the complete absence of issues in his final years 64-70 CE (Bowersock 1994; Meshorer 1975). Another reason has to do with the epithet applied to his successor and officially the last king of the Nabataeans, Rabbel II (r. 70-106 CE), which stated “he who has brought life and deliverance to his people” and is found in many inscriptions (Bowersock 1994: 72; Hackl et al. 2003: 402-4), which of course implies a time of stress for the kingdom. Additional arguments were proposed that suggested the shift towards maritime trade routes that took advantage of the then recently discovered Indian monsoon winds which led to a steady decline in both the use of overland routes (discussed earlier) and the port of Leuke Kome, favoring instead the ports on the western side of the Red Sea (Bowersock 1994). And yet the reduction of silver content in minted coins was initiated under Obodas III and was in decline already by the time of Malichus II (Schmitt-Korte & Price 1994), there is “no reason to think that... the cessation of the coinage in the last years implies a singular weakening of his rule” (Bowersock 1994: 72), and the epithets of previous Nabataean kings were never implemented as pejorative statements about predecessors as discussed earlier (more on the epithet below). Finally, Wenning (2007) argues for the continued economic success of Leuke Kome (and by extension Hegra/Petra) by citing a passage from the *Periplus de Mari Erythraeo*, which identified “Leuke Kome, through which the land route passes going to Petra and to Malichus” and further referenced the taxes levied on goods moving through the port (quoted in Pearson 2011: 70-1); the *Periplus* was analyzed quite convincingly by Bukharin (2012) to identify the modern location of Leuke Kome as al-Wajh, Saudi Arabia.

With Rabbel II (r. 70-106 CE) there appears to be a brief and somewhat modified resurgence of Nabataean material production, such as the ad-Deir, the second largest rock-cut facade, which was supposedly built in Petra during his reign (Schmid 2001). It is generally accepted that the capital of the Nabataeans shifted from Petra to Bostra in the Syrian Hauran during the reign of Rabbel II (Milik 1958; Starcky 1965; Hammond 1972; Bowersock 1994; Millar 1993). This is primarily based upon a clustering of inscriptions that mentions Rabbel throughout the Hauran and an inscription at Bostra specifically dedicated to “Dushara, god of Rabbel our lord, who is at Bostra” (Millar 1993: 408; quoting Milik 1958: 227). One
argument in favor of the shift to Bostra is that the Nabataeans were increasing their sedentary way of life and by extension required a more favorable environment for surplus based agricultural production. Khouki (2013) pointed out that, according to the archaeological evidence the majority of hinterland agricultural activities surrounding Petra were primarily for local subsistence purposes rather than a surplus driven system that fed into the urbanization program of Petra (see extended discussion below). Another argument typically centers around the shift in trade routes, similar to the arguments and counter-arguments discussed about Malichus II above, where Bostra was located nearer to trade routes that were located along the Wadi Sirhan and the increasingly economically powerful city of Palmyra (Millar 1993). Regardless, what is clear from the archaeological evidence is that considerable spatial investment occurred at Bostra in the late first century (Ball 2000). Given the associated advantages for trade, both with its accessibility to the Wadi Sirhan and northern trade cities like Palmyra, and its proximity to previously established Nabataean sites throughout the Trachonitis like Seeia, Bostra was certainly a worthy investment during this time.

In 106 CE, the Roman Empire, under Trajan annexed the kingdom of Nabataea, including portions of the Arabian peninsula outside the Nabataean territorial domain, establishing the Roman province of Arabia Felix (Bowersock 1994). It is still unclear as to whether Rabbel II was aware of the annexation years prior to the establishment of the province, hence justifying the supposed shift to Bostra, or whether Rabbel acquiesced a mostly peaceful transition under Roman authority. There are indications that some of the urban centers throughout the region required more direct (ie. aggressive) means of control on the part of the Romans (Schmid 1997), but there are no signs of this at Petra nor at Bostra. There are also indications that a brief Nabataean monarchy continued at Hegra as an enigmatic inscription dated to just after annexation refers to a king Malichus III (Edie 1985; Hackl et al. 2003), but there are disagreements about the dating (Bowersock 1994; Wenning 2001; see discussion in Pearson 2011:81). The Romans began construction of the *Via Nova Traiana* almost immediately that connected trade from Bostra in the north to Aila (modern Aqaba) on the Red Sea coast via Philadelphia (modern Amman) and Petra, all completed by 114 CE (Graf 1996).
E. **Regime, Urbanization, and the City of Petra**

It appears that throughout urban history elite groups exploited the formalized spaces and aesthetics of towns and cities in efforts to facilitate subtle or overt changes in the power dynamics in the daily lives of subjects in order to enable the reproduction of their status (Trigger 2003; Smith 2003). In every early civilization not only were there urban environments, but these built environments “impressed visitors by their scale, richness, and architectural magnificence and the grandeur of what went on in them” (Trigger 2003: 121). Their primary objective was to emphasize “the insignificance of the ordinary person, the power and legitimacy of the ruler, and the concentration of supernatural power” (2003: 121; citing Rapoport 1993). This “relationship between political leadership and urban built environments has also been noted in the pre-Columbian Andes, where capital cities - such as those at Cuzco, Tiwanaku, and Chan Chan… - served as seats of royal lineages and centers for cults of dead rulers” (Smith 2003: 186). What follows is a discussion of the development of the Nabataean regime and the relationship between Nabataean political authority and urbanism. The term ‘regime’ is applied here in the same sense as “the spaces defined by political and social elites with a direct interest in reproduction of structures of authority in concert with broader coalitions supporting authoritative rulers” (2003: 27). Within a built environment, such as Petra, this may include the “horizontal circuits of prestige, influence, and resources among elites” or the “vertical ties (kin, ethnic, religious) that extend down to grassroots levels” (27).

The most common source material in urban studies for pre-historical societies is public architecture (or public art) (Moore 1996). This is because public architecture is often constructed out of materials that is meant to provide an impression of a legacy that is as permanent as the status of the elite (1995). In societies where textual sources are severely limited, such as the case in Nabataea (Kropp 2013), public architecture is a key data source. It is also worth noting that this is not exclusive to monumental architecture, but certainly includes those forms as well. The body of this work would not be possible without the century-long foundational research on architecture and society in Nabataea beginning with the comprehensive surveys of monuments and sites by Brunnow and Domaszewski (1904) and Gustaf Dalman (1908; 1912) and the excavations that started in 1929 by George Horsfield (1938; 1939; 1942) and later by Nelson Gleuck (1937; 1938; 1939; 1965).
In recent years, the majority of studies about Nabataean political authority and the city of Petra are often wrapped in broad political, economical, and historical narratives (Bowersock 1994; 2003; Millar 1993; Graf 2003; Parr 2003; Taylor 2007; Wenning 2013; Graf 2013). Others attempted methods more akin to an art historical approach (McKenzie 1990; 2001; Nehmé 1997; 1998; 2003; Healey 1993; 2001; Kolb 2003; 2007; Parr 2007) where the art, architecture, structures, epigraphy, and numismatics of Petra are catalogued in favor of searching for similarities and groups (Nehmé 2013), influences (Schmid 2001; 2007), syncretisms (Healey 2001), aesthetics, or typologies and chronologies (Wadeson 2010; 2011). Additional studies worth noting examined Nabataean water management engineering and hydraulic techniques (Bellwald et al. 2003; Ortloff 2005; Oleson 2007).

While these studies have their advantages, it is important to note that when these narratives and approaches overlap it is possible to harness a more holistic perspective of the Nabataean regime through the nexus of urban and political life. Recounting each of the studies mentioned above in full is beyond the scope of this review. Instead, if “spatial practices of urbanism and political practices of authority are not separable” (Smith 2003: 199), then it is more beneficial to examine the political dimensions of Petra’s built environment as it is related to the power dynamics of the Nabataean regime that emerged out of social stratification during the third and second centuries BCE (as discussed earlier), becoming institutionalized by the second century BCE until finally becoming formally grounded in place at Petra by the first century BCE.

The reason for Petra’s establishment at its particular location is debated. The location of Petra, as was discussed in the Geographies of Petra section above, lies just below the limestone plateau providing more fertile lands than those in the Hijaz. This may have encouraged agriculture which may also explain the rise of Nabataean settlement in farming towns and communities throughout the Wadi Araba and the Negev to the west. As Parr (2003) points out, that since they were “no longer dependent upon the incense trade or the products of pastoralism; economically they had moved away from their Arabian background and become Levantine.”

It is clear from archaeological evidence that by the 4th c. BCE, some sort of settlement existed. Although this does not imply anything in a proper urban context, the settled nature of early Nabataean Petra
likely included tents and gatherings for “annual assemblies” and for “thwarting enemies” (Diodorus 19.96-8, as cited in Bowersock 2003). The impetus for an urbanized Petra has been argued by Parr (2003) and others. Diodorus described the Nabataeans as having a negative attitude towards sedentary lifestyles, but something encouraged a shift to a more urbanized way of life, and as I discussed earlier, perspectives of civilization was likely a reference to what Western writers constituted as civilized (i.e. Greek civilization) (Retso 2003). The discussion above of a so-called ‘rock’ by Diodorus indicates at the very least that by 312 BCE a centralized location of storage was already established for the protection of surplus, whether in Petra or elsewhere. As threats continued from two fronts, the Seleucids to the north and the growing competition with Ptolemaic Egypt to the south and west, the Nabataeans began establishing a new secure home east of the Wadi Araba (Taylor 2007). What is clear is that by the late 4th century BCE, "a rather unusual civilization" developed (Pearson 2011:8) that displayed the need for persistent mobility and nomadic lifestyles on the one hand while establishing "a sophisticated trade network" and "a formidable military capacity" on the other (2011). The presence of considerable wealth, in the form of 500 silver talents, indicates their centrality in the trade of frankincense and myrrh spanning from the Minaean kingdom in southern Arabia to the Mediterranean (Graf 1983; Graf & Sidebotham 2003) and their "considerable economic success, even at this relatively early stage" (Pearson 2011:8-9).

The first mention of Petra in the documentary record is found in an inscription from Priene in Asia Minor, where Moschion, a diplomat, was described as having visited both Alexandria and Petra on a diplomatic mission (Wenning 1987, Hackl et al. 2003, Schmid 2008). This possible event is reinforced by the writing of Agatharchides of Knidos writing in Alexandria in the mid-2nd century identifying the major trade route running through Petra (Pearson 2011). Additionally, the Nabataean name for Petra - Rekem - is mentioned as far away as Han China where a report by Chang Ch’ien, writing after his visit to Bactria and the Hellenistic world, identified a Li-Kan which has been concluded by scholars to refer to Rekem (Graf 1996, Graf and Sidebotham 2003, Pearson 2011).

The earliest evidence for a settlement of any kind in Petra within Nabataean contexts typically demonstrate domestic activities, limited and clustered to small embankments around the Wadi Musa, which later became the most sacral space of the Nabataeans including the temenos and the Qasr al-Bint
(Graf 2007; Mouton & Kropp 2008; Parr 2007). Interestingly, the archaeological record, so far, is limited in ascertaining the urban fabric that pitted it alongside Alexandria in the mid-2nd century. In recent excavations by Graf and Bedal (2005-2012) as part of the Hellenistic Petra Project a number of smaller deliberately oriented structures were excavated and surveyed along the Colonnaded Street. Their results may yield clues to the lacunae that exist in Petra prior to ~100 BCE (Graf 2013).

Focusing primarily on free-standing monuments and their associated chronologies determined through numismatics and pottery styles, Peter Parr examined the "urban development of Petra" (2007). One of the earliest known structures at this time was located in "the stratigraphic sequence beneath the south portico of the Colonnaded Street" and may be dated to the "first decades of the 1st century BC" (275), supported primarily by numismatics and "a few examples of find Nabataean pottery, including one sherd painted in the simple linear style" which was linked to early Nabataean styles (277; citing Parr 1965; Schmid 1995). This structure was paved with stone and constructed with limestone boulders, mined from a nearby ravine, and lined with clay. Another structure was located beneath the street which Parr identified as earlier than the previous structure, but due to "human or natural agencies," dating was difficult but Parr suggests that "the earliest occupation here dates back to the early 2nd or even the late 3rd century BC cannot be far wrong" (278). Another early structure, dated by Parr (citing Zeitler 1989, 1990) to no later than 30 BCE, was situated in front of the Um Tomb atop the main terrace, which "overlies a rock-cut tomb containing a coin of Obodas II (or III...)") (280-281). Finally, another early freestanding structure was identified under the ridge at ez-Zantur (see Stucky 1995; 1996) where, although no real structure was unearthed, there exists "some circumstantial evidence, in the form of stone chippings" indicating the earliest dated structure that may be contemporaneous to "tented settlement" (Parr 2007: 281; citing Stucky 1996: 17). For Parr (and Stucky), this was indicative of the earliest transition from tent-dwelling to residential dwelling, however Parr was willing to admit that "it is surely premature to assume that the earliest settlement was tented, ignoring the possibility that permanent stone architecture was to be found on ez-Zantur earlier than the late 1st century BC" (282) adding "it is also by no means unlikely that... a tented settlement existed side-by-side with the permanent buildings" (283). Parr concludes that settlement
likely occurred as early as “the 3rd or 2nd BC” (283), mostly restricted to the slopes immediately adjacent to the Wadi Musa.

Interestingly the earliest confirmed and widely accepted example of monumentality with regard to architecture is the Obelisk Tomb, which is dated to 94 BCE due to a corresponding inscription that may refer to its dedication (Wenning 2013). It is also one of the first monumental tombs encountered when arriving at the site. It indicates an early focus on rock-cut architecture within the region of Petra and presents a clear implementation of the nefesh, or a house of the soul (Kropp 2013), depicted in the four monumental obelisks that line the front of the tomb. In close proximity are also the early markers of what are thought to be additional nefesh; the so-called djinn blocks (2013). Wadeson (2011) identified these as marking the early boundaries of Petra, although Mouton and Renel (2013) presented clear evidence that these blocks likely existed long before the presence of the Nabataean regime and were retrofitted with tombs in one phase and the ubiquitous Nabataean crow-step motif in a later phase.

Arguably, the emergence of the conspicuously urbanized regime at Petra was initialized during the latter periods of Obodas III’s, reign, likely under the direction of Syllaios. Trade routes were shifting favorably towards Nabataean interests, maritime trade through the Red Sea was increasing (Graf & Sidebothom 2003), and the Roman expedition into Arabia had removed any nascent or lingering competitors in the region (see discussion above). Cultural norms were implemented that favored and reproduced economic surplus for the elites as seen in Strabo’s comment “[Nabataeans] are so much inclined to acquire possessions that they publicly fine anyone who has diminished his possessions and also confer honours on anyone who has increased them” (Geog. 16.4.26). Surplus gave way to conspicuous consumption, both in housing which was “costly” due to its “use of stone” (Geog. 26) and in monumental architecture with the initial construction (and possible deconstruction) of the Qasr al-Bint (Kropp 2013). The initial phases of the large private mansions or villas excavated on Ez-Zantur also date to the time Aretas IV, possibly earlier (Stucky 1996; Kolb 2007; Parr 2007). It is during this time that the social institutions of Petra and Nabataean were rooted in place.

There was also rapid intensification of agricultural production from Petra’s increasingly settled hinterland throughout Aretas’ reign (Khouki 2013). Bowersock (1994) argued that the intensification of
agriculture and water management should be viewed as correlated to the decrease in surplus from trade due to shifting maritime trade routes in the Red Sea towards Egyptian ports and the fading of the Petra-Gaza trade by the middle of the first century CE (64). This is based on the assumption that the intensification of agriculture generated enough surplus to supply a rapidly increasing population in Petra. According to Khouki (2013) however, the “production [of rural agriculture] was probably mostly aimed at supplying local needs and, at the level of an individual farm, it may not have been very much above subsistence level” (329). Within this perspective the agricultural intensification in the hinterland around Petra and the rapid urbanization program within Petra are both responding to “the peak of the Nabataeans’ economic and political influence” (330). The intensification of agriculture should therefore be tied to the effects of urbanization, not as a necessary component of population sustainability but rather as a side effect of economic success that attracted migrants to Petra’s hinterland. In the hinterland, especially “in the Escarpment and Jabal ash-Shara areas” (329), the structural remains “at rural sites range from simple houses with one or two rooms to multi-room mansions with courtyards” (329; citing ‘Amr et al. 1998: 538, 540). The question still remains however as to why domestic structures appear much easier to locate in the hinterland than in Petra.
IV. Prior Research

Since the agricultural revolution and the so-called *urban revolution* (Childe 1950) one of the primary domains of spatial analysis pertaining to ancient societies focuses on the conglomeration of individuals situated within a specific settlement or hamlet, an urban area (e.g. small or large village or town), or a city (see Flannery 1998: 16; Renfrew 2008). Scholars have attempted to explain the peculiar characteristics of settled, conglomerated, and urbanized groups. Multiple narratives, studies, and research endeavors were produced by sociologists, geographers, anthropologists, archaeologists, historians, and architects in order to better explain the multivariate underlying forms, functions, and (more recently) social meanings of urban systems (Paccione 2005; Trigger 2006; Cox 2014). The acceptable methods of inquiry for these social science disciplines have shifted on multiple occasions depending on the intellectual environment at the time. Essentially these shifts demonstrated various means and methods through which researchers constructed narratives in order to explain or theorize about the interconnectedness of the urban *milieu*.

The situating and conglomerating of individuals at a specific geographic locale appears to be a (near) universal characteristic of society from its earliest formations to the present. Examples include the independently urbanized centers in Mesopotamia, the Indus Valley, China, Egypt, Mesoamerica, the Andes, and elsewhere (Scarre & Fagan 2003); the urban transformation of conglomerates into city-states (Hansen 2000; Trigger 2003; 2008), territorial states (Trigger 2003; 2008), regional states and/or empires (Trigger 2003; Yoffee 2005); the isolated urban areas of Medieval Europe (Lilley 2004), the Islamic Near East and Arabia (Butzer 2008), and pre-colonial Africa (Connah 1998); the commodity-driven industrial cities; and post-industrial monetary-driven and consumer-driven cities of today (Pacione 2005). This is confirmed by Colin Renfrew’s (2008:30) observation that “the city is one of the most obvious and the most concrete, independently recurring (that is, independently emerging) features in human experience and thus perhaps indicative of what is latent and potential in all humans.”

While these examples demonstrate the consistency of urbanism throughout history, it is important to note that each of these urban systems exhibited different levels of social and spatial complexity. In this review, it will become apparent that the primary objective of an historical urban study is to examine the relationship between social and spatial transformations that led to increased levels of complexity. In order
to accomplish this it is important to critically examine i) the early approaches to urban analysis, especially the models, classifications, and schema that were proposed through comparative analyses; ii) the predominant social and urban narratives and their associated methodologies in recent decades; iii) the changing theoretical narratives of space and spatial analysis in recent decades and how these relate to the social realm; and iv) recent methodologies that synthesized the interconnectedness inherent within socio-spatial analysis.

In Nabataean studies, Nabataean material productions are the primary objects of investigation due to the lack of written historical records. Occasionally, textual and epigraphic documentation acquired from the society directly often lack the resources necessary for adequate assessments of social development. It is for this reason that a wide range of social science disciplines (e.g. archaeology, architecture, history, geography, philology, engineering) investigated the social development of Nabataea where historical accounts were derived primarily from epigraphy (e.g. Graf 1990, 2003; Healey 2001, 2007; Milik 1982, 2003; Nehmé 2013), philology (e.g. Abu Taleb 1984; Graf 1990; MacDonald 1998, 2000, 2003), externally written documents (e.g. Josephus, Strabo, etc.; see also Bowersock 2003; Graf 2013), limited internal documentation (i.e. Petra Papyri), and geopolitical contexts (e.g. Bowersock 1994; Wenning 2007); supplemented by the material record identified through excavation (e.g. Schmid 2000; Graf, Bedal, & Schmid 2005; Mouton, Renal, & Kropp 2008; Parr 1962, 2007; Nehmé 2012, 2013; Renal & Mouton 2013), architecture (e.g. McKenzie 1990; Schmid 2000; Wenning 2003; Kolb 2003, 2007; Tholbecq 2007; Wadeson 2010; 2011; 2013; Kropp 2013), pottery (e.g. Parr 1962; Schmid 2001, 2007) and ceramics (e.g. Dolinka 2003), iconography (e.g. Zayadine 1981, 1991; McKenzie 2003), numismatics (e.g. Augé 2013; Kropp 2013), technology (e.g. Eadie & Oleson 1986; Ortloff 2005; Oleson 2007), and agricultural hinterland (Alcock & Knodell 2011; Kouki 2013).

Still, as I demonstrate here, questions remain regarding the social and spatial complexities related to Petra’s urban development. Nabataean scholars appear to focus exclusively on broad historical narratives or particular material classifications and descriptions. While these studies certainly hold value for Nabataean research, and this study, I demonstrate that the theoretical and empirical components of socio-spatial analysis were commonly lost in research on Nabataean Petra. Studies on urbanization and
urban development of this Hellenistic city often ignored the interrelated and interconnected concepts of social and spatial complexity, especially the theoretical relationship between social action, space, and the reproductive and discursive influences between the two.

Therefore, I integrate critical examinations of relevant research on Nabataean Petra within the prevailing trends and methodologies in urban research. Additionally, it is also imperative to assess the various definitions of city, urban, or even civilization, that were proposed throughout each of these disciplinary shifts and perspectives. By situating the predominant trends related to social and spatial complexity within urban contexts, it is possible to allow an innovative methodological narrative to emerge that engages empirical socio-spatial analysis alongside theoretical perspectives of the relationships between society and space in order to better understand an urban milieu, such as Petra.

A. Modelling Spatial Patterns

During the first half of the twentieth century, social complexity was examined through the physical relations between societies and their natural environmental contexts, where an understanding that humans and nature were dueling and irreconcilable components was a foundational concept to discerning human behavior. Agency, or the ability of an entity to affect change, rested solely within the natural environment and, most often, a society’s climate which limits, controls, or dictates the actions of humans (i.e. environmental determinism). This soon gave way to possibilism where humans were seen as capable of pushing the limits imposed by the environment through technological and cultural adaptations. Even so, the principal objects of inquiry began with an examination of the natural environment and ended with the adaptive responses of humans to that environment (Cresswell 2013; Cox 2014).

Interestingly, what emerged out of environmentalism was a notion of civilization. While today this complex term may be defined broadly as “urbanized, state-level societies” (Scarre & Fagan 2003:6), civilizations during this time were defined according to their technological and cultural adaptations and classified along ordinal stages of development. Unfortunately this led to ethnocentric value-judgments on entire groups and civilizations, past and present, especially towards the developing world, where societies and countries were situated within a particular stage based on a particular trait and were expected to adapt, or progress through natural transitions (Cox 2014). Additionally, “all societies at the same stage of
development were [considered to be] very similar” (Trigger 2003:43). While geographers were applying these stages in terms of modern industrialization, anthropologists and historians applied this concept throughout history where a society "could therefore be assigned to a particular stage on the basis of a small number of distinctive criteria or even a single trait," such as the presence of writing (2003:43). These evolutionary stages were maintained in the social sciences well into the 1950s (2003).

There was another aspect of social complexity that ran counter to environmentalism. Focus shifted to the differentiations between places and although "[t]he idea of difference between places… has always been central to the practice of geography” (Cox 2014:10), the implementation of this idea varied. One of the most significant countercurrents to environmentalism was the cultural landscape and the introduction of a temporal component of social relations through morphology (Sauer 1925). Within the so-called Berkeley School of Cultural Geography, Carl Sauer rejected the privilege of environmentalism and proposed elevating the role of human agency. Sauer was concerned with the ability of humans to affect and change their environment through material change (1925; Cresswell 2013; Cox 2014), claiming that “The cultural landscape is fashioned out of a natural landscape by a culture group. Culture is the agent, the natural area is the medium, the cultural landscape the result” (Sauer 1925:25; emphasis added). In regions with material expressions, like in cities or built environments, the entirety of the cultural landscape was to be assessed holistically as a single, “organic unit” (1925:25; cited in Cox 2014:11). By adding the synchronic morphological approach to these material expressions, one may “form an idea of landscape… in terms of its time relations as well as its space relations. It is in continuous process of development, or of dissolution and replacement” (Sauer 1925:36). This form of landscape through a morphological consideration would not be applied directly to urban areas until M.R.G Conzen (1968) years later with his European school of urban morphology.

This shift towards investigating the material manifestations of human culture was integrated with persistent influences of evolutionary theory, neoclassical economics, and the sociological writings of Max Weber concluding that humans not only adapted to the environment but also created new environments. This perspective became an early form of urban ecology and was foundational to the Chicago School who “saw the city as consisting of populations that had created a new environment… [and] borrowed concepts
from plant biology and animal ecology” (Marcus & Sabloff 2008:7). This led to a number of conceptualized
models of urban forms as made up by human populations and distributed according to specialized
economic functions related to “competition and succession” (2008:7). These models often included
evolutionary stages that were derived through universal human motivations rooted in neoclassical
economics. The models from the Chicago School remained heavily influential throughout most of the
twentieth century (Cox 2014).

The most well known model was the *concentric zone model* developed by Ernest W. Burgess
(1925), where a population becomes established at a geographic node and then extends outwards through
various stages. Borrowing from the Chicago School, the model’s center was the central business district
(CBD) and iterative concentric stages, represented as rings, extended outward. These stages were
identified as the factory district, working class residences, middle and upper-class residences, and finally a
zone of commuters (Marcus & Sabloff 2008; Burgess 1925). Although there are obvious limitations with
applying a model based on modern urbanism to early cities, this idealized concept paved the way for a
number of other models that attempted to identify universal rules and morphologies across all cities
(Marcus & Sabloff 2008).

A subsequent and complementary model was developed by an economist, Homer Hoyt (1939),
known as the *sector model*. Considering that land-use tends to change slowly within the CBD discussed
by Burgess, Hoyt identified a series of transects and cross-cuts that emanated outward from the center like
pie-shaped wedges across the concentric model. Still highly idealized and theoretical, the model is based
on the simple assumption that new land-use tends to remain contiguous to similar land-uses. An example
can be found in modern residential areas where new residential areas are often developed contiguously to
pre-existing residential neighborhoods. Also, income and class are highly influential in this model as new
working class communities or upper-class communities are usually developed alongside their respectively
pre-existing counterparts. Within this model, gradients may exist within the structures themselves where
size is often a function of its proximity to the center, some increasing or decreasing in size based on the
distance (Hoyt 1939; Marcus & Sabloff 2008).
Shortly after the development of the sector model, geographers Chauncy Harris and Edward Ullman (1945) developed the multiple nuclei model demonstrating that as a city develops over time, the city may become decentralized enabling spatially centralized and increasingly specialized districts based on occupation and/or land-use. Eventually these nuclei attract similarly specialized groups allowing these sectors to develop consistently, but independently from one another. This is also a reflection of an earlier model by Louis Wirth (1938) that attempted to demonstrate how similarly specialized groups, whether based on class, ethnicity, or income were likely to reside within clustered communities due to these shared experiences.

Harris (1943), mentioned earlier for his work on the multiple nuclei model (Harris & Ullman 1945), also attempted one of the earlier, classification schemes for modern cities based on the functionalist, economic approaches. Based on a city's function and size, he considered a city to have a "general type" that is "distinct," and that while cities are inherently "multifunctional" (Harris 1943: 86), cities may be understood and measured by their working population and their respective occupations. Through this occupational analysis combined with considerations of city size and shape, Harris derived nine general types. The most common of these were identified as: 1) manufacturing, 2) retailing, and 3) diversified. The remaining distinct types were identified as: 4) wholesaling, 5) transportation, 6) mining, 7) educational, 8) resort or retirement, and 9) political and all others (1943: 90). This classification combines the functionalist approach with the environmentalist/positivist approach enabling the conclusion that "the different functional types of cities exhibit differences in the factors affecting their location" where "central-location theory" is considered the major contributor to site location in modern U.S. cities which is a concept borrowed from Ullman (1941). The locations of the various types are then primarily a function of costs associated with a city's function where convenience and accessibility to resources required for the function is key (Harris 1943; Ullman 1941).

While these models each have advantages and disadvantages for urban research they are criticized on multiple grounds. One is that they lack the consideration of what constitutes or induces development and change over time within a given urban system. These "models tend to pay too little attention to the roles played by individuals (human agents)... as well as the important roles played by
culture, symbolism, ritual, and religion” (Marcus & Sabloff 2008: 9). Also, it should be clear that these models fit well within modern notions of urban development, specifically those inherently based within capitalist models of development. The agents, in these cases, are often elite groups driven by economic imperatives whose narratives provide convenient classification schemes. For early societies, applying these models becomes difficult, if not impossible (2008).

Many of these models were predicated on the methodological import of Walter Christaller’s central place theory, which used “idealized hexagons to describe hierarchies in the distribution of cities in southern Germany” (Smith 2003:38-9) and identified “striking regularities in the size and spacing of settlements” (Knox & McCarthy 2012:57; citing Christaller 1933; Christaller & Baskin 1966). The methodology of Central Place Theory “assumed a uniform landscape, uninterrupted by rivers, roads, or canals” where:

“Accessibility is assumed to be a direct function of distance, in any direction… central place theory depend[s] on [the] elementary principles concerning the ‘range’ and ‘threshold’ of goods and services” (2012:57). The distance an individual is will to traverse for a range of goods is differentiated between high-order, or highly specialized goods and services that encourage greater mobility (e.g. health services, entertainment events), and low-order, or more widely available goods and services that require less distance (e.g. local markets, convenience stores). A distance threshold was determined by the “minimum market size of available customers” (Knox & McCarthy 2012:58) or consumers within the surrounding hinterland of a settlement area that merit and enable the presence of goods and services. High-order goods service a larger distance (i.e. hinterland) and therefore a greater population, while low-order goods serve less distance and fewer consumers. What results is a nested hierarchy of centrally placed settlements that may be delineated by “the population size and packages of services offered at each level of the hierarchy” (Knox & McCarthy 2012:58) considering that “[s]patial regularity… arises from universal physical principles” (Smith 2003:39; Pacione 2005; Marcus & Sabloff 2008).

With the advent of the spatial-quantitative revolution that began in the 1950s, the fundamental nature of socio-spatial inquiry changed. While the spatial turn in geography occurred much earlier, most notably economic geography, with town-rural distributions and forms (Mackinder 1907; Colby 1933), central place theory (Christaller 1933; Ullman & Harris 1941), and urban spacing (Dickinson 1933), the introduction
of quantitative methods supplemented and expanded the frontiers of the questions geographers asked of spatial relationships. \textit{Spatial regularity} was well established by the proponents of central place theory, the emergent \textit{rank-size rule} of Felix Auerbach, and the arguments for universal spatial laws by Fred Schaeffer, the methodological approach for investigating spatial regularity was formalized under new schemas rooted in quantification. This coincided with rapid increases in urbanization and suburbanization. Topics pertaining to urban, transport, and communication systems, networks, and nodes became commonplace for most of the social sciences. Fundamental spatial rules, laws, typologies, and classification schemes were proposed based on quantitative analyses that revealed discrete thresholds through a new sort of spatial positivism (Smith 2003).

For those assessing urban systems, the spatial-quantitative revolution brought an imperative to investigate spatial regularity through quantitative methodologies by “breaking it down into its component parts and analyzing it” (Cox 2014:30). The city, therefore, was an entity to classify, model, and measure in order to uncover the underlying universal spatial order. The seemingly universal physical properties of urban systems led many researchers to conclude that their manifestations were a result of adaptive processes that were classifiable based primarily on their resulting forms, functions, internal elements, spatial divisions, and spatial regularities (2014). This in turn led to a multitude of urban narratives, models, classification schemes, typologies, themes, thresholds, and dichotomies that were proposed to explain the physical and spatial similarities and variations for numerous urban areas in nearly every society throughout space and time (Morris 1979; Kostof 1991; Marcus & Sabloff 2008). Essentially, social and spatial complexity was limited to the realm of classification and idealized models.

What should be clear is that the objective for research in this intellectual atmosphere was to situate social and spatial analysis in an abstract, idealized yet absolute representational \textit{space} that became more real to the researchers than the actual entities themselves (Smith 2003). The early twentieth century in the social sciences began with a focus on abstract representational stages of historical evolutionary trajectory and culminated in idealized modeling techniques that were solidified through the positivist empiricism that came to dominate spatial sciences during the spatial-quantitative revolution. While both the social and spatial realms of inquiry were present throughout this period, the complexities of these two
components were reduced to representational abstractions that were used to justify discrete oversimplified, under theorized, idealized classifications and models. Still archaeologists and anthropologists maintained the socio-evolutionary perspectives in what came to be identified as the functional neoevolutionist movement built upon the foundations of Lewis H. Morgan, V. Gordon Childe, and Julian Steward (Smith 2003; Trigger 2006).

Subsequent trends in human geography and sociology pushed against this trend in behavioral and humanist movements. New theoretical questions emerged about cities asking what a city is, why cities form, what were/are the conditions necessary for city formation, and whether the resulting forms can be compared and categorized. Questions of socio-spatial complexity emerged that approach urban space through their patterns and processes such as how is the city reflective of social complexity, and what causes them to change and evolve over time. As the nature of socio-spatial inquiry shifted, so too did the geographic scale of these inquiries. Through the identification of commonalities between social and urban systems, cross-cultural and cross-temporal comparisons of these similarities became commonplace and even broader theoretical notions of City, State, and Civilization were proposed by some and subsequently challenged, modified, and re-proposed by others to explain the mutual character social and spatial complexities.

B. Social Process & Urban Patterns

"With the ancients, a city was never formed by degrees, by the slow increase of the number of men and houses. They founded a city at once, all entire in a day... As soon as the families... and the tribes had agreed to untie and have the same worship, they immediately founded the city as a sanctuary for this common worships, and thus the foundation of a city was always a religious act."
- Fustel de Coulanges 1874:134

Each city throughout history carries with it a contextual narrative with details of its emergence and evolution. For Fustel de Coulanges the establishment of cities was a (social) religious act conducted by a specific society ("families" or "tribes") who often consulted various gods or oracles prior to construction (1874). The "earliest Roman cities were created by a solemn religious ceremony - the banding together of a group of people to form a community at a definite site" (Philips 2010: 106). The failure or success of a city hinged on its ability to please the gods. de Coulanges, writing his original publication La Cite antique in
1864, reviewed a large number of available sources to compare cities within Greek and Roman contexts and examining these chronologically and morphologically. An example of a fabled establishment of a city as a religious act was drawn from Rome's famous conception where "Romulus set up an altar, and lighted a fire upon it. This was the holy fire of the city" (de Coulanges 1874:137) and "around this altar the city of Rome allegedly arose" (Marcus & Sabloff 2008:5).

Such a framework of city formation suggests that the perceived function of early cities was inevitably religious. While this perspective was highly oversimplified (Marcus & Sabloff 2008), it raises questions about why cities emerge where they do and orients inquiry towards the social meaning behind city formation and evolution. Cities were constructed by social actors for social purposes and evolved within localized physical and cultural environments (Philips 2010). Investigating the city merits exploration of the social actors as well as the physical result. In fact, the Romans drew a “sharp distinction between the community of people… called civitas… and the physical place they formed - an urb” (2010: 106). Since de Coulanges’ assessment, researchers have attempted to discern the narratives of city formation and evolution through both the social components that appear necessary for a city to exist and the resulting physical patterns that result in the city itself. Ultimately, such an investigation requires the researcher to begin with the most basic question - what is a city?

This question is one that has plagued social theorists for decades and as such it is important to understand the difficulties involved in defining and analyzing cities in the past and present. V. Gordon Childe claimed that the city "is notoriously hard to define" (1950). Albert the Great, borrowing from the writings of Aristotle’s Nicomachean Ethics, described the city "'materially' as 'a collection of humans and a set of buildings,'" writing in the thirteenth century (cited in Lilley 2004; quoting McGrade et al. 2001:107). While theorists and philosophers have attempted to answer this question since Aristotle, it was not until the 20th century that a wide variety of interpretations, proposals, and approaches were developed and conducted from a number of social science disciplines - geography, archaeology, anthropology, sociology, history, and architecture. As we have seen, some latched on to the quantitative/positivist stance like sociologists Louis Wirth (1938) and Kingsley Davis (1965) who defined the city in demographic terms which were "relatively large, dense, and permanent settlement[s]" (Wirth 1938: 8) delineated by "the proportion of
people in places 100,000 or more” (Davis 1965: 42). Others, however maintained the theoretical social components of urbanism exemplified early on by the historian Lewis Mumford (1937) who viewed the city as constituted by social forces, defining the city as “a geographic plexus, an economic organization, an institutional process, a theater of social action, and an aesthetic symbol of collective identity” (59).

Prior to the spatial-quantitative and emerging functional approaches to describing the city, early cities were given consideration primarily through top-down assessments of political narratives and architectural aesthetics. This antiquarian perspective predominately viewed ancient cities as phenomena that “flow[ed] directly from the construction programs of kings without any account of either the processes that translated royal policy into built edifices or the array of interests that might have intruded on the imposition of kingly authority on physical space” (Smith 2003:195). Socio-historical processes and individual contexts were removed from consideration in addition to the physical properties that were manifested by such processes. During this time the primary object of inquiry was the aesthetic role that monumentality played in dominating physical space, “read as the physical imprint of the majesty of ancient rulers” (195).

Writing in contrast to the antiquarian perspective, V. Gordon Childe (1933; 1950), an archaeologist and philologist, assessed the characteristics that made up the earliest urban systems from within Marxist frameworks. Often described as “the man who made order out of archaeological chaos” (Flannery 1994; cited in Smith 2009), Childe identified ten qualities, or criteria, about the social, economic, political, and cultural shifts that led to the rise of urban conglomerations in early societies (Smith 2009) after the Neolithic Revolution. Shifts in agricultural production “made possible the regular production of a social surplus” (1950:6). This surplus led to the emergence of a “corporation of priests” who established centralized monumental temples and from there arose the city (Childe 1946: 96). This new mode of production led structuralist scholars to view cities as “an integral part of the capitalist mode of production by providing an environment favourable to the fundamental capitalist goal of accumulation” (Pacione 2005:30).

Still, much of this determination is predicated on the evolutionary processes related to transitory transformations that were identified as encompassing the entirety of human historical trajectory. Within this view, Childe described three revolutions: the agricultural, the urban, and the industrial. For Childe, “the
development of writing was one of the crucial cultural elements of true urbanism” (LeGates & Stout 2011:15). In Childe's words:

“The notion of 'city' is notoriously hard to define. The aim of the... study is to present the city historically - or rather prehistorically - as the resultant and symbol of a 'revolution' that initiated a new economic stage in the evolution of society” (1950: 3).

In "The Urban Revolution" (1950), Childe focused on the earliest cities and has since become the favored theoretical foundation for most urban discussions among anthropologists and archaeologists. Rather than analyzing "cities or urbanism per se," Childe's analysis is about "the series of interrelated social, economic, political, and cultural changes that led to the earliest states and cities" (Smith 2009). His findings can be summarized by illustrating that cities displayed "greater community size, larger populations, higher densities of people, agricultural surpluses, truly monumental public buildings, full-time craft specialization, systems of counting and record-keeping, a writing system, regular foreign trade and subsidized traders, officials, and priests" (Marcus & Sabloff 2008: 10). It is tempting to apply Childe's characteristics as a sort of rubric or set of preconditions for early cities, however, as we have seen, his analysis was primarily an attempt to understand the commonalities among early urban societies.

It became increasingly clear that while Childe’s assessment provided a valuable “mixture of material culture and social organization as defining features [which] marked an advance over previous, purely typological definitions… his listing provided little insight into how early cities had functioned” (Trigger 2008:54). At the same time, the spatial-quantitative revolution all but removed the realities of social complexity on the ground in favor of abstract, spatial theories (Pacione 2005), and yet it was clear that forms and patterns were useful within urban analysis (Harris & Ullman 1956:7; Marcus & Sabloff 2008:24). The diversities and similarities of urban patterns appeared to be the functional result of rational human actions where cognitive processes related to humans with imperfect information may be used to explain the varieties of social and spatial complexity. The growing opposition to abstract quantitative spatial analysis and the insistence on functional, yet cognitive explanations of social decision making sparked the behavioral approach to social studies. Cities were explained in terms of (empirical) form and (social) function, whether through analyzing the origins of cities or their development thereafter (Cox 2014).
In archaeology, this movement is often called "processual," or "New Archaeology," where "the underlying historical processes... are the root of change" (Renfrew 1987) and that historical and, more importantly, environmental processes result in measurable cultural adaptations. Processual methodologies then may assess economic modes of urban change, the environmental and historical motivations of societal change, and how these influenced the size and distribution of early urban centers. These modes are investigated by assuming that humans generally seek, "in a rational manner, to locate activities so that energy expenditures were minimized when it came to providing services and transporting goods and information" (Trigger 2008:55-56), in other words - cost-based modeling. For the processualist, analytical tenets are based on assumptions that quantitative measurements may elicit information about culture through rigorous application of the scientific method allowing the researcher to remain objective and unbiased (Renfrew 1987). With the advent of a methodology investigating both form and function, this enabled historical investigations into the comparative analysis of urban systems that considered the physical properties as well as the socio-economic contexts (Pacione 2005; Trigger 2006; 2008; Marcus & Sabloff 2008; Cox 2014).

The behaviorists criticized spatial analysis for situating itself within abstract, spatial theories and models, which "did not always fit the data" (Cox 2014:44), that too often resulted in the removal of human actions as playing a role in the urban spatial process. Human cognitive sciences were given greater attention due to the growing influence of psychology and its theories of human behavior, such as learning theory, where social scientists explored "the effects of imperfect information on decision making" (Cox 2014:44). Still both approaches continued the tradition of researching and concluding generalized universal laws about human existence. Quantitative empirical analysis was still common, but the method of interpretation expanded to include ecological and economical constraints and motivations of humans as rational individuals and communities where cities were considered as playing a role as "centers of marketing and trade" (Trigger 2008:54). Geographers like Garner (1967), Chorley & Haggett (1967), and Carter (1972; 1989) and archaeologists like Flannery (1972), Johnson (1973), Marcus (1973), Rathje (1975), and van der Leeuw (1981), and sociologists Duncan (1961) and Blau (1967), performed similar methodological, quantitative analyses on cities in both historical and urban contexts by implementing
locational analysis, central place theory, and a variety of cost-based models that portrayed economic costs and social conveniences as the key to understanding historical urban environments (Trigger 2008). The functional approaches above (following Christaller 1933; Carter 1972; Cowgill 2004; Smith 2005; Trigger 2003; 2008; Renfrew 2008) were combined with broader socio-political considerations of state formation where subtle or dramatic shifts relate to the types of state formation and the motivators that encouraged or prohibited societal change. This led to two distinctions between early states, i) city-state civilizations (Hansen 2000; 2008; Trigger 2003; 2008), or "city-state cultures" (Hansen 2000); and territorial states (Trigger 2003; 2008), or "macro-states" (Hansen 2000; 2008). This dichotomy was developed over several decades of seminal research (see Hansen 1994; 2000; 2002; 2008; Trigger 1993; 2003; 2008; Yoffee 2005). Some motivators of social shifts in cities were common to all states, specific types, or were highly localized.

As the functionalist approaches established methods that combined the ecological/economic motivations of human behavior alongside quantitative methods, a number of debates came to the fore regarding the theoretical notions of the city, such as the definition of the city, the preconditions for urbanization, and the influences on the growth and development of an urban system. Trigger explains the intellectual environment where "neither archaeologists nor geographers could agree on a generally acceptable, cross-cultural definition of urbanism" (2008:54). The sociologist Louis Wirth stated that a city is a "relatively large, dense, and permanent settlement of socially heterogeneous individuals" (1938:8) While Sjoberg delineated cities in terms of population values where a city was "little more than 10,000 and perhaps only 5,000 persons" (1960:83). In the end, however, "[a]rbitrary definitions based on population size or population density invariably succumbed to counter examples" (2008:54). So then what may be determined about a generic definition of the city?

When assessing the Graeco-Roman world, Owens claimed that "the fulfilled various functions and these functions affected its physical and architectural development… Cities were located with a view to the natural defensive qualities of the site… The political, economic, social and religious functions of the city are reflected in its public buildings and their location within the urban environment" (1991:3). For Owens, the spatial complexity of urban forms shared direct relationships with the social functions that cities, as
physically manifested social institutions, provided. According to this functional approach, the city grows in spatial complexity whereby the social functions of the city gain efficiency over time and “is obtained by having these functions concentrated in one site” (Wolf 1966:11). Through a functional-historical approach, Spiro Kostof suggested that the “energized crowding of people” (i.e. density) is what defines a city (1991:37). This energizing of social complexity “presents us with a new set of environmental ideas, such as the street, the public square, the defensive wall and its gates… [and] a score of building inventions” (1991:43). Therefore, the conglomerating of human populations result in spatial complexity centered on socio-economic functions.

Rather than focusing on the internal components of city form, others take a relational, yet still functional, approach by defining the city in terms of the relative countryside or hinterland. Colin Renfrew (2008) established the differences of cities in terms of a four tiered model characterized as "cities, towns, villages, and hamlets" (Hansen 2008: 71) where a city provides specialized services serving a broader society (Renfrew 2008: 31; citing Cowgill 2004: 525). Bruce Trigger proposed that a "city can be defined as a community or settlement that performs numerous functions in relation to a broader hinterland" (2003: 120; 2008). Such proposals, suggests Hansen (2008) were derived primarily from Central Place Theory (Christaller 1933) and the rank-size (Carter 1971) rules of cities where distances from the primate cities indicated forms of political and economic distance decay.

Some still maintained the role that environmental context played in early city formation. Combining this ecological context alongside positivist and behavioral approaches, Otis Dudley Duncan (1961) promoted a quantitative approach that considered a set of "pre-conditions" (Pacione 2005) as necessary for growth. This locational focus on a city's growth and how social, behavioral changes were related to such growth quickly became one of the major thrusts of the behavioral approach. Duncan identified four major pre-conditions: 1) population, where the total of a permanently settled residents within a city is indicative of a society's agricultural surplus; 2) environment, which was a resource-based assessment used to explain why a city is located where it was; 3) technology, primarily used to extract and mitigate the challenges of water management specifically; and 4) social organization, where population pressures and economic shifts (trade) merited and enabled greater social complexity and hierarchically-based cities leading to social
stratification (1961; Pacione 2005:40). Here again we see the common themes of the behavioralist approach where cities are directly related to proximities to resources, economic shifts in surplus and production, and the social consequences of growth that resulted from increased accessibility to resources and trade. This particular study reiterated the importance of environmental context, or rather constraint, as measurable contributors to urban growth.

Within the functional approach, the origins of cities are a result of growth in socio-economic complexity and the form is a manifestation of that complexity. Of the many theories attempting to explain the emergence of cities, some are specifically functional and worth explaining here. These may be summarized as agricultural surplus (Childe 1950; Woolley 1963), hydrologic factors (Wittfogel 1957), population pressures (Boserup 1981), trading requirements (Jacobs 1969), defense needs (Weber 1958; Wittfogel 1957), and religious causes (Sjoberg 1960; Wheatley 1971; Knox & McCarthy 2012). Proximal distances to resources related to agricultural accumulation is were cities arise “where people lived next to rivers, where irrigation agriculture was practiced, and where agricultural surpluses could be produced to support craft specialists” and that as surplus of capital increased, so too did the top-down institutional process that created “elite residences and discrete types of monumental public buildings” (Marcus & Sabloff 2008:20-21). Residential clustering was the result of craft specialization and religious monumental institutions situated in near universally centralized locations were places that “political agendas [were] cloaked in religion” and efficiently disbursed (2008).

Agricultural surplus, whether the impetus or not, was directly related to the technological capabilities of an individual society, especially irrigation. The control of irrigation and annual flood events merited direct investments into hydrological management programs, which in turn resulted in divisions of labor and an increase in social complexity to manage and incorporate these divisions (Wittfogel 1957). These divisions were eventually manifested in spatial form and organized according to functional processes. Much of this view is predicated on the notion that irrigation projects necessarily resulted in spatial and social complexity, but critics of this view point out that i) social complexity was likely a prerequisite, or at least a requirement established in tandem, to large scale irrigation projects; ii) it is doubtful “whether a complex social organizational structure was even necessary in order for people to
undertake large-scale irrigation”; and iii) some cities appear to lack large scale irrigation systems (Knox & McCarthy 2012:22).

Another component may be the advent of long-distance trade networks (Jacobs 1969). Within this view, urban centers arose out of the need for centralized social structures (i.e. an authority) that might manage, administer, and mediate the formal exchange of goods and services. In turn, labor increased along with occupational specialization which led to more urban development. Still, as with those previously mentioned, what “remains unclear is the extent to which trade was the cause or the consequence of urban development” (Knox & McCarthy 2012:23). The seemingly near universal presence of walls and fortifications indicates a patterned requirement to protect the accumulation of resources and led some theorists to conclude that need for defense was the main impetus for urbanization (Weber 1958; Wittfogel 1957). While it is certain that cities maintained some sort of fortification or barriers to protect against external threats (Flannery & Marcus 2003; Zou Heng 1987), these threats mostly contributed to the intensification of growth and development (Wheatley 1971).

In Trigger’s (1972; 2008) critical assessment of the locational analysis of early urban geographers, identified from B. J. Garner's "Models of Urban Geography and Settlement Location," Trigger identified a number of useful components from this movement. While processual approaches alone are unable to completely assess the economic, social, and political aspects of a city, urban center, or societal configuration, Trigger pointed out that there are many useful pieces of this approach that may assist an urban analyst. These may be summarized thusly as i) the assumption that spatial organization in urban centers (esp. smaller centers) are physical manifestations of hierarchical activities and social stratification, ii) analysis pertaining to increased "complexity and specialization" encouraged human activities to become centralized and immobilized "in order to minimize the need for movement of people, goods, and information" resulting in an "increasing number of specialized functions" within a single urban center (2008:55), iii) and that urban size is directly related to its growth and number of specialized functions.

Given these assumptions, what can be gleaned from the processual approach is that a city "can thus be defined as a community or settlement that performs numerous functions in relation to a broader hinterland" (2008:55; citing Mabogunje 1962:3-4). The city may be understood, in part, by its functions
where these specialized functions are meant to serve the needs of the elite, upper classes. Although this clarifies the differences between a city and a large agricultural community, it does little to explain the multivariate settlements of "service villages, towns, and cities" (55). Amending the functional definitions of the city, Trigger (2008) suggests that these approaches may better explain the overall increase in the size of urban centers. Therefore, rather than identifying the differences between city/non-city or urban/non-urban communities, Trigger suggests that functionalist approaches assess the "factors that could lead to increases in the size of early urban populations" that result in pressures on the administrative classes to "devise the institutions of governance that were required for these cities to function" (55). These factors may include: overall population growth, rural unemployment, increased craft specialization, increased marketing and trade, growing numbers of administrators, landowners urbanizing as a way of seeking protection from commoners, defensive needs, cult activities, tourism, demands for education, and "the employment of more retainers to serve expanding urban elites" (55).

Apart from societal activities that resulted in large amounts of waste (ex. "some forms of handicraft production" or mining operations), one, many, or all of previously mentioned functions were within urban centers. These functions may carry variable importance throughout an urban center's history and some urban centers may exhibit only one or a few of these factors. Although there is no quantifiable threshold of when a specific number of specialized functions delineate a small town or urban center from a city, it may be simpler to state "Cities are large urban centers with numerous urban functions, whereas towns are smaller urban centers with fewer urban functions" (Smith 2007).

Perhaps the focus on broad definitions of urban and city borrowed from multiple urbanists like Childe, "misses the point in that it implies that there is a single, rational answer" (Butzer 2008: 77). Perhaps, after reviewing the multitude of approaches posited by the various movements and trends in the spatialities of built environments, one may conclude that it "would be much more creative to explore multiple facets [of the urban] such as religion, social values, and ethnicity at greater depth" (77). The insistence on simple or complex definitions based on materialities of urban environments is the foundation of urban archaeological study, which "we must transcend" in order to derive social understandings and theories through "a sustained, cross-disciplinary discourse among practitioners from all the subdisciplines..."
[where] geographers are major contenders in historical and cross-cultural urbanism, and they contribute to identifying and understanding questions of contemporary relevance" (77). In other words, discovering the social relations of built environments in past societies are more relevant when combined with interdisciplinary approaches where conclusions may be directly applicable to contemporary society.

C. Formal & Functional Approaches

Scholars such as Lewis Mumford (1961), Richard Fox (1977), A. E. Morris (1979), Kevin Lynch (1981), and Spiro Kostof (1991;1992) characterized a set of broad, yet potentially universal principles of commonly recurring traits (social, cultural, historical) and patterns (layout, architecture, form). Marcus & Sabloff identified a wide range of other comparative approaches to cities (Adams 1960; 1966; 1972; Andrews 1995; Arnauld & Michelet 2004; Benet 1963; Benevolo 1967; 1980; Braidwood & Willey 1962; Chakrabarti 1995; Doxiadis 1968; Fox 1977; Hall 1998; Hardoy 1968; 1973; Hauser & Schnore 1965; Kenoyer 1998; Kostof 1985; 1991; 1992; Kraeling & Adams 1960; Nas 1993; Nichols & Charlton 1997; Reader 2004; Redfield & Singer 1954; Robson & Regan 1972; Sanders et al. 2003; Scargill 1979; Sennett 1969; Sjoberg 1960; M.L. Smith 2003; 2006; Southall 1998; Trigger 2003; van de Mieroop 1997; Weber 1962[1958]; Whitfield 1969). Rather than focusing on the form of an urban conglomeration, some conducted an historical approach (Mumford 1961; Morris 1979). To accomplish the historical approach, scholars examined the city through history identifying these characteristics. Since Childe's analysis, there was a growing misconception about the form of early cities where a particular configuration or layout was described as either "planned" or "unplanned" (Smith 2007). This was a false dichotomy rooted in an ethnocentric focus on classical Greek and Roman cities. Late Greek and Roman colonial cities commonly exhibit forms that may be described as orthogonal. This orthogonality led some to conclude that these were planned and others were unplanned, or organic. Partly in response to this dichotomy, Kostof (1991) assessed the multiple variations in urban forms throughout world history and categorized them thematically under common spatial and architectural elements. Through empirical functional methodologies, these studies focused on both broad (ex. Gates 2003) and narrow accounts of urbanism (ex. case studies in M.L. Smith 2003; Marcus & Sabloff 2008). These approaches commonly assessed the broad materialism of the
form and function of the built environment (e.g. organic, gridded, or inorganic) while others narrowed their focus to specific urban elements (e.g. architecture, streets, or resources) within an urban locale.

Traditionally in historical urban studies, ancient cities are often classified by their spatial layout as “organic” or “unplanned” in contrast to the “planned,” often “orthogonal” city (Smith 2007). Still, “Nearly all scholars adopt a simplistic scheme in which cities with an orthogonal layout are classified as planned, whereas those that lack the grid principle are considered to be unplanned” (Smith 2007:3). Smith suggests that the term “organic” within urban research “often mistakes cultural variation in aesthetics for decentralization of urban planning” risking a largely Eurocentric perspective (citing Smith 2003). Smith (2003) continued by arguing for an examination between “competing plans and their vision of the proper role of political authorities in landscape production” (discussed later). Smith (2007) later argued that “the planners in most cases were kings and other members of the urban elite class” which in itself implies a sort of “central planning” (5). Ultimately the definition of “planned cities are those in which large areas were deliberately and self-consciously laid out” (2007). This dichotomy is one of many “simplistic schemes” that have been used to assess urban planning.

For Smith (2007), ancient planning may be identified on a linear ordinal scale of less planned and more planned. This scale eliminates the “erroneous assumptions” inherent in earlier scholarship that assess planning in a binary sense: present or absent. In this approach, a “more planned” city may exhibit some forms of orthogonality in one case, but in another case may only exhibit components of monumentality in the layout. In early cities, patterns may exist in central districts, or urban epicenters, but may be absent or dissipate in residential areas which may imply a less planned designation for the layout. Regardless, Smith concludes by stating that “the scale of planning is complex and multifaceted” and must be assessed beyond overly simplified schemas (2007).

If urban planning can be viewed empirically in the measurements of the spatial layout of urban areas, then it is important to discuss how this can be accomplished. Following Michael Smith’s (2007) approach, objectively analyzing the “form” of given urban areas yields results in two major areas: the coordination of buildings and spaces, and the standardization of layouts and buildings among cities (comparative analysis). Ideally, enough data exists to analyze the urban form within these components
using a variety of the methods that are discussed later. The coordination of buildings and spaces can be elicited from the structures themselves. Once a form is defined for an urban area, it can then be compared with other urban layouts based on a series of “standards” common to those forms (Smith 2007).

Spiro Kostof’s *The City Shaped* (1991) and subsequent work *The City Assembled* (1992) assessed at length the discrepancies and complexities involved in planned and unplanned growth based on four overall spatial models: organic, grid, cities as diagram, and the grand manner. These models are based on “thematic” discourse through functional considerations where these models are not defining notions of all city forms, but instead “metaphors” of city forms throughout history (1991). Here organic simply implies a city that developed “without benefit of designers, subject to no master plan but the passage of time, the lay of the land, and the daily life of the citizens” (1991). The point here is that to characterize a particular town as “organic” does not mean necessarily that an organic city in Greece will exhibit the same forms or functions as another organic city in China or Peru.

To discuss city form is to also discuss its function(s). As Kostof notes above, the city has a diversity of functions and as such they must be addressed in each of the themes here. I have borrowed these functions from previous studies in urbanism which includes economic, administrative, or religious (Fox 1977). The economic function can be expanded to include two of Kostof’s premises that a city has a relationship with the countryside and has a reliance on resources for income. Both of these imply geographical relationships and can be broadened into an overarching environmental function. This environmental function will also include a discussion of the role of topography, specifically in reference to organic patterning along a natural landscape. Many have argued that the patterns that appear in classical cities in the Mediterranean Basin are a function of environmental circumstances. These arguments state that cities were a function of terrain, accessibility to resources, and/or defense against climate variability (Gutkind 1964, Lynch 1981, Kostof 1991 & 1992).
Organic Patterning

“Where once there were fields and steep pasture land, streets will materialize and link up, tightly girded public places will ensconce collective life, and the spread of houses will thicken mesh...in time...these arrangements will turn self-conscious.” (Kostof 1991)

Some of the earliest towns show layouts inherited from earlier settlements that were based on tenurial patterns of agricultural land (Smailes 1964). Some of the reasons for the development of these earlier towns, however, have been lost in obscurity throughout history. The patterns of these cities are typically geomorphic in character. It is presumed that these developed without any benefits from designers, except as to what can be explained by the passage of time, the lay of the land, and the daily life of the citizens (Kostof 1991). Some of these developments are given the name of organic, irregular, or having an “instinctive growth.” These irregular cities can sometimes become patterned cities if overtaken by some outside force, such as colonization. It may be the objective of planners to have a specific layout, but a morphological attribute of unplanned processes can take over or vice versa (Benton 1968). Much of the focus here will be on the nature of city formation and notions of early planning. Attention will be given to influences, whether topographical, religious, or administrative, and to the overall formation of the cities placed within the context of Kostof’s organic patterning.

As I discuss the organic theme it is important to note that I am not referring to the usual bifurcated “planned” versus “unplanned.” In terms of ancient urbanism, this theme can imply both planned and unplanned cities. If we approach the city retroactively with a Western concept of organic, we might conclude that organic is the same as unplanned since it lacks the “usual” orthogonal layout seen within the gridded cities of today of as Adam T. Smith states “the ‘organic’ description of irregular cities often mistakes cultural variation in aesthetics for decentralization of urban planning” (2003). The discussions here will attempt to move beyond this fallacy and propose that ancient cities were planned regardless of their “patterning” or lack of “discernible overall direction or coordination” (Smith 2007).

Levant & North Africa

Ancient cities throughout the Levant and North Africa displayed some of the earliest forms of organic patterning. Along the eastern Mediterranean Basin, two civilizations constructed cities during the
Iron Age (tenth century BC – 330s BC) such as the Phrygians in Western Anatolia and the Phoenicians in the northern Levant (Neiman 1965). Unfortunately, little is known about city form in these three civilizations during the Iron Age of the Near East. Also the Nabataeans were colonizing parts of the Negev desert in the Southern Levant during the late Hellenistic and early Roman periods (Bienkowski 2006). What is especially common among these Levantine and North African civilizations is the importance placed on water management. Many of these organic towns were influenced by water management strategies (Ortloff 2008). It is also necessary to include a discussion of those strategies and how those pertained to city formation and growth.

The Phrygians have received little attention in previous literature due to the constantly changing landscapes of Anatolia throughout history. When Alexander the Great began his conquests through this region, much of the history of these peoples was destroyed. One of the only surviving settlements was located at Gordian (Young 1955, Devries 1990). Excavations have revealed that the Phrygians built massive “stone foundations of… city walls… and rectilinear buildings” and the city plan was relatively simple and designed along a main street (Gates 2003). The city itself is located on a floodplain next to the Sakarya River (Marsh 1999). The Phrygians also developed systems of water capture and irrigation through the use of “dredging systems” (1999). Unfortunately, due to the lack of Phrygian archaeological remains after Alexander’s conquests, no comprehensive survey exists that has mapped cartographically the layout of the city itself (Redman 1978, Devries 1990).

The Phoenicians are well known for their seafaring capabilities across the Mediterranean Sea. They were among the earliest sailors to colonize the Mediterranean extensively, in some cases sailing as far as modern day Spain and Morocco (Shaw 1989). In the Levant, one of the more well known city locations was Tyre. Expansion among the Phoenicians was a function of trade (Hansen 2002, Shaw 1989). Eventually the settlements would grow enough to become city states in their own right, such as Carthage, founded by the Phoenicians around 815 BC (Hansen 2000, Redman 1978). Still little is known about how the city of Carthage might have looked, but information can be derived from Greek and Roman literature. Much of the external literature discusses Carthage in terms of trade and their attempts to gain a monopoly on the Western Mediterranean (Hurd 1934, Schmitz & Klings 2001). It is difficult to determine whether the
settlement patterns were purely organic or orthogonal. What is understood is that there were three periods of "growth" in Carthage: attempts to dominate other North African Phoenician settlements, competition for control of the Western Mediterranean resulting in warfare with the Greeks, and finally the three Punic Wars with Rome (Scullard 1955).

Settlement in desert environments was difficult for early societies. These societies were able to adapt to the challenges of these harsh environments by developing and improving water management techniques for agriculture. In Roman Africa, for example, floodwater farming techniques were employed in the Libyan valleys that captured water runoff into fortified farms and catchments (Barker 2002). Similar techniques were developed throughout other parts of North Africa as in Algeria and Tunisia and the ancient Near East, specifically Israel, Jordan, and southern Syria. The Nabataeans, for instance, developed a vast array of permanent water harvesting techniques, catchments, pipelines, and nearby spring capture to support their central trade areas throughout Jordan and the Negev (Bellwald & Ruben 2003).

Each of these groups developed water management techniques that could thrive under the harshest conditions of desert environments in the Negev and northern Sahara. Many of the identified sites throughout Jordan and the Negev are Nabataean. Some researchers have claimed that the Nabataean establishment of Petra contained the most ‘unique’ set of techniques since it was an amalgamation of previously established methods borrowing from Phoenician, Greek, and Roman civilizations (Ortloff 2005). Also, there have been a number of sources that attributes Nabataean technology to the earlier Middle to Late Bronze Ages (Barker 2008, Chesson & Darnell 2005, and Haiman 1995). In Petra, there are four types of hydraulic systems that have been identified, (i) subterranean canal system throughout Petra, (ii) cisterns and pools for runoff catchment, (iii) spring water channels, and (iv) diversion systems for major flood events (most likely added later by the Romans) (Lane & Bousquet 1995, Bellwald & Ruben 2003, Joukowsky 1998). What is important to note here is the major role that water played in influencing city form throughout the Levant and North Africa and the indications that water played an equally crucial and important role in the establishment of spatial order within Petra. As a desert society, the Nabataeans implemented a number of water catchment regimes that enabled their existence within the desert mountains along the Wadi
Arabah and it is important to understand the role of hydrology in the urban morphology of Petra; an important component of this study.

**Ancient Greece**

When investigating city form throughout the history of ancient Greece, it is important to separate urban influences into several transitional periods. Here we begin with early forms present in the *Archaic* (600-479 BC) period of ancient Greece to the end of the Persian Wars. Much focus will be given to the initial city-states, or *poleis* as the Greeks referred to them. A majority of the “great achievements of Greek culture are associated with the [polis]” and will be used as the foundation of our analysis (Gates 2003, Zaidman & Schmitt 1992). By the seventh century BC, the Greeks had settled major portions of Anatolia, founded colonies in the Levant and Northeastern Africa, and settled small sections of Sicily and South Italy. Many of the settlements outside of the Aegean Sea were reflections of the originating city-states (Owens 1991). Therefore, our focus will remain within the Aegean considering that the major administrative centers of the *poleis* remained there (Hansen 2000).

In the Classical Period of Ancient Greece (480 BC – 323 BC), Mogens Hansen has argued for two methods that *poleis* originated: natural growth and deliberate foundation (2000). Here I focus on those city-states that originated through “natural growth.” By the time of the Classical period, most *poleis* in Greece were formed from nucleated segments of villages and farmsteads. For our purposes, investigating the Classical period as opposed to the Archaic period or earlier allows us to explore the “polis as city with a hinterland” (Hansen 2002). This will fulfill Kostof’s criteria of what a city is that was discussed above.

Hansen identified five aspects of the “polis as city” in the Classical period. The first is a centralization of political institutions. In this case, the polis appears to “have had a *pytaneion* with a dining room, where the principal magistrates of the city entertained...” and most poleis had a “Council-house (*bouleuterion*) as an independent structure, where the Council… held its meetings” (2006). However, Hansen points out that the architecture of the political centers was of “simple materials” and that “monumental political architecture” would not appear until the Hellenistic period. It is also important to note that the *agora* was the focus of public space and centralization of political authority until the Hellenistic period. Much of the polis was physically centered on the public *agora* where public assemblies were held often (Hansen 2000).
The polis also contained many religious structures and sanctuaries. It is commonly known that a majority of monumental temples were built in the Archaic period and were not born out of the polis, but that the polis consumed these structure into the city space (Owens 1991). Much focus and attention has been placed on temples located on an acropolis, but during the Classical period, many newer religious structures were placed on the outskirts of the walled parts of the polis or out in the hinterland, probably defining territory (Hansen 2006).

Before we can approach a discussion of ancient Greek city form, we must discuss synoecism. A term first used by Aristotle to describe city origins, synoecism is the theory of how small, nucleated and clustered villages coalesced over time to form an urban area, or city. Synoecism is the term commonly used when discussing aspects of early Greek city formation and can come about in two ways (Owens 1991). One is through the desertion of a village in favor of a larger village in the immediate vicinity (such as in early Mesopotamia and Iran) and the other is the spatial coalescing of villages through growth (Kostof 1991). For Kostof, synoicism describes “the administrative coming together of several proximate villages to form a town” (1991). For Harold Carter, an urban geographer, it is “the process by which a central organizing location grew out of the needs of a dispersed population” (1972). Many other urban historical researchers have discussed other ways of interpreting this process and have concluded that city form was a process usually driven by political goals first, and environmental and economic goals second (Smith 2005, Marcus and Flannery 1996). When investigating city formation in the ancient world, it is important to note that some researchers suggest synoicism as the primary influence (Marcus and Flannery 1996).

According to Aristotle, the “polis comes into existence” when “several villages are united in a single complex community… large enough to be nearly or quite self-sufficient” (350 BC). An example of this can be seen in early Athens when the original villages were clustered around the Mycenaean citadel around the Acropolis as was the original agora (civic center). By the fifth century, the villages coalesced in the walled city of Athens and the annual festival of Synoecia was held later to celebrate this evolution (Gates 2003, Hansen 2000, Zaidman & Schmitt 1992). What is important to note here is the Greek awareness of organic formation. This is different from previous scholarly notions that organic is equivalent to unplanned, in that synoecism is itself a form of planning.
Two of the most famous Ancient Greek cities were Athens and Sparta. Sparta was unique in that its focus was on military and defense and writing was of little importance. Unfortunately, this has resulted in little evidence of Spartan city form as few writings or archaeological remains exist (Whitby 2002). In contrast, the Athenians left researchers with amazing amounts of evidence that allow urban historians accurate assessments of its city form. During the seventh and sixth centuries BC, the city was centered on two dominant hills (Harris-Cline 1999). The higher hill contained the location for the Acropolis, a religious center inherited from the Bronze Age, while the smaller hill, near the Pnyx, was the Agora and public civic centers. The original Agora and Acropolis were situated along aspects of elevation (Graham 1964). These elevated components of the city illustrated two important aspects of culture: religion and administration. Religion was the most important cultural aspect for Archaic Greeks as can be seen in the urban pattern (Harris-Cline 1999). As kingships diminished and democracy expanded, the city plans evolved to include communal and public centers. For Athenians, the topography was a major influence in the placement of religious and administrative centers. The remainder of the city formed around the two dominant hillsides (Owens 1991).

Among the best examples of an East Greek city is Samos. Samos an island controlled by a central governing authority, a tyrant named Polykrates (538-522 BC). The city-island itself can be identified as being organic since much of the city is organized around the island coastal plain. This city also contained an Acropolis and Agora with the Acropolis located, like Athens, on the most elevated hill near the harbor. Although topography played a major role in the layout of the major structures of Samos, it is also important to point out the Tunnel of Eupalinos. Unparalleled in other Archaic Greek cities, the aqueduct was 1km long and was tunneled to a spring beyond the inner coastal mountains. Also, a fortification wall was built around Samos by Polykrates to protect them from Persian attacks. Eventually the coastal location, the fortification wall, and the aqueduct proved unsuccessful and the city fell to the Persians in 519 BC (Owens 1991; Gates 2003).

As the Persians moved to the western portions of Greece and attacked Athens, much of the cities were destroyed leaving little clues to other city forms during the Archaic period, especially in Eastern Greece. This destruction allowed for an urban renewal to take place marking the beginnings of the
Classical periods of Greece. During this time, influences on urban form took a different turn. The best city to characterize this transitional period is Olynthus. Olynthus is a city that appears to include two types of planning. One form includes the irregular street patterns that seem to conform to topographical influences including and Acropolis and Agora we saw earlier in the usual Athenian organic planning. Some scholars note that not all of the organic patterns of Olynthus have been uncovered, but it is apparent that topographical and climatic issues played a major role in the original shaping of the town pattern. The second form involved an orthogonal layout with paved streets aligned at right angles. This form has been identified with the Classical period of Greece following the aftermath of the Persian Wars.

During the urban renewal of Athens, the Acropolis and Agora were rebuilt and restructured with an emphasis on defense including a fortification wall. As was noted above with Samos, this emphasis on defense was characteristic of the late Archaic and early Classical periods. During the refurbishing of the Arcopolis in Athens, the Parthenon was constructed as a Temple to Athena Parthenos, the Temple of Athena, and the Erechtheion. These included architectural features that were apparent in both the Doric and Ionic traditions indicating a diffusion of culture and techniques across the Aegean in the early Classical period. Although there was much emphasis placed on the religious aspects of monumental construction, the new city center was designated as the Agora which also became a major market center within Athens. This indicates a shift in cultural priorities from religious centrality to public mentalities.

In the lower town of Athens, the residential neighborhoods in the Classical period were still demonstrating organic patterns. This is unusual since much of the newer developments during the “urban renewal” period during this time were borrowing from Hippodamian principles, such Pergamon or Priene, which will be discussed later. The streets of the lower parts of Athens continued to display haphazard and irregular shapes with “narrow, twisting streets of hard earth and gravel” (Gates 2003). The outgrowths from the inner cities in Ancient Greece continued to display these irregular patterns until the end of the Classical periods.

**Etruscans & Early Rome**

Usually when we consider Roman city form, a harshly grided pattern designed around administration and defense comes to mind. However, the city form of early Rome (c. 650 BC) can be
characterized in a similar way to the Greek synoecism discussed above. The Romans, like the Greeks, celebrated their synoecism in an annual feast of the *Septimontium* (Rykwert 1989). This celebration pointed to “Romulus’s settlement on the Palatine joined together with several other hilltop villages on the Esquiline, the Caelian, and perhaps the Capitoline,” around the eighth century BC (Kostof 1991). The organic nature of early Rome was a result of the coalescence of these hilltop villages. According to the biographer Suetonius, Emperor Augustus boasted that he had “found Rome a city built of mud-brick and left it a city of marble” (28 AD) (Boren 1977, Owens 1991). Compared to other Greek cities at the time of Augustus, Rome was lacking in monumentality and organization. Even some suggest that Rome “does not belong in the category of planned cities” (Tomlinson 1992).

It is likely that many of the influences to urbanization of early Rome originated from the Etruscans, who were themselves influenced by early colonization from the Greeks (Rykwert 1989). When the Etruscan kings ruled Rome from 600 to 509 BC, they distributed Greek urban forms improving drainage (the *cloaca maxima*) and paving parts of the city (Boren 1977). The resultant Forum Romanum became a central gathering place for the residents. Also, the Etruscans are credited with constructing some of the earlier temples, like Jupiter Capitolinus. The origins of Roman fortification are unclear, but some attribute the walls to early Etruscan cities of the seventh and sixth centuries that were also fortified while others have concluded the wall was built in response to raiding Gauls in 390 BC (Gates 2003, Owens 1991). Although Etruscan city form is most well known for its orthogonal layouts of Marcabotto and Orvieto, most of the cities seemed to feature hilltop locations with cliffs and walls, unplanned and irregular networks of streets and housing, and some religious structures.

Due to the modifications and transformations over a long span of time, the urban history including the building fabric, functions, and form of the original city of Rome are complicated. During Republican times, the Roman Forum (Forum Romanum) was the civic center of the city located on the lower ground to the north of Palatine Hill. Leading into the forum was the *Sacred Way*, which indicated the “intertwining of religious and civic… at Rome as already seen in Athens and the Ancient Near East” (Gates 2003). As the need arose, communal and public buildings were added over time in irregular patterns, also comparable to the Agora in Athens.
Over time religion took on more significance for early Romans and three temples were constructed in the forum. The main temple was dedicated to Vesta, the goddess of the hearth, which contained “the sacred hearth fire of the state” and was central to the Roman religion (Gates 2003). Another temple was the Temple of Saturn, which stood on a high podium and contained the state treasury. As was the case with many structures in early Republican Rome, this temple was reconstructed many times over the course of history. The third structure, also built on a high podium, was to the twin deities Castor and Pollux who were credited with the Roman victory over the Latins in 496 BC. This structure was also rebuilt later during the Augustan period. What is important to note within the city of Rome during the Roman Republic was the centrality of administration and religion (Rykwert 1989). This is no surprise considering the influence of the Etruscans and the Greeks in earlier centuries. Also, the original city evolved through organic patterning, usually conforming to topographic features and influenced later by the need for administrative and religious representation.

**Imperial Rome**

Much of the re-urbanization discussed earlier in Rome was a signification of the “New Order” ushered in by the rise of Emperor Augustus. In the main city of Rome, changes were applied to the building fabric and the new “grandiose palaces, temples, commemorative monuments, and civic buildings commissioned by the emperors” (Gates 2003). Also, in part due to the new use of concrete, the fabric and structural materials of the buildings themselves changed. During the imperial period, Rome acquired many buildings dedicated to emperors such as the Baths of Diocletian, the Baths of Trajan, the Baths of Caracalla, and so on (Owens 1991, Tomlinson 1992).

The city of Rome during the Imperial Period abandoned the focus on religion as can be seen by the lack of construction in religious temples. The newer structures and city form now resembles those of the Hellenistic kingdoms and dynasties. In the Hellenistic Ptolemaic and Seleucid dynasties, the centers of new cities had palaces and temples dedicated to the dynastic kingships. As we can see, the same took place within imperial Rome (Rykwert 1989).
Orthogonal Layouts

It seems that, throughout history beginning with Hellenistic Greece, the more popular form of city planning was the grid-iron, orthogonal or checker board pattern. This remained the standard form for new towns that were established following Alexander’s conquests in the Middle East (Smailes 1966). Whether we discuss the flat plains of Alexandria or the hillside topographies in the Po Valley, the grid’s orthogonality has been useful as a method of “creating urban order” (Kostof 1991). There are a number of points that need to be addressed when discussing the grid. One is the location of religious and political structures. Throughout much of the ancient world, the location of these structures have indicated the centralization of authority, whether gods, goddesses, or an assembly of people, as was especially the case throughout Greek colonization. Ultimately,

“the Hellenistic city was designed to project a New Order of enlightened polity and Greek civilization I non-Hellenic areas. The axial layout and formal architecture represented dynastic power, the official cult, and the centers of cultural and social interaction… clustered around the city core… designed to impress and to acculturate these indigenous, Near Eastern peoples” (Butzer 2008:83).

Another point is the irregularities that may arise during the formation of the grid. In some cases the grid was installed in an area that was inhabited previously and may maintain characteristics of that previous culture. Throughout much of the ancient world, the grid was a luxury afforded only to those societies that were capable of colonizing other land areas. Much of the focus here will be on colonization efforts of the Greeks and the Romans, considering that many of these sites still exist today.

Early Greek Grid

The Greeks established forms of orthogonal layouts as early as the seventh century BC. As we will see in Roman colonization efforts, the grid seemed to function best within Greek colonies such as Smyrna, Olbia, Priene, Miletus, or Pergamon. Colony in Greek is apoike or “away-home” (Kostof 1991). As urban populations expanded in some of the original Greek organic cities, such as Athens, colonizers were sent out to find other avenues of growth. The reason for the usually orthogonal layout is that land division in other geographic areas was of little concern (Boyd & Jameson 1981). The usual notions of synoecism no longer applied in open areas without prior settlements (Owens 1991). Eventually, as per the usual methods of Greek philosophers, order of geometry was to be applied to these new orthogonal plans.
In Miletus in the later parts of the Archaic period in Greece, Hippodamos derived a philosophy about the "art and science of city planning" (Eisner 1963). It is Hippodamos who has been credited with the "grid-iron" system and its introduction into the Western world. These principles were applied to a number of Greek city forms in Archaic and Classical Greece. Although the grid plan was already established, Hippodamos meant to perfect the plan with three classifications of ownership: "craftsmen, farmers, and soldiers" (Grew & Hoblet 1985). Up to this point the colonies were divided up by the original colonizers and those who arrived later had to "do without" (Kostof 1991).

The city of Priene is one of the better preserved orthogonally-oriented Greek cities. It is located on modern day Turkey's coast near the Aegean Sea. For reasons unknown, the town technically occupied two sites. One site is the newer location closer to the sea coast. The residents of Priene evidently moved to the new location in the fourth century BC. The older location is still unknown, but it is likely farther inland and was settled sometime in the second to first millennia BC. The defense systems of Priene incorporated the mountainside to the north while the walls were constructed along the topography. The city itself is gridded and the streets were laid out along east-west and north-south axes. The Agora is located at the geographic center of the city where the main streets meet and indicates the focus on public life (Graham 1964). The bouleuterion (or council-house) was located just north of the Agora also situated near the city center. The streets themselves were leveled so as to allow easy wheeled access within the city for transport purposes. To the west of the city center is the Temple of Athena, the most important shrine of the city (Fustel 1956). Also, the temple is especially important since Alexander himself made the dedication after financing its construction. Although one might be willing to associate this grid with Alexander's conquests, Priene was a grid laid out prior to Alexander's spreading of the grid across the ancient world (Wycherley 1945, Gates 2003). Priene demonstrates a unique diffusion of the grid across the Ionic landscape just prior to Hellenistic civilization.

**Distributing the Grid**

While Alexander was conquering the ancient world, the grid layout went with him. These new cities took the form of two types of settlements (or colonies). One was a town or city established purely for military reasons, or katoichiai, and kleruchiai which were "legitimate offspring of mother cities" (Kostof
After his conquests, the Hellenist dynasties led to the “mass production of new Hellenistic cities” usually meaning the grid layout. New cities in the Seleucid dynasty, such as Antioch, Apamea, and Laodicea all conformed to the grid and “had blocks of the same size, roughly 367 by 190 feet” (Downey 1963).

One of the first cities created by Alexander during his conquests was modestly named Alexandria. Alexander himself is credited for layout out the basic conceptual plan of the city, but the architect Deinokrates receives the credit for the details (Ortloff 2008, Kostof 1992, El Din & De Luca 1993). Much of the settlement is located along a flat plain and promoted topographically the usefulness of the grid layout. Some scholars have claimed that Alexandria was based on Macedonian principles and is similar to the layout seen at Pella. Two main streets crossed the center and met at the Agora (Gates 2003). The placement of the Agora in the center along east-west and north-south axes is similar to that also found in Pella. Also, a bridge, called the Heptastadion, was built to connect with Pharos Island. It is also likely that the city was inhabited prior to Alexander’s arrival as traces of massive harbor works were discovered, however their origins are still disputed (Tomlinson 1992). Unfortunately, in its original state little is known about the location of its sanctuaries, religious structures, and original public buildings.

**Etruscans & Greeks in Italy**

As was discussed above, the Etruscans, living in Etruria just north of Rome, contributed much to Roman culture and it is appropriate to start here when discussing urban forms in the ancient Italian peninsula. The Etruscan contributions to Roman urban form are controversial, but it is known that they shared similar rituals to their earlier aspects of city form. It is also important to note that the Etruscans did not have a unified government but were maintained city-states that were similar to, and perhaps influenced by the early Greek poleis. Through kingships and aristocracies, the Etruscans were able to expand north to the Po Valley and ultimately south to rule Rome itself from 600 to 509 BC. Conflicts with Rome continued until the first century BC when the Romans finally conquered the Etruscans.

The city of Marzabotto was established by the Etruscans in the late sixth century BC near Bologna in the Po Valley. This city is a “classic example of early Etruscan orthogonal town planning” (Gates 2003). The wide streets ran north-south and east-west with narrow streets in between. Every street was also lined
with drainage canals. One may want to conclude that the Greeks were influential in the development of this city; however there is a striking absence of an Agora or city center with communal or public structures. The temples and altars within the town are oriented cardinally along with the main grid (Rykwert 1989).

Paestum is an example of an early Greek Italian city with a form laid out along an orthogonal grid. The city was most likely settled in the sixth century and most likely took on a grid pattern then. It is difficult to measure Greek plans in some of the earlier Italian cities considering that Roman colonization usually conformed the city into a plan of their own (Rykwert 1989, Owens 1991). Other confirmed Greek colonies in the Italian peninsula took on the grid form as well, such as Metapontum. In Paestum, there were three Archaic and Classical temples, identified as the Temple of Athena, the Temple of Hera I, and the Temple of Hera II (Boren 1977). Considering that the city form was most likely planned in the sixth century, Hippodamian principles were non-existent. The grid here conforms along less strict orthogonal lines. It does seem that emphasis was placed on the orientation of the temples as they were placed along a north-south line in the middle of the city “each oriented toward the east” (Gates 2003).

**Roman Colonization**

As was mentioned above, the Etruscan grid influenced Roman colonization heavily. However, as the Roman Republic was already forming their own “grid identity” as they took over the Etruscan and Greek portions of the Po Valley with the founding of Pavia, Verona, and later Aosta in 25 BC. At this time a more inner-locking frame with wider blocks took shape. The forum was usually placed in the center where the major axes joined. In the transitional period between the late Republic and the early Empire the grid represented the “New Order” (Kostof 1991). Pavia and Verona maintained identical layouts. In the city of Rome and the small local towns of the provinces, the organic patterning discussed above was kept mostly. However, colonies where centralization of authority was needed, such as in provincial capitals in Roman Africa, the Roman Near East, and Britain the grid was instilled. The gridded pattern was popular throughout Roman antiquity with towns divided into blocks (*insulae*), and the city walls were also characteristically laid out in the form of a square or rectangle, with four main gates. These gates ran north-south, known as (*cardo*), and east-west, known as (*decumanus*) (Boethius 1960, Ward-Perkins 1984).
Cosa was among the original colonies (*coloniae*) founded by the Romans in the third and second centuries BC. Originally the colonies were meant to control conquered territory, as was the case with Cosa. Cosa was part of Rome’s northern expansion into the Po Valley. Despite its highly contoured landscape, the town was laid out with a grid. The town’s streets form the usual grid pattern seen throughout many colonies in Rome with a wall erected around the outskirts in a somewhat irregular pattern. Throughout Republican Rome, the city form served two common functions. The first function is the focus on the temples, in the case of Cosa the focus is on the Temple of Jupiter inside the citadel known as the Arx. A major street was laid directly from the Arx downhill to the second important function, the *forum*. Here the forum is constructed with a circular open-air and the curia which house the local senate. Cosa is considered to be characteristic of the variety of functions, especially administrative and religious, included in the colonization periods of the Republic.

As was seen above, Rome was re-urbanized in ways that represented the “New Order.” After Emperor Augustus applied changes to Rome, the changes could be seen throughout the rest of the empire. Due to the ever expanding empire, colonies became a means to house veterans of battles and wars as was the case with Timgad in Northern Algeria. Here we can see Timgad is unique as it represented the simplest and most rigorously applied orthogonal layout.

Some colonies of imperial Rome consumed the indigenous layouts in their efforts to apply a grid city form. A specific case of this was with Jerash in modern day Jordan. For the most part, the city plan follows a standard grid. However, there are topographic features and peculiarities that set it apart from most imperial colonies. The city, prior to Roman colonization, was established during the Hellenistic period, most likely by the Seleucid king Antiochus IV Epiphanes. In 63 BC the town passed to the Romans and was completely romanized by AD 130. As was usual during imperial Rome, structures like the large triumphal arch in the south was built in commemoration of Hadrian’s visit in AD 128-9. The Temple of Artemis was the most prominent Roman building built in the center of the city. Irregularities were frequent, as was the case with Jerash, but the desire for a city-wide organization was always present.
Alternatives to the Organic versus Grid Paradigm

Smith (2007) called for a new approach to the study of ancient urban planning based on two overarching components. The first is assessing the coordination among the buildings and spaces in a city by empirically examining a) building arrangements, b) formality and monumentality of the layout, c) orthogonality, d) geometric order, and e) access and visibility. The second component assesses the “standardization among cities” through a) architecture, b) spatial layouts, and c) orientation. Smith included a short discussion on metrology, or the study of units of measurements and how those units may represent symbolic relationships, but as of now there are few studies on this aspect and will not be included here. Most of these aspects can be measured empirically through spatial analysis and overlap with methodologies of urban morphologists.

The coordination of buildings may involve the sharing of common orientations. These orientations alone have been used to derive conclusions about the planning scheme of a certain urban area. Smith (2007) points out that the “simple fact of common orientation does not necessarily imply central planning because other factors such as topography or location with respect to [resources]… could produce the same pattern.” It is more practical to assess orientations in terms of cultural contexts and arrangements through “common reference[s] to features such as avenues, plazas, city walls, a royal palace, or other urban architecture.” Also, many early cities oriented their layouts along cardinal directions (Wheatley 1971, Smith 2007).

Perhaps the most common assessment of early city form has been about orthogonality of the spatial layout (Smith 2007). This is reflected in the planned versus unplanned dichotomy above where the absence or presence of an orthogonal grid demonstrates a “plan.” Moving beyond this simple bifurcation, Smith (2007) expands the nomenclature along “degrees” of a coordinated orthogonal layout. One example is to assess a “semiorthogonal urban black” arrangement that “occurs in dense settlements in which each individual house abuts one or more other houses,” such as Catal Hoyuk, Mohenjo-Daro, Ur, and Amama. This layout is viewed as a product of simple “practicality and efficiency…[owing]…little to central planning” (2007). It is more likely that these are factors of unplanned growth even though they may exhibit orthogonality.
Smith (2007) proposed an integrated orthogonal plan which is best represented “when buildings are aligned orthogonally with respect to one or more large-scale features.” Smith cites the alignments of the buildings along the Street of the Dead in Teotihuacan as an example. An integrated plan may also be a function of topography, like in some Greek orthogonal cities where two orthogonal zones may exist within a single urban area (Castagnoli 1971, Ward-Perkins 1974). Another may be a function of resources where canals and reservoirs contribute to an orthogonal layout for a given city, like what may be the case in Angkor (Fletcher 2001).

Lastly, a modular orthogonal plan is proposed to represent the higher level of the ordinal ranking of orthogonality. A modular plan is best characterized by strict grids of intersecting streets at near ninety degree angles. The obvious examples are those found in Roman military camps and colonies and occasionally in Greek and Hellenistic cities like Olynthus (Castagnoli 1971, Cahill 2001, Gates 2003). Smith (2007) points out that it is likely this type of orthogonal plan that has contributed to the Eurocentric view of the planning dichotomy discussed earlier. In early cities of the ‘Old World,’ this plan occurs in only a few locations, often in political capitals, like in “China, South Asia, and the ancient Khmer cities of Cambodia” (Wheatley 1971, Steinhardt 1990, Spodek & Srinivasan 1993, Fletcher 2001, Smith 2007). This type of orthogonal planning was rare in the Near East and Mesopotamia, although it has been seen in Assyrian and Persian periods at Borippa and Babylon (van de Mieroop 2003, Gates 2003, Smith 2007). Another aspect of arrangement worth noting is borrowed from Kostof’s diagram cities (Kostof 1991), which Smith characterizes under “other forms of geometric order” (2007). Although there are only a few examples of this in the ancient Near East, their presence merits some discussion. Examples of this type are seen with Parthian and Sassanian cultures that later “became incorporated into Islamic city planning with al-Mansur’s plan of Baghdad” (Johnston 1983, al-Sayyad 1991, Smith 2007), or in earlier examples of Iron Age Palestine and circular fortifications that surrounded residential communities (Kempinski 1992, Shiloh 1978, Smith 2007).

Apart from the potential of Smith’s new approach to ancient urban planning, these approaches adequately illustrate some of the urban functions of early cities and urban centers, it does little to explain "their form, social composition, and the specific activities that occurred inside them" (Trigger 2008: 56). The
approaches outlined above provide a number of valuable considerations with regard to a city’s overall location, size, and growth, but missed opportunities to consider what “occurred inside them” (56). These analyses require expansion to include multiple aspects of society including their economic, political, and historical contexts and evolving points of view. In addition to the multivariate, idiosyncratic patterns in ancient cities, societies and cities were not monolithic. Cities were malleable tools of societies that interacted and facilitated change within a society or city over time.

The layouts and resulting configurations of early urban centers varied widely across time and space. Considering this, if urban centers were primarily a function of cost-based, economic circumstances, then these layouts would invariably demonstrate similar patterns to one another, but this is not the case (Trigger 2008). While the behavioral approaches attempted to explain the city from an external perspective borrowing from internal measurements, it did little to consider the internal social relationships (religion, politics, economics, or culture) and interactions between the city and its residents (individual perception, movement, or historical memory). To explain the multiple variations in city layouts, patterns, forms, and functions, some scholars attempted to thematically compare cities throughout world history using common historical, cultural, regional, temporal, and architectural themes.

**Multiscalar Classifications: Cities, States, and Civilizations**

“Technology, settlement patterns, art, and architecture can be understood only in terms of the roles they played in materially supporting such [social, economic, and political] institutions, facilitating social interaction, and promoting the ideological objectives of various segments of society.” (Trigger 2003: 44)

Numerous studies have been conducted since the Childe’s list of characteristics related to early societies. While it is well concluded that Childe’s list pertains more to early urbanizing civilizations than to cities directly (Trigger 2003; Smith 2003; Smith 2009), a plethora of scholars considered the multiple configurations of social and spatial complexities of early societies throughout nearly all regions of the world. The focus was predominantly towards urbanism and the various characteristics of form, while others were, like Childe’s revolution, comparative where urban systems were representative of entire states, territories, regions, and civilizations with linkages between the spatial configurations and the social transformations. In terms of transformation, scholars proposed a wide range of reasoning that demonstrated why societies
transform, whether along a linear continuum (mostly abandoned today) or through complex multiscalar analysis. In recent years, the focus of comparative studies “is of course essential” (Mote 1977:110) when identifying the potential for universal societal characteristics (similarities) and near-universal differences. Still, “[a]bstracting the seemingly comparable elements to construct broad generalizations… must be done with considerable understanding of peculiarly [or specifically cultural] conditions” (1977:110).

We have examined the multifaceted definitions, forms, and functions of urban and city in the opening discussion above, but I now turn to recent approaches to notions of State. The nomenclature of State-centered discussions often include terms like primary/secondary, archaic, pristine, early, or complex and recent considerations for civilizations, city-states, territorial states, or early complex polities. Rather than recounting the methodological and epistemological problems of State typologies dubbed archaic or pristine state (see critiques by Smith 2003: 94-102; Trigger 2003; Yoffee 2005), I focus herein on studies that consider social development or social formation as the major thrust of societal inquiry and how it relates to the manifestation of specific spatial formations within emerging urban environments. This assists in determining the multi-scalar social factors that influenced the spatial formations within Petra. Much of the focus in recent studies on states maintain discussions of city-states, territorial states, and empires (or regional states) where the term states primarily refers to an areal totality with a centralized political authority (Scarre & Fagan 2003). For the sake of this review and following a preliminary discussion about comparative studies, I herein limit the discussion to the growing dichotomy of city-state vs. territorial state. This dichotomy is still influential in discussions of early polities, states, or nations (Hansen 2000; 2003; 2008; Trigger 2003; Yoffee 1998, 2005; Marcus 2008).

The theoretical social aspects involved in what encouraged or discouraged social action or inaction provides a stronger framework for discussions related to social production and reproduction. My assessment includes aspects of city-states and territorial states, borrowing primarily from the writings of Mogens Hansen and Bruce Trigger. This dichotomy is not to suggest that these states were radically different but rather to facilitate discussion between motivations of social behavior that resulted in similarities and differences between all early societies (Trigger 2003) considering that “layouts of urban centers in early civilizations display considerable variation” (2008:56). Additionally I include a summation of
Smith’s discussion of “early complex polities” as it is also relevant to any discussion on early urbanism. The formal, functional, and cognitive elements associated with these comparative typologies were especially revealing in how studies of urbanism may be related to socio-political organization, economics, and culture (Trigger 2003). Within Nabataean society, discussions of social development pertain primarily to the so-called ‘Bedouin state’ and the ascendency of the Nabataean tribal group (Knauf 1989), social transformations from nomadic to sedentary life (Parr 2003; Wenning 2007), the impetus of urbanization at Petra (Parr 2003, 2007; Wenning 2007), and Petra’s early urban development (Parr 2007).

Smith offered the term early complex polities to describe the practical, relational dimensions of political authorities. This particular syntax may be regarded as a combination of two broadly defined terms of "early polities" and "complex" (2003: 103). Early polities refers to the delineations inherent in the potential for data collection. The earliest societies are primarily investigated through material archaeological records, while later polities often were accompanied by numerous epigraphical evidence and historical documents. Simply put, early polities are identifiable by methodological restrictions where the absence or presence of limited historical documentation necessitates spatial contexts in order to "provide sufficient bases for understanding social life without archaeological research" (2003: 103). This delineation is especially helpful when considering the historical placement of Nabataean society where, unlike Hellenistic counterparts, the historical documentation and epigraphic evidence limits understanding of Nabataean social behavior. Therefore, archaeological context is necessary to gain a more complete understanding of Nabataean social phenomena.

For Hansen (2000; 2006), the city-state maintained an empirical set of measurable properties. In these cases, the city-state is "highly institutionalized and highly centralized" within the greater regional cultural landscapes "consisting of one town (often walled) with its immediate hinterland and settled with a stratified population" (19). The surrounding territory of a particular city-state tended to remain small geographically with populations who were "ethnically affiliated with the population of neighbouring city-states" (19). Perceptions of political affiliations, however, remained internally focused within the city-state itself where the majority of the population resided. Interestingly, Hansen points out that although the political orientations were usually internal, these perspectives existed as a differentiation between
neighbor city-states often resulting in a “self-governing” unit that is “not necessarily an independent” one (19). These connections resulted in a "city-state culture," of sorts where the networks themselves become the civilized system with each being reliant on the other for survival (19; Yoffee 2005). Hansen's archetype of the city-state was mostly drawn from the Greek polis. Considering this, it is important to point out that the use of the term city-state for Hansen and others (Trigger 2003; Yoffee 2005) does not necessarily encompass the entirety of a civilized society. As is the case with the Greek polis, the network of city-states (or poleis) may result in the civilization which is then better described as a geographic, "cultural boundary within which city-states (and their citizens) interact" (Yoffee 2005: 46).

The interconnected city-state systems “tended to compete, often militarily, to control intervening territory, trade routes, and other resources while at the same time sharing common beliefs and symbols and making alliances with one another, often in the form of intermarriages among their ruling families” (Trigger 2008:56). Spatially, city-states, according to Trigger (2008), varied in size but usually “controlled a territory of only a few hundred square kilometers” with a “capital city usually near the center of its territory” (56). Peripheral cities, including small farming villages and hamlets, formed in close proximity to the main capital city. These led to a relatively dense and large population “ranging from a few thousand to 100,000 individuals” depending on the administrative ability to manage, control, and tax the expansive population. Cities were viewed as centers of protection resulting in the concentration of not only full-time crafts and labor specialization, but also farmers and peasants who labored in the countryside. The mixing of these populations allowed for urban-rural trade of specialized higher quality goods in exchange for raw materials/resources. Interstate trade was organized by non-residential non-member merchants allowing for the continuation of trade even during interstate conflicts. Transport costs were mostly linked to non-member merchants while agriculture remained predominantly clustered near the city enabling about 10-20% population providing services and production of specialized goods (Trigger 2008; Hansen 2000; 2008).

The city-state often showed signs of planned and unplanned growth. Temples were located near the geographic center and surrounded by walls and connected to the main thoroughfare of the city through a broad straight avenue. Royal palaces and administrative centers were less centrally located considering
that power was generally shared through multiple institutions, leading families, and the wealthiest residents. Divinely ordained authority was less extensive in city-states. The interior was characterized by networks of streets and paths lined with houses, while trade occurred outside the city. This corresponded to the rise of suburban populations made up of wealthy tradesmen or migrant poorer populations (Trigger 2003; 2008). Considering the multitude of variations in early states, others have offered the term "territorial state" (Tigger 2003), borrowed from Maisels (1990), to contrast with the geographic and cultural networks common to city-states. One of the earliest examples of this variation is from ancient Egyptian society. In Egypt from the fourth millennium BCE, the state was "politically centralized, marked by an extreme polarization of wealth, symbols of kingship over an Egypt perceived as a geographic and symbolic duality" where the spaces in these geographic/symbolic centers showed marked "growth of mortuary architecture ensuring the continuing role to be played by kings in an ordered and decorous cosmos," which were also expressed in "elite art forms" and writing (Yoffee 2005: 47). What is extra telling about Egyptian state formation is that urbanization appears to be more "a part of the trends towards territorial unification rather than a factor opposing such trends" (48). This claim is best validated in the form of iconography, epigraphic, and architectural evidence found throughout the Egyptian territorial domains where "symbols of kingship and unification, including royal names, are found all over the country" indicating a "developing territorial ideology" (48). Here the role of the state was to manage the distribution or labor and resources whose managerial actions were legitimized through "displays of royal power and religious ceremony" (2005). The role of cities in Egyptian territories may be explained in the following summation:

"The unified state commanded and managed the distribution of resources in which cities played special roles. Much of the structure of cities was dedicated to displays of royal power and religious ceremony (especially in mortuary displays), and administration in the cities was primarily concerned with managing these displays and the labor needed to build and maintain the edifices of royal and ritual power" (2005:48).

Therefore, urbanism, in territorial states, may best be characterized as spatial methods of defining territorial and cultural boundaries while in city-states, these boundaries are dependent on the associations of competing cities within a greater network.
In territorial states, administration was established through a geographically extensive and elaborate hierarchy which was highly centralized with complete control over the economy. The total area of the territorial boundary was much larger than city-states, but the cities were far less populous and densely populated. Rulers, officials, and their retainers and specialized craftsmen encompassed the social range of urban populations. Farmers and peasants remained within the countryside and had no need to seek protection as the state focused protection and security on the broader territorial boundaries. Therefore, agricultural communities continued to exist unchanging, while the urban elite were consistently elevated in political and economic significance (Trigger 2003).

The hierarchical pattern of social formation was reflected in a spatial hierarchy as well where numerous nested centers existed throughout the territory. The capital city maintained a mobile potential, shifting to various sites throughout the territory and monarchs spent much of their time travelling between nodes in order to maintain allegiance of these nested cities. These cities often took “the form of dispersed settlements where rulers and the upper classes lived in special enclaves around which administrative and storage facilities, cult places, burial grounds, and settlements of lesser functionaries, retainers, craft workers, and supporting farmers were arranged” (2003:133). Within these cities, the urban elements were generally the same where houses often maintained large ornamental gardens and elite areas were often enclosed by walls and sheltered from public view, reinforcing the symbols of power and exclusion. Ultimately, the symbolic heart of the urban fabric was not the architecture, but the role of the residing monarch and his court which was subject to change (2003).

Some scholars considered this dichotomy as a potential trajectory of transformation where city-state evolved into territorial states (Renfrew 1997) and/or vice versa (Marcus 1989; 1998). Still others reject a perspective that still relies on size-based value judgments to determine the potential differences and that a “complication of [Trigger’s et al.] approach is that [they] link the size of the polity with variations in the degree of urbanism and entrepreneurialism without developing causal links” (Stone 2008:141). Instead, Stone proposed that one may consider variability along a “single dimension” (2008:142), such as the hierarchical structures of early societies and whether hierarchy was necessary in state societies. Following Crumley (1987), it is possible to consider the differences and variations in terms of heterarchy,
such as Blanton’s (1998) distinctions between “systematic exclusionary domination” (144) and “corporate power strategy” (145; cited in Stone 2008). Identifying the differences between those complex societies based on hierarchy versus heterarchy, Stone argues, is the “underlying social structure [that] shaped the physical organization of ancient cities” (Stone 2008:142; also 1997; 1999).

This perspective is notable to this study because it considers the potential for variation among societies with limited, or energy intensive access to arable land and resources. Here, Stone reintroduced the potential for environmental influences in determining socio-spatial patterns stating that “exclusionary domination… [is associated with] arable land that is both permanent and bounded” while corporate power strategies appear where “land is either… impermanent and unbounded” and “represent unusual environmental conditions” (142). Ecology, therefore, may account for the variations identified by Trigger’s assessment. Arable land that is geographically and physically bounded by natural features, such as a river or desert (ex. Egypt and Peru), “makes it easy for elites to monopolize the means of production… and thus control the larger population… and elites were able to live apart in small enclaves that were separated from rural populations” (142). The restrictions on the dispersion of the population enabled effective systematic exclusionary domination.

Those that were scattered or where land was unreliable whereby populations were required to traverse longer distances, it was “imperative for the rulers of these states… to attract labor rather than control arable land” (143). Therefore, in corporate power strategies, “power sharing and the provision of broad economic opportunities are needed to attract and maintain the labor force” as characterized by “large populous cities, high levels of entrepreneurial activity, high social mobility, [and] more open decision making” (143). This was maintained even during times of conquest where a society participating in corporate power strategies maintained these social relationships even after domination, as is similar to claims about city-states (Hansen 2000; 2008; Trigger 2003). Cities such as the capitals in Yorubaland (Krapf-Askari 1969) or Medieval Syria (Abdel-Nour 1982; Lapidus 1984 [1967]) were identified by Stone (2008) as physical manifestations of this relationship where “political and religious institutions… were physically and structurally… separate, a reflection of the power-sharing mechanisms” (143). These kinds of cities mostly characterized by a centralized entrepreneurial market center, which attracted and “connected
people living in different neighborhoods” which were themselves made up of “different social classes and served as the locus for social mobility” (143).

By contrast, exclusionary domination may be identified spatially through their relatively small size, dominance of centralizing institutions, and occupations by elites and their servants (Stone 2008). Occasionally, as was the case with Cuzco (citing Bauer 2004:107-138; Hyslop 1990:29-68), labor and dependent populations were clustered around the fringes of the city, perhaps forcibly placed nearby, or laborers were “scattered throughout the countryside” (Stone 2008:143). The smaller sizes of these cities reflect the ability of these elites to dominate at close proximity (2008). The qualities here are more closely associated with what is known about territorial states. What should be clear in these discussions of state is that the layout of the urban environment in question may be directly related to the formation, growth, and transformation of entire complex societies. Social forms and functions necessitate spatial forms and functions regardless of scale. This is an important conclusion in that understanding the social development of Nabataea, its socio-political formations and emergent institutions as outlined in the previous chapter, one may better understand the resulting spatial forms. To further this understanding it is important to discuss recent investigations into what sort of state, if any, the Nabataeans developed.

The Nabataean State

In Nabataean research, questions of state formation have emerged. The majority of discussions revolve around the transition from nomadism to sedentary life that would later characterize an urban Petra. For instance, Knauf (1992) suggested that Nabataean society was structured in a manner that is best described as a “Bedouin state,” where the various sub-tribal groups may be characterized and measured chronologically by their use of the camel. This then frames the Nabataeans within a particular "phase" characterized by the competitive advantage as related to the ability to fight from the saddle on a camel. Combining this particularist material alongside Western notions of Bedouin tribes as one organized militarily and mobilized along economic urban centers, Nabataean state formation resulted from increasing social stratification where a particular tribal group (i.e. the Nabataeans) ascended. The control of trade routes was established through this advantage which led to great accumulation of wealth. Wealth accumulation led to emerging elite who reinforced their role in the elite through the already established belief systems of
nomadic life. This elite group resulted in a familial royalty from where a king (or leader) arose as the central figure (see discussion in Alpass 2013).

The principal argument against such notions of Bedouin statehood came from MacDonald who pointed out that the Nabataeans, even as a settled population, were inherently "inimical to that of a state" (1991: 105). While there were certainly differences between societal groups during this time, the differences dissipated during Nabataean territorial and political dominance where the "originally nomadic group, 'the Nabataeans'" (Alpass 2013:10) dissolved "the differences between the original tribe and the indigenous population" (MacDonald 1991: 108; quoted in Alpass 2013: 11). Wenning pointed out that "Nabataean society remained a tribal organisation and the sheikhs/kings of the tribe seem to have followed the behaviour of Hellenistic eastern kings only within the constraints the tribal rules allowed them" (2007: 31). Wenning portrays Nabataean society as one that exhibited little transformation outside of what is known about Bedouin tribalism. Kingship is equated to sheikhs. Therefore, social transformations, and, by implication, spatial transformations that actually occurred were likely the result of emulation of "Hellenistic eastern kings" (2007). Ultimately, as this particular nomadic group transitioned towards and emulated Hellenistic social structures, the Bedouin nomenclature should be abandoned. The central tenet of MacDonald's critique was that a nomadic group gained ascendancy, acquired territory, consumed existing societal groups within the newly acquired territory, wherein this eclecticism became mostly indistinguishable over time. The evidence for multiple social, likely tribal, groups within Nabataea were well attested in the Nabataean religion, but the epigraphic evidence may also suggest the existence of multiple familial groups, rather than tribal (Alpass 2013). Still, none of these portrayals considered the spatial forms and functions of life within Petra or other Nabataean settlements. At this point, without combining what is known about the social complexities with the spatial complexities of Nabataean society, it is difficult, if not impossible, to surmise the type of state that formed.

While the universality of various urban schema described above may lend to an understanding of urban transformations as discrete events or as a function of a commonly shared unilinear historical trajectory through natural transitions, it is clear that the social motivations and local realities of these transformations were extraordinarily complex with similarities and variability occurring (mostly)
idiosyncratically (Trigger 2003). In general terms, social processes related to economics, demographics, politics, culture, technology, and environment may result in shifts in spatial complexity (Knox & McCarthy 2012). These complexities may be manifested within the spatial layout of the city directly. This means that an urban researcher may be able to understand the variability between city forms and functions by investigating the spatial forms and functions as they are revealed through archaeological investigation. In Nabataean research this has yet to be the case. The majority of state-level discussions do little to consider the social complexities related to the spatialities on the ground and instead examine social (trans)formation by way of particularist components of nomadic society, such as a camel's saddle (Knauf 1988; 1989; 1992); or through an historical evolutionary approach (MacDonald 1991); or by considering transformation a function of mimicry between a tribal society and the Hellenistic world (Wenning 2007). One of the components of this study, therefore, is to determine whether the spatial complexities on the ground were the result of social transformations and whether these complexities may be more revealing in determining the broader multiscalar patterns of Nabataean society.

D. Extending the Spatial Narrative

"The central question for the study of early complex polities is thus not the origin and evolution of an essentialized totality that we call the State but an inquiry into how, in varying sociocultural formations, an authoritative political apparatus came to gain varying degrees of ascendancy over all other social relations. This is what we should mean when we refer to states, if the concept is to have any utility: those polities where a public apparatus holds the legitimate power to intercede in other asymmetric relationships in order to mark itself as the authority of last resort." (Smith 2003: 108)

"...many physical geographers remain fairly uninterested in problematising the idea that space is straightforwardly empirical, objective and mappable. Likewise, until the 1970s, most human geographers considered space to be a neutral container, a blank canvas which is filled in by human activity." (Phil Hubbard and Rob Kitchen, 2011)

Up to now, the trend in social science studies on the interrelations between social and spatial transformations was viewed as a result of functional processes where the influence between social and spatial processes was unidirectional. Within this perspective, the social realm produces or creates spatial transformation and is a direct result of social change. While the majority of comparative studies on cities, states, or civilizations cited above investigated the form and function of the spatial complexities present on
the ground, these studies assumed that spatial complexities were manifestations of social functions alone. On the other hand, other scholars borrowed heavily from the cultural turn in geography where empirical spatial relationships may be theorized through highly conceptualized notions of \textit{space} and \textit{place}.

Geographers began asking different questions of spatial manifestations and elements with a simple premise – space was not only \textit{relational} but \textit{interactive} and \textit{discursive} (Massey 1999; 2006). For studies on early societies this was initially conceived in ancient Chinese urban configurations by Paul Wheatley (1971), then with cross-spatial analysis perceptions of space and place by Yi-Fu Tuan (1977) and later extended towards a more developed theory of relational space by scholars such as Doreen Massey (1984; 1999; 2006). Additionally, questions were oriented towards the various groups or processes that were seen to produce the narratives of spatial relations. These groups were most commonly investigated through the top-down generative processes of \textit{power} and \textit{political authority}. Stemming from Marxist geographies, David Harvey repositioned the challenges of spatial relationships through Karl Marx’s perspectives on modes of production and labor and the spatial contradictions of capital accumulation (Harvey 1973; 1982; 1985; 1989; 2001). Only within the past ten years have archaeology and anthropology considered space in these terms.

The more “sophisticated synthesis” (Trigger 2008) of these was by Adam T. Smith (2003) who repositioned investigations of power and political authority in ancient societies within a broader framework of relational space that remained within the practical analytical domains of spatial experience, perception, and imagination.

While the formal, functional, and comparative studies above elicited information about early societies that demonstrated the connections between spatial complexity and social complexity, the social realm was exclusively within the economical (i.e. wealth accumulation) and political (i.e. administration). Cities were the manifestations of social functions where concepts of centrality and monumentality were seen as displays and/or symbols of authority and wealth. A complicated aspect of society, like religion or belief, was explained in functional terms alone as components that existed simply because they were necessary and present within the spatial configuration in question. Questions of belief and the impetus of religion and, more importantly for this study, \textit{sacred spaces} were anathema to functional considerations.

Smith (2003) situated the question of religion within the broader framework of how political authorities were
constituted through power and legitimacy. The reason for religious institutions having been manifested in physical space, in this view, was that these institutions assisted in legitimizing the power held by elite authorities. They were necessary in order to manufacture complicity among subjects and their centrality and monumentality elevated their importance within the experience, perception, and imagination of followers.

During the "cultural" turn in the social sciences (geography and sociology and later archaeology) social theories emerged that contextualized urban areas within broad historical, political, and economic narratives focusing on social development and production, human agency, intent, space, place, landscape, and meaning. For the geographer Paul Knox, the city through history was and is a social construction where its "significance lies in their role as centres of authority, as places that are able to generate and disseminate discourses and collective beliefs... to develop, test, and track innovations, and that offer 'sociable' settings for the gathering of high-level information (economic, political, cultural) and for establishing coalitions and monitoring implicit contracts" (2005:8-9). Inevitably a split occurred between the functional (processual) and cultural (post-processual) researchers. I attempted to demonstrate above that the functional approach to cities rests almost exclusively within the empirical domain (i.e. quantification or survey-based), while others focus on the theoretical domain (i.e. narratives and high-level theories) of analysis. While some have proposed a middle-level range of urban analysis in an attempt to bridge this divide (Smith 2011), it is clear that there is growing consensus for urbanists to engage with both realms of analysis (e.g. Smith 2003; Lilley 2004; Smith 2007; Fisher 2009; Pauketat 2013).

For the geographer Paul Wheatley, urbanism is defined as "that particular set of functionally integrated institutions which were first devised some 5,000 years ago to mediate the transformation of relatively egalitarian, ascriptive, kin-structured groups in socially stratified politically organised, territorially based societies" (1971:xviii). For Henri Lefebvre (1991), "the urban" is not about population, size, its nodal point, the building fabric, or a central point in trade and production, but rather all of these together analyzed from a phenomenological basis (Shields 2011). Although goods, services, occupations, and people may be transient, occupying spaces in an urban center only temporarily, for Lefebvre, the urban is the intersection
of capitalist modes of production and exchange of goods and services constituting social centrality. Therefore spatial centrality of "the urban is social centrality" (2011:280).

Beginning in the humanist tradition, geographers considered whether perceptual and imaginative notions of space played a role in the forms and function of cities. This line of inquiry gave way to discussions about the meaning of cities where urban spaces were meant to display or constitute discernible messages and engagements with broader socio-spatial imaginations. Theoretical considerations of space emerged that considered space as an environment that was not only affected by humans and socially produced, but also a producer of social transformation. Scholars like Yi Fu Tuan (1972; 1977), Paul Wheatley (1971), Anthony Giddens, and Henri Lefebvre, elevated the importance of spatial construction as an active agent of society. No longer should spatial analysis be limited to the empirical, functional properties of urban systems as defined through economic imperatives of social-economic functions, but instead may consider the cognitive reciprocal relationships between space and society that ultimately result in further human action. For instance, when Tuan claimed:

"The regular motions of the stars were to be translated architecturally and ritually to space and time on earth. The walled city oriented to the cardinal directions, the positioning of the twelve city gates, the location of the royal compound and the alignment of the principal axial street were given a geometric pattern that reflected the order to be found in heaven. The key concept was built on the related notions of rectilinearity, order, and rectitude. This key concept acquired architectural and social forms that were then imposed on earth, for the earth itself lacked paradigms of perfect order" (1968:185).

Within this view a city may be a representation of imaginative sacred space where sacred order was made manifest and to which people were drawn (Marcus & Sabloff 2008; citing Laur 2002; Malville 2000; Singh 1994; Wright 1977; Pauketat 2013). Meaning and symbolism were identifiers of city forms and function, but function was related to perception and imagination rather than the direct manifestation of economic (or ecological) forces. The geographer Paul Wheatley pioneered this notion in ancient Chinese cities claiming that it "was established only after an array of geomantic considerations had been satisfied; it was constructed as an axis mundi, an omphalos incorporating the powerful centripetality of that symbol; and it was laid out as a terrestrial image of the cosmos, a schema involving cardinal axiality and orientation, and, as a corollary, strong architectural emphasis on the main gates" (Wheatley 1971:481). For
Wheatley, the form was indicative of this imaginative symbolism. While the functional approaches may consider the presence of city walls as indicative of the need for defense (Flannery & Marcus 2003; Zou Heng 1987) or to restrict mobility between an elite core and the residential subjects (Marcus 2000), the cultural focus considered gates as potentially demarcating “sacred space at the center of a ceremonial center” (Marcus & Sabloff 2008:21; Malville & Gujral 2000; Wheatley 1971).

**Theories of Space & Place**

Humanist and structural approaches contextualized the "individual as a purposeful agent of change in the city rather than a passive respondent to external stimuli" within various social and environmental constraints (Pacione 2005:30). With special regard for the city, this approach was best summarized as "the social construction of urban space" (Ley & Samuels 1978) and the theoretical applications of humans as actors within dominant social structures (Giddens 1984). Recent approaches in geography (Massey 2006) and archaeology (Smith 2003) have attempted to explain space as relational to human action, conception, perception, interaction, representation, and imagination. The city, or built environment, was viewed through the eyes of the individual and the society and how political and social shifts do not require external stimuli, as was the case with processualist perspectives. These approaches include, but are not limited to, investigations of i) conceptual notions of space and place (Harvey 1973; Tuan 1977; Lefebvre 1976, 1991; Soja 1988; 1998; 2000; see also Bourdieu 1977; 1999; Foucault 1984) including absolute and subjective approaches to space, ii) an innovative approach to urban landscapes where social interactions with space may be understood through relational spaces that are reflective, recursive and constitutive of authority (Smith 2003), iii) the city as symbol and image (Lynch 1960; Wheatley 1971; Tuan 1977; Soja 1989), and iv) non-verbal communications of built environments (Rapoport 1982, 1988; Moore 1996).

As with the city, the terms space and place are also notoriously hard to define. As the quote at the beginning of this section suggests, considerations of space ran through the gambit of social science approaches from environmentalism to postmodernism. The environmentalists considered space as strictly mappable through Euclidean geometry and primarily considered for location. The positivists in the 1950s and 1960s considered space constant and unchanging where spatial analysis of components in space resulted in statistical methodologies and spatial modeling techniques akin to the quantitative revolution
(Hubbard & Kitchen 2011). Interestingly, the behavioral approach "explored the role of the conscious mind in shaping human spatial behavior" but, like those mentioned above, still maintained positivist perspectives by "simply replacing concepts of absolute distance with notions of subjective distance" (2011:5) such as early research from Kevin Lynch (1960). By the 1970s, space was considered something both produced and consumed by social relations and culminated in such authors from David Harvey, who focused primarily on the spatiality of class inequalities in local/regional contexts, and Immanuel Wallerstein, focusing on international inequalities controlled by divisions of space through geopolitical strategies and territorial acquisitions.

Following along the lines of post-processualists and postmodernists, Henri Lefebvre published a seminal work titled *The Production of Space* (1991[1974]), defining space as relative to different societies with different modes of production. Attacking the common trend of social sciences to consider space as "absolute," Lefebvre characterized relative spaces through history distinguishing "between the abstract spaces of capitalism, the sacred spaces of the religious societies that preceded it, and the contradictory and differential spaces yet to come" (Hubbard & Kitchen 2011:6). Within these histories of spaces, Lefebvre sees space as "entwining of cultural practices, representations and imaginations" or rather "perceived, conceived and lived space" (2011:6). Perceived spaces are those spaces that frame the focus of the everyday lives of individuals through sensational experience - movement and interaction with and through spaces. Conceived spaces are those commonly framed for others through symbols and representation, such as a map. These are idealized spaces that are meant to represent and reinforce authoritarian perspectives of space. Finally, lived space, are those perspectives of social interaction that exist primarily in the imagination and are primarily disseminated and interpreted through literature, the arts, and fantasy (Shields 2011:281-282). Symbolism, historical memory, and interpretive meanings are all functions of lived space and may tilt the balance between how individuals and societies view themselves within their perceived or conceived spaces.

In recent years, the urban geographer Edward Soja, primarily focusing on modern-day Los Angeles, locates space as one of the major challenges for critical social theory. Throughout Soja's works (1989, 1996, 2000), there is a recurrent theme that "critical social theory needs to take space seriously if it is to
make sense of society” (Latham 2011:381). Echoing geographers of the past, Soja argues for a consideration of the "spatiality" of social and urban life (381). Rather than focusing on processual, historical, and temporal aspects of urban analysis, spatiality must be of primary importance for a species that appears to have a primary focus on space. The privileging of temporal and historical aspects in social theory, or 'historicism', was explicitly attacked by Soja, quoting Foucault, claiming that "space had been 'treated as fixed, the undialectical, the immobile. Time on the contrary was richness, fecundity, life, dialectic’" and that social theorists must consider a "triple dialectic of space, time, and social being" (Soja 1989:10, 12; cited in Latham 2011:381). In Postmodernism (2000), Soja clarifies that this "triple dialectic" or "trialectics of being" was meant to de-compartmentalize considerations of space within the various social disciplines.

Finally, Soja proposed the concept of thirdspace in a publication with the same name (1996). In his analysis of space and the critiques of social theories that inherently ignore space or see space as monolithic, Soja identifies three typologies: firstspace - the material, real, world; secondspace - the imagined, representational and symbolic spaces; and thirdspace - where "Everything comes together... subjectivity and objectivity, the abstract and the concrete, the real and the imagined, the knowable and the unimaginable... structure and agency, mind and body... everyday life and unending history" (1996:56-7). This concept of thirdspace appears to be the easiest to criticize given the vagueness of Soja's explanation. Essentially, this perspective, like those mentioned above, appear impractical for the social scientist (Latham 2011). A criticism shared by Barnett (1997) who pointed out that Soja's terminologies "are discussed at a very high level of 'ontological' generality, which tends to obscure the fact that all Soja seems to be saying is that time, space and society are mutually constitutive" (528; cited in Latham 2011).

In practical terms, it is important for the urbanist to consider that "people extend themselves - mentally and physically - out into space" where these "extensions" become symbiotic relationships where both the person and the space are affected (Shields 2011:284). Therefore, space may be defined as "spatial patterns of social action and embodied routine" where humans apply symbols and meanings to "arrangements of objects... landscapes and architecture [which] are concrete instances of this spatialisation" (2011:284). In measurable terms, it is best to consider an example study by Lefebvre when,
considering the seemingly late arrival of capitalism in human society, he "postulated that a secular space, itself commodified as lots and private property, quantified by surveyors and stripped of the old local gods and spirits of place, was a necessary precondition for the separation of people from the means to their own subsistence" (2011:284) or in other words, divorcing people from spaces that hold meaning applied by those same people.

*Place*, within the context of this review of urban studies, is a *type* of space that humans construct through spatial experiences. While space, following Lefebvre, is about interactions through perceptual and conceptual spatialities, *place* maintains a "sense of belonging" as a "locus of identity" (Hubbard & Kitchen 2011:6). Here again, place was approached in absolute terms, "simply as a largely self-contained gathering of people in a bounded locale (territory)" (2011:6) that may be measured and quantified in purely geometric terms. By the late 1970s humanistic and cultural geographers reoriented spatial discussions towards space as a "social construct with important symbolic meanings" (Antrop 2013). Among the principal researchers to consider place as more than geometry was Yi-Fu Tuan, whose book *Space and Place: the Perspectives of Experience* (1977) offered a theoretical foundation for discussions of place. Tuan's overview of *space* and *place* provide useful relationships between place and time, population density, spatial and architectural awareness, and individual experiences that reinforce place as a locus of identity. For an urban review, Tuan's additional connections between place and *visibility* are especially useful, which is primarily a discussion of how regimes purposely *create place*. Consider his perspective on the city:

"The city is a place, a center of meaning, par excellence. It has many highly visible symbols... the city itself is a symbol. The traditional city symbolized, first, transcendental and man-made order as against the chaotic forces of terrestrial and infernal nature. Second, it stood for an ideal human community: 'What is the Citie, but the People? True, the People are the Citie' (Shakespeare, Ciriolanus, act 3, scene 1). It was as transcendental order that ancient cities acquired their monumental aspect. Massive walls and portals demarcated sacred space... A city draws attention to itself, achieving power and eminence through the scale and solemnity of its rites and festivals. Ancient capitals began as ritual centers of high import. Splendid architectural settings were required for the enactment of sacred dramas" (1977:173).

**Political Ordering of Space**

For political regimes, the problem of space rests in its ontogenesis and the need to control its multiplicitous fluctuations at multiple scales. The production of space emerges out of the relational
connectedness between objects and space (Harvey 1973; Massey 1999). *Space* is neither an absolute set of essential attributes existing prior to objects and “thus discernible as an abstract governing geometry;” nor a highly abstract “faculty embedded directly in the sense apparatus of subjects and thus knowable as an expression of mind or belief” (Smith 2003: 69). The agency of objects occurs in space and with enough relations between objects, spatial practices emerge which in turn are capable of becoming agents of social change. Therefore *space*, once it embodies meaning in relation to these objects, is processual and in a constant state of *becoming* (Massey 1993; 1997; 2005; 2006; Murdoch 2006; Cresswell 2013).

It is necessary for political regimes to control the narratives of these spatial dynamics, especially those with higher levels of meaning, see Rapoport’s (1990) analysis of levels of meaning. Most often these spaces become institutionalized and are woven into the fabric of spatial experience, perception, and imagination. Considering that space is neither fixed nor inherently ordered, political order may be viewed as synonymous with spatial order (Smith 2003). The ordering of space is accomplished by ordering the objects - or architectural structures in this case - along with their relations, within spaces. The political ordering of space may occur in the construction or destruction, inclusion or exclusion of objects within these spaces so as to control these relationships. Space then comes to embody normative properties that determine an object of being “in place” or “out of place” (Cresswell 2013: 221) resulting in a dynamic that is directly related to social control and power (Moore 1996). Restricting or encouraging the objects that exist in space is essential to spatial ordering.

At the same time spaces are “constituted as much by their ‘outside’ as by their ‘inside’” (Cresswell 2013: 221; citing Massey 2006). This implies a sort of boundedness to space, and for a political apparatus, this is the primary objective in spatial construction, often manifested in the built environment as aesthetic coherence (Smith 2003). As mentioned earlier, however, space emerges out of the relations of objects and is therefore one of fragmentation, hybridization, and decentralization and void of an essential singular identity which does little to contribute to the political ordering of society (Massey 2006). Political regimes therefore attempt to set narratives on these spaces by suppressing their fluctuations, cleansing or promoting hybridizations, re-centering and situating spatial meaning within the scope of the prevailing political authority, enforcing ordered spatial practices and methods all in an effort to create a controllable
spatial identity. These spatial narratives are what set the boundedness of discrete spaces (or cities or regions) within a specific identity impressing upon subjects a sense of discrete, unified political and spatial order. In reality these political spatial narratives are negotiated out of contested and consensual power-filled spatial practices between elites and subjects.

Early discussions of space by Isaac Newton conceived of space as specific to objects where the space itself is "thing-like" (Agnew 2011). This type of space, as we identified already, is best described as *absolute* space. Extending this, Leibniz transcended the space-as-object perception by arguing that space itself has little to no power in social terms unless events or objects take place within and occupy the space (2011). This perceptions is best described as *relational* space, where power and meaning of various spaces "can be construed only from the relations between" objects and events within space (2011:9). David Harvey's discussions were among the earliest steps towards relational approaches in historical and, later, economic geography. Positing that "space is not given and absolute or a 'container' into which intrinsically 'non-spatial' things are stuffed" (Castree 2011: 236) and that the alteration of space alters the individual recursively, which Soja (1989) identified as a "socio-spatial dialectic" (78). Therefore, neither spaces nor places may exist without relations to the other and their internal objects and events. This "relational ontology, arises only as it mediates relationships among objects [and events]" (Smith 2003: 69). Therefore, space is only surmised and understood by how "objects exist and relate to each other" (Harvey 1973: 13).

John Agnew argued that there is little difference between the subjectivist and absolutist accounts of space since the subjective account emphasizes "the subjective orientation of human actors in places that condition them" where place is viewed as constant and absolute, while the relational account emphasizes "the role of causal 'forces' in human life" between the social realm and physical space (Agnew 2011). Focusing on the essentialist properties of either "subjects" or "objects" (Smith 2003) or the events (Agnew 2011), prevents an ability to assess the social practices that "give rise to, solidify, and overturn particular configurations" (Smith 2003: 69). Michel de Certeau pointed out similar perspectives by viewing space as "a practiced place... [where] the street geometrically defined by urban planning is transformed into space by walkers" (de Certeau 1984: 117). In de Certeau's view, individuals and their "footsteps in the city" (1984: 102), "weave places together" creating a "pedestrian rhetoric" (102). Smith (2003) pointed out that
these subjective accounts ignore the power relations between individuals and the disparities between authorities and subjects that create discernible differences in the significances and meanings of socially produced spaces. In other words, constructions of built environments vary based on the authority of rulers and ruling institutions.

These power relations were evident in early societies because the "construction of a single structure requires considerable economic resources, a significant amount of knowledge about architectural technology, recourse to a source of labor... and permissions from regulating bodies" (2003: 71). Michel de Certeau’s individuals or pedestrians, although capable of producing domestic structures like a barn or house, were unlikely to construct large scale networks (roads, pathways), monumental structures, or publicly defined spaces on their own (2003). Therefore, multiple elements of power relations were required in order to construct these objects in space. While geographers focused on relational space as constraining or encouraging social production of built environments, archaeologists focused primarily on "human agency" and the various "actors behind artifacts" (2003: 71). This focus on individual actors borrows heavily from the writings of Anthony Giddens. A sociologist writing about "the theory of structuration" (Warf 2011: 179), Giddens focused primarily on the actors involved in various social structures and their relative perceptions, cognitions, languages, and identities (2011). Social structures pertain to the lifelong processes of structuralizing norms, behaviors, and rules in the daily lives of individuals which in turn reproduce and modify previous social formations. Therefore, human agency and social structures may be viewed, not as "opposing forces", but rather related dual forces that "are simultaneously determinant and mutually recursive" (Warf 2011: 179).

Implicitly, the relationship between agents and structures is similar to the relations between societies and space in that they enable and constrain social behavior over time. With regard to power relations, "in this relational sense, concerns the capability of actors to secure outcomes where the realisation of these outcomes depends upon the agency of others" (Giddens 1986: 93). Therefore, the social structures inherent in political relations primarily relate to "allocative resources (material wealth and technology) and authoritative resources (the social organization of time, space, and the body)" (Warf 2011: 180). Ultimately, for Giddens, individual behavior was controlled through the "routinised patterns of
behaviour through which social reproduction and change occur (mostly unintentionally) [which] are always structured temporally and spatially," which borrows heavily from the time geographers who focused on constraints of individuals to "negotiate the temporal and spatial trajectories of life" (Warf 2011: 181-2; see also Hagerstrand 1970; Pred 1984).

Since "locales are not just passive places but active milieu that influence, and are in turn influenced by, the interactions of actors" (Warf 2011:182), space may be viewed relationally. Space, for Smith (2003), may be "defined as the relationships between bodies, forms, and elements, [and] is a product of negotiations between an array of competing actors with varying practical capacities to transform these relationships" (72). Alleviating the problems associated with absolutist and subjectivist accounts of space within a relational account has proved challenging (Agnew 2011). However, when considering that spaces are constructed through social practice, then "inquiry must go beyond formal description to understand the physical space of the environment, the perceived space of the senses, and the representational space of the imagination" (2003: 72).

**Political Landscapes: Constitution of Authority**

Smith (2003) proposed a tripartite methodology of considering the spatialities of political relations, adapted from Henri Lefebvre's maxim of space as the "lived, conceived, and perceived realms" (Lefebvre 1991: 40) and David Harvey's description of "representations of space" (1989: 218). These included investigations and discussions pertaining to spatial experience, perception, and imagination (or "representations") as "practical dimensions of landscape" (Smith 2003: 73).

Spatial experience refers to the materiality of constructed spaces. The properties of physical environments shape the experience of the individual body moving through space which may include aspects of "distribution, transport, communication, property rules, land use, resource exploitation, and administrative, economic, or cultural divisions in physical space" (73). This is the most common form of spatial analysis conducted by urban and historical geographers and archaeologists. Additionally, spatial experience may include not only the mobility of constructed, and completed space, but also "the techniques and technologies of construction" (73). I posit that another addition is necessary to this aspect of spatial practice - construction materials. Early societies used a wide variety of construction materials
such as mud brick, stone, marble, pole and thatch, tents, and even the rock substrate itself like with the rock-hewn tombs of Nabataea. The sources of these materials also yield important information about the message imbued in the urban landscape. Roman conquests, for instance, enabled the extraction and importation of a multitude of construction materials never seen previously in Rome. Many of these materials were used to construct numerous monuments and buildings with in Rome in order to encourage the individual moving through the city to experience the breadth of the Roman Empire within the materiality of the urban building fabric.

Spatial perception is borrowed mostly from conceptions of evocative space or "representations of space" as defined early on by David Harvey (1989). Perception pertains to the "sensual interaction between actors and physical spaces" (2003: 73). More specifically, this includes the "signs, signals, cues, and codes" (73) or the messages and meanings in aesthetics coupled with spatial form. While experience primarily relates to the form of the physical environment, perception examines the potential of interpretation of the percipient through emotional, rhetorical, and demonstrations of authority (2003; Kuper 1972: 421). It is important to point out, however, that this is less about scholarly interpretations of encoded meanings that may be decoded by the researcher, but rather more about the "affective terms" that describes perceptual properties of individuals such as "dangerous spaces... inviting spaces... impassive spaces... [and] unmiraculous spaces" (73). I view this piece of spatial analysis as too vaguely described by Smith (2003).

Finally, Smith proposed spatial imagination as an often ignored investigation into spaces of early societies. Imagination "emerges most forcefully in the analytic domain of representation from maps and pictorial landscapes to spatial theory and philosophy" (74). This is analyzed through depictions of spatial awareness in art, iconography, inscriptions, literary documents, maps, and other imaginative facets of social representation. For Smith, the nexus of spatial experience, perception, and imagination are useful methodological constraints that illuminate the spatial practices of landscapes which "can unify the scalar divisions that have separated geographical, urban, architectural, and aesthetic dimensions of spatial analysis" (74).

For Adam Smith, the persistent focus on the City (capitalized to denote its "conceptual singularity") lacks a focus on the institutions that coalesced into regimes that socially produced and reproduced urban
environments (2003: 186). Smith (2003) pointed out that space has become something impractical and "highly unproductive" in socio-spatial research leaving little room for analytical work. Extending highly theorized discussions of urban space and place, Smith situated the focus within the aforementioned practical dimensions of spatial experience, perception, and imagination. Additionally, this relational account of space may be applied regardless of scale by investigating the practical scalar dimensions in geopolitics, polities, regimes, and institutions. While discussion of geopolitics and polities help frame the contexts of spatial construction, for this review I focus on Smith's analysis of regimes and institutions which are essential for understanding urban dynamics within a singular, capital city such as Petra.

After a powerful critique of Chile's Marxist accounts of the City, Smith proposes that to understand ancient cities "is not simply an analysis of the determining economic interests of elites but also the constitution of the political authority of more broadly sited regimes" adding that these "regimes are located at the confluence of horizontal ties among elites and vertical ties between dominant political authorities and grassroots social positions, such as kin leaders, neighborhood councils, and ward chiefs" (189). Urban landscapes, therefore, were note merely "symbols of authority" (following Bard 1992), but rather constitutive of authority for regimes and subsequent institutions. Smith proposed an analytical shift akin to Plato's Socrates in The Republic, where cities are "multidimensional landscapes simultaneously riven by a multitude of social and political divisions yet pretending to coherence through a highly politicized urban imaginary," which speaks to the major thrust of his approach (189-190). Again, this may be accomplished by examining the spatial experience, perception, and imagination of urban landscapes.

To investigate this, Smith analyzed the regimes associated with production and reproduction at the Mesopotamian city of Ur. The principal problem of research of Mesopotamian cities, for Smith, derives from Robert McC Adams analysis of cities and their situational ecological aspects. Adams, in The Evolution of Urban Society (1966) focused on an "organic absolutism, where local environments play, if not a fully determinative role, then a critical enabling one in giving rise to the City" (198). The focus on ecological relativism misses opportunities to discuss why particular elements of urban form was necessary, such as: "the extensive canal systems that allowed cultivation on the alluvium; the salinization of soils around intensively occupied sites created by intensive demands on productivity by political regimes...; the
degradation of topsoils promoted by overgrazing; and the effects on piscatory resources caused by varying demands on the region's hydrology" (199; citing Adams 1965, 1978; Adams and Nissen 1972; Redman 1999: 127-39). Although the organic absolutist account of space "demands that we cut this web of interdependencies once we reach agriculture and the articulation of human systems with natural environments" (200), it is important to understand that the "manufactured nature of local environments demands that forays into the constitution of authority" and to "understand the places of subsistence production as elements of political landscapes" (200).

Perhaps the most important and practical component of Smith's methodology is the assumption that authority requires "fundamental relational processes: the power to direct others, and the recognition of the legitimacy of these commands" (108). Weber identified three principal forms of authority as i) traditional, the sanctification of socio-politico-cultural historical trajectories; ii) charismatic, sanctification of an individual and his/her subsequent ordering of society; and iii) rational-legal, sanctification of the procedures and rules that order society (Weber 1947; Smith 2003). Consider again Smith's perspective in the discussion of "states" above, pointing out that a "public apparatus" must maintain "legitimate power" (2003: 108). Weber classified authorities by "the kind of claim to legitimacy" (1947: 324; emphasis added). Regardless of the classification of an authority, the important aspect in Weber's assessment is the "bases of legitimacy that differentiates them."

Legitimacy may be defined as "the ability of a regime to synchronize practices that perpetuate the existing political order within a discursive framework that generates the allegiance of subjects" (108). Others considered legitimacy in similar perspectives defining the term as "the institutionalization of people's acceptance of, involvement in, and contribution toward order" (Baines & Yoffee 1998; 2000: 15). Additionally, authority must be accompanied by power, as Smith demonstrated that "...power is not just the ability of one (individual, class, regime, polity) to realize its (political, economic, social) interests at the expense of another (individual, class, regime, polity) but, more profoundly, the capacity to constitute interests and determine their significance within the management of existing conditions" (2003:108; emphasis added). Therefore, for governance to be constitutive of authority, governing entities must maintain relations of both power (domination) and legitimacy (recognition of dominance).
Sacred Ordering of Space

The more we look, the more we can see religion as a critical element in many areas of life above and beyond those usually considered - technology, diet, refuse patterning, housing. All can be influenced by religion; they are today, why not in the past?" (Insoll 2004: 22; quoted in Pauketat 2013: 26)

"Since ancient civilizations expended considerable effort paying tribute to celestial deities, one should not be surprised to find that, in many instances, astronomical principles played a role in the design of the places where they worshipped their gods." (Aveni 2003: 150)

Following the discussion in the previous section, it is clear that spatial order is synonymous to political order. But why do many societies appear to order spaces along more cognitive lines? In some cases entire layouts of cities appear to be oriented towards cosmologies or at the very least towards some sort of sacred geometry (Eliade 1954; 1959; Lynch 1960; Wheatley 1971; Ashmore 1989; Freidel & Schele 1990; Pauketat 2013; see critiques in Smith 2003; Trigger 2003:444-471). There are numerous challenges to determining such sacred formalities within historic landscapes and too often loft conclusions are derived about entire urban systems with little regard for the nuances of social or political life. Still there appears some idiosyncratic consistency between the role of ideology, or religion in this case, and spatial order. Perhaps religion, or rather belief, must be given further credence in the ontogenesis of spatial meaning.

It is tempting to dismiss the role of religion as a mostly manipulative process of elites to mystify the masses into subsidence, similar to Marx's viewing of religion as "an ideological product of social life that legitimated power relations" (Pauketat 2013: 12; critiquing Marx 1906: 91; Marx & Engels 1970: 47). Still the role of ideology played a powerful role in shaping the cohesiveness of pastoral nomads consisting of a myriad of tribal groups and identities throughout the Middle East (Caton 1990). The role of cults and belief and by extension their institutions were crucial to holding elites accountable to moral standards set forth by the gods in early civilizations while simultaneously encouraging surplus contributions to these institutions by the masses during times of excess production (Trigger 2003:472-494). These were certainly politically constitutive, following the terms of Smith (2003), but more indirectly than Marx traditions which have yet to be seen in social relations between pastoral tribes and tribal elites (Caton 1990). The institutions tied to ritual were crucial in establishing political and spatial order, both within the city and
throughout rural hinterlands. Occasionally this order was reinforced through the establishment and alignment of sacred geometries (Pauketat 2013). Over time these came to drive the mode of political constitution as was seen in Chinese cities (Wheatley 1971) and Mayan cities (Ashmore 1989; Freidel & Schele 1990).

Of the societies reviewed by Trigger (2003), each society conceptualized and imagined itself as uniquely situated, cosmically and geographically, in the "centre of the terrestrial plane [or flat disc] and to enjoy a privileged location in relation to the gods and the rest of the universe." Along this plane, terrestrial space was occasionally divided cardinally, closely related to the sun's path across the sky, as was the case in ancient Mesopotamia and Egypt (2003: 470). Spatial conceptions and imaginations within Egypt, specifically, were especially telling about early urban configurations in that "Efforts to relate the terrestrial realm more closely to that of the gods often took the form of aligning public buildings and tombs with solar, lunar, or stellar rising and setting points. The main axes of at least some Egyptian temples were oriented to the rising or setting positions of the sun, moon, or particular stars on certain days of the year" (2003: 468; citing Wilkinson 2000: 36-7). Additionally, the faces of the monumental pyramids appear oriented towards the cardinal directions (2003: 468).

Still sacred spaces such as these were not simply passive representations of symbolic order, but were orders of spatial discourse that were relational to temporal social dynamics. As was found in Mayan cities, the consistency of cosmographies throughout Mayan architecture was less a symbolic rendering of cosmic power, and more a political rendering of that "emerged over time as Maya rulers mapped patterns of political ritual and cosmography onto each other" (Smith 2003:76: citing Freidel & Schele 1990:72). The layouts of monuments and cities played active and agentic roles in societal relations in establishing the constitution of political authority of a particular regime within a settlement as superseding the authority of regimes at other settlements (Ashmore 1989). These understandings of geometries are understood in relational terms in that they emerge over time and are relational to political dynamics within and among regimes (Smith 2003).

If we assume a particularly “narrow anthropocentric point of view, [where] only people are bestowed with agency” (Pauketat 2013:28) then the agency of these sacred geometries is downplayed to
the point where narratives reinforce “people as subjects by purifying them of objects” (31; citing Miller 2005:17). Instead, Tim Pauketat (2013) argues against the theoretical foundations of “top-down representational theories of the past have not treated religion as a critical element” (26). Within pastoral societies, the role of ideology is central in nearly every model in shaping a multitude of different identities within a single coherent form, sometimes referred to as a “tribal confederacy” (Caton 1990). Tribes seem to be more supportive of elites that are representatives of ideological values that emerge from the tribe (ie. the ground-up), and more oppositional to top-down manipulative approaches proposed by traditional Marxist or structuralist views of elites (1990). Therefore, the role ideology and religion must be given greater consideration.

In urban empirical studies, normative theory is a methodology that is suited to investigate cosmological urban planning schemes where an ordinal ranking of urban designs and finished plans was based on “positive social values... [and their] benefits [provided] through the design and constructions of cities” (Smith 2011: 180). Borrowing from the urban geographer Kevin Lynch (1960), normative urban theory is primarily an investigation into the social behaviors and perceptions of the planners themselves, whether these were individuals or political authorities. Cities were ranked in order to identify the common traits associated with good cities and encouraging planners in less good cities to improve their own plans. Value judgments were made pertaining to entire urban plans based exclusively on social values. For the sake of a study on ancient urbanism, two key tenants are recurrent in the literature, i) city as image (Lynch 1960; 1981) and ii) city as cosmogram (Eliade 1954, 1959). For both of these, a conceptual representation or imagination was derived from the urban landscape directly.

In addition to the mostly perceptual empirical city elements mentioned above (Lynch 1960), Kevin Lynch identified three “normative theories” where two theories, “the city as an organism” and the “city as a practical machine,” were assessments of “basic form elements” common to industrial and post-industrial cities. The third, “the theory of magical correspondences” pertains to the ancient cities where traditions encouraged plans that mirrored efforts to relate terrestrial urban configurations to the cosmos (1981: 73-81; cited in Smith 2007, 2011). Lynch discovered a series of ancient urban models that manifested physically societal conceptions of the supernatural and associated cosmologies, specifically in ancient China and
India. For Lynch, ancient urban planners implemented basic experiential and perceptual elements like "axial lines of procession, encircling enclosure with gates, dominance of up versus down, grid layout, and bilateral symmetry" (Smith 2007: 31). These were tied fundamentally to the social values of these ancient environments where "order, stability, dominance, a close and enduring fit between action and form - above all, the negation of time, decay, death, and fearful chaos" (Lynch 1981: 79). Therefore, the city imagined these social values, manifested in physical forms, as emphasizing the continuous spatial negotiation between order/chaos and dominance/decay as directly relational to the supernatural - the city as image.

Some of the form elements common within early cities with "magical correspondences" according to Lynch’s (1981) assessment include:

"... the axial line of procession and approach; the encircling enclosure and its protected gates; the dominance of up versus down, or of big versus small; the sacred center; the diverse meanings of the cardinal directions, due to their relations to the sun and the seasons (the north is cold and the south warm; the east is birth and beginning, the west is death and decline); the regular grid for establishing a pervasive order; the device of organization by hierarchy; bilateral symmetry as an expression of polarity and dualism; landmarks at strategic points as a way of visibly controlling large territories; the sacred nature of mountains, caves, and water" (75-79)

These physical, empirical elements may be institutionalized by a series of perceptual factors such as: "regularly recurring religious rites, the organization of government, the disposition of the social ranks, the dress and behavior of city people, and so on" (79). The physical elements must be accompanied by their social institutions in order to “have a powerful psychological effect” where the fundamental aspect of these elements and institutions “lie certain primary values: order, stability, dominance, a close and enduring fit between action and form - above all, the negation of time, decay, death, and fearful chaos” (79). The purpose of these elements and institutions are to instill a set of social values that supply order to naturally chaotic environments. In these instances, the spatial ordering of urban space is cosmic order.

Considering Bruce Trigger’s assessment above of conceptual urban cosmologies, it is plausible to consider cosmologically oriented socio-political manifestations in the urban landscape if it is reinforced by representational and conceptual sources, usually "written texts" (Smith 2011: 181; citing Flannery and Marcus 1993). This representational imperative is a direct result of poorly justified claims related to the highly problematic claims of cities as cosmograms, beginning with Mircea Eliade (1959). An expert of Siberian shamanism, Eliade argued that cosmological perspectives of early societies may be tied to a
"primal event that inaugurated reality and determined humanity’s situation in the cosmos" (Trigger 2003: 445). He concluded that cosmological significance in early societies universally suggested "(1)... a parallel between the workings of heavens and life on earth; (2) the basic link between earth and the cosmos is the axis mundi; (3) the cosmos are laid out in four cardinal directions and (4) divination and augury are needed to identify and sanctify sacred space on earth" as constructed by legitimate authorities (Eliade 1959; quoted in Smith 2007: 31; see also Eliade 1954). Additionally, Bruce Trigger, through his comparative analysis, criticized this insistence:

"...the widespread influence of Eliade’s theories may have encouraged the interpretation of fragmentary data in ways that exaggerate the extent of cross-cultural uniformity of ideas relating to cosmology. His ideas may have become self-fulfilling... The desire to create cosmograms does not appear to have been as obvious or widespread in early civilizations as Eliade and his followers have maintained... individual temples, palaces, or complexes of such buildings served as cosmic symbols connecting the vertical realms... [but] His general ideas seem to have been applied too dogmatically and in some cases without sufficient local warrant to the physical layout of structures." (Trigger 2003: 445, 470)

As a result of this study and other publications on cosmology, a number of scholars insist upon representational evidence of imaginative cartographies that encouraged discourses of space linking the terrestrial domain with the celestial (Flannery & Marcus 1993; Trigger 2003; Smith 2003; Smith 2003, 2005, 2007). Interestingly, Eliade’s claims contributed to a growing body of work related directly to cosmograms in ancient India (Bafna 2000), Angkor (Dumarcay & Royere 2001), medieval Europe (Lilley 2009), and Bhaktapur in Nepal (Gutschow 1993; Levy 1990; identified in Smith 2011). An historical geographer, Paul Wheatley, was among the earliest "followers" of Eliade and, incidentally, one of the most cited with regard to cosmograms (Wheatley 1971). Using a plethora of textual historical and archaeological data, combined with experiential urban components of gates, processional ways, and an overall plan seemingly oriented cardinally, Wheatley identified an early example of imaginative constitutions of authority where legitimacy was primarily a function of establishing capital cities in geographically significant locations (1971: 411-427; Smith 2011). These significant locations were identified through textual data referencing how "oracles were consulted and divination rites were performed, following feng shui principles, to select the sites of capitals" (Smith 2011: 181). Therefore a discourse of cosmological space existed that enabled Wheatley’s
identification of ancient Chinese cities as potential cosmograms. The success of Wheatley's research merits expanded review within "relational empirical theories" below.

So then, one central problem with viewing cities as associated with universal cosmograms and city imaginings is the risk that propose “culturally-specific ideas into the past by means of the direct historical approach or inferring them contextually... is a highly speculative, and largely unverifiable operation” (Trigger 2003: 59). The direct historical approach mentioned here occurs when a researcher retroactively asserts that ancients held similar conceptions and knowledge about the world or, in this case, the cosmos and urban planning as those in the present. This leads to another problem that imaginative cartographies by definition lack reality-based manifestations. As Smith pointed out, "it is entirely possible that ancient people had a rich symbolic interpretation of city layout that in fact did not match the physical reality of city plans at all" (Smith 2007: 33).

Spatial conception was relational with the physical landscape, especially during early establishments of a given society. It is for this reason that there is an understanding of place in archaeology like "the continuation of cult" where previous notions of spatial imagination were held. Of course, this is not to suggest that political authorities did not establish, cultivate, or enable the continuation (i.e. reproduction) of such a place, but rather to suggest that the persistent focus on political dominance misses the opportunity to consider why this particular place was established in the minds of individual humans initially. The earliest memories of place are ignored to make way for how the existence of said memories were reproduced over time through monumental establishment (e.g. a temple, public ritual space). How was a place produced originally by individuals that merited political (re)production later? This consideration is imperative, I argue, in any relational study of landscape production.

Pauketat's assessment reoriented the discussion of agency and societal action through imaginative, yet empirical landscapes, which extends greatly Smith's (2003) references to spatial imagination as primarily investigated through cultural representations (i.e. art, iconography, inscriptions, maps, etc.). Within this innovative view, I propose, landscapes themselves may be representative of spatial imagination, not necessarily in Eliade's sense of "cosmovision" or "cosmograms," but rather the sense of one's (human or society) conception of self within the polity, regional geopolitical realm, or the
cosmological universe. By approaching a study of landscapes through this notion of spatial imagination, one may find the methods of archaeoastronomers far more useful to understand why political authorities found this sort of physical manifestation necessary to control a given society's conception of the supernatural - "religion from the ground up" (Pauketat 2013). Ultimately if one agrees that power and legitimacy were (and are) necessary to constitute authority (Smith 2003), it is important to view the actions of political elite as reflections of the imaginative properties within the people themselves. While regimes, institutions, and authorities manipulated and controlled spatial imagination, especially the supernatural, and implemented these as institutionalized tools of manipulation; political production was enabled only through previously established and conceptualized notions of cosmology. Therefore, political production and reproduction was useful only when it fulfilled the conceptions of the people - religion from the ground up.

In reviewing prior research on urban studies regarding early societies, three important components emerge. The first is that while studies that focus on economic imperatives as explanations for morphological processes are often limited in their scope to describe the social development of entire urban regimes, it is clear that functional processes influenced the ordering of urban space in early societies. Second, the establishment of spaces within early urban environments were political acts meant to portray a sense of political order across social identities, historical trajectories, and spatial scales that constituted and reproduced political authority. Third, that imaginative processes often tied to forms of ritual, the sacred, or religious practice that manifested spatial representations of cosmic order that connected sites and cities to greater conceptions of the supernatural that was relevant to that society. Within this perspective, social order and spatial forms are inherently relational processes. Modifying social order leads to modified spatial forms, and vice versa. Therefore by understanding the spatial ordering of Nabataean Petra it is possible to gain a firmer understanding of the social ordering of Nabataea.
V. Methodology

In the review of prior studies, it is clear that there are three primary components of spatial order in early societies: functional order, political order, and cosmic order. Still, investigating these theoretical forms of order merit empirical methodologies. Within this methodology is an attempt to develop an empirically rooted and theoretically rendered approach that disentangles urban orders and assemblages by examining urban features and forms through the analytical domains of function, perception, and representation. The functional domain consists of lower-level analytical components of spatial measurement often applied to urban form, function, and accessibility to investigate the basic negotiations of spatial experience and the influences of economic imperatives on the morphology of Petra. The perceptual domain is a middle-level set of analytics that extend measurement to include analyses of visibility, accessibility, monumentality, and legibility in order to investigate the political ordering of architecture and social control. Finally the representational domain focuses on symbolic and imaginative manifestations of space by investigating terrestrial and cosmological relationships (Rapoport 1988; Moore 1996; Smith 2003; Smith 2007; 2011; Trigger 2008). Finally, the purpose of this methodology and overall scope of this work is to assess the functional, political, and cosmic ordering of space within Nabataean Petra.

What is important to note in this study is that the methodologies implemented were based on the assumption that the built environment is "a cultural environment" and is therefore "imbued with social meanings" (Moore 1996:15). This is due to the interaction between power (or authority) and space and how these interactions result in spatial elements that were socially produced and socially reproduced. Therefore, borrowing from Moore's "basic argument" these assumptions may be summarized through four components:

(1) buildings as cultural constructs are imbued with symbols;
(2) public buildings often contain public symbols;
(3) the nature of the symbols informed prehistoric societies about the basis of social order; and
(4) it is possible... to make limited, but significant, inferences about the composition of the social group and basis of social order from analyses of prehistoric architecture. (15).
In the case of publicly oriented social productions (i.e. public constructions and urban ordering), these elements usually exhibit public symbols. These symbols reinforce and reproduce social order (i.e. spatial order is political order) and some aspects of these symbols may be inferred by scholars today.

A. Data Collection & Preparation

Currently no single resource exists that catalogues all structures within Petra that includes all necessary features and attributes required for a study such as this. Therefore, data were gathered in Petra to fill paucities not found elsewhere. The initial data were gathered in the summer of 2010 with follow up research visits in the summers of 2012 and 2013. These data were collected through the use of a Trimble Juno GPS, a Brunton compass, a laser range finder, and an inclinometer. These were used to create the initial GIS database stored within an Esri ArcGIS Geodatabase.

Table 5.1: A sample of the monumental structures and sites measured within Petra that were given primary consideration during field work. This does not include the numerous secondary and minor structures, monuments, spaces, and pathways that were considered and measured.

<table>
<thead>
<tr>
<th>PRIMARY Nabataean Structures</th>
<th>MONUMENTS*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Khasneh (Treasury)</td>
<td>Great Temple</td>
</tr>
<tr>
<td>Ad-Deir (Monastery)</td>
<td>Temple of Winged Lions</td>
</tr>
<tr>
<td>Royal Tombs</td>
<td>Blue Chapel</td>
</tr>
<tr>
<td>Uneishu</td>
<td>Petra Church</td>
</tr>
<tr>
<td>Qasr al-Bint Faroun</td>
<td>Roman Soldier</td>
</tr>
<tr>
<td>Um Tomb</td>
<td>The Theater</td>
</tr>
<tr>
<td>Bab as-Siq Obelisk Tomb</td>
<td>Garden Tomb</td>
</tr>
<tr>
<td>Silk Tomb</td>
<td>Palaces? (Biyarah, Wadi Musa)</td>
</tr>
</tbody>
</table>

A GeoEye-1 image was acquired and generously purchased by the King Fahd Center for Middle East Studies at the University of Arkansas and the center was gracious enough to enable its use for the present study (see Table 5.1). For more inaccessible locations, or locations that were not easily identified in situ due to time constraints, this imagery proved invaluable.
Following the field seasons and data collection in the summers of 2010, 2012, and 2013, over 130 points were collected that included tombs and facades, processional ways and pathways, major arterial roads, major structures, and principal landmarks. These points were corrected and adjusted accordingly.
following the orthorectified GeoEye image. At the same time their orientations were gathered using a Brunton compass and were later corroborated with the satellite imagery as well. These are documented in Appendix A.

A digital elevation model (DEM) was derived from contours (isohypses) provided by Cultural Site Research and Management in Baltimore, MD with a resolution of up to 10 meters. This was used to derive a series of topographically relevant products: slopes, aspects, cost-based networks, viewsheds, and elevations. Using the DEM in conjunction with archival material, the road and water networks were modeled at ground level using least-cost paths and water runoff modules within ArcGIS 10.x and Idrisi v16 respectively.

Figure 5.2: Digital elevation model of Petra layered with the GeoEye-1 image.

B. Functional Methods

Urban planning is one of the principal modes of inquiry for cities. Michael Smith (2007) identified a number of practical components of how this is applied to early cities. In quantitative terms this may be
measured more specifically in how the orientation of structures create symmetry or reproduce a “coordinated arrangement of buildings and spaces” (8). The orientations of structures gathered here were examined with regard to the lower level concerns of empirical measurement as evidence of planning schemata. Within Nabataean studies, Wadeson (2011) concluded that one of the primary influences into the arrangement of funerary architecture in Petra was topography. It is for this reason that simply searching for patterns in the arrangement of structures with regard to orientation “does not necessarily imply central planning because other factors such as topography or location with respect to a river or shoreline could produce the same pattern” (Smith 2007:8). Alone such methodologies are highly reductive and constrain dynamically produced urban environments within a totally measurable, and ecologically constrained form (see discussion in previous chapter). Still the collection of these attributes were useful in assessing the wholesale influence of topography on the urban development of Petra. Therefore the arrangement of buildings with regard to their physical geographic contexts was examined.

Considering that the standardization of orientated structures may be a result of topography or hydrography (Smith 2007), it was important to assess the relationship between the orientation of structures and their physical geographic contexts. One method was to identify the orientations of structures and analyze these in relation to the averaged topographical aspect adjacent to the structure or monument itself. This was used to indicate whether the structure’s placement was primarily a product of topography or was specifically placed in opposition to its environmental context. In cases of greater deviance between the topographical aspect and the structural aspect, the structure was identified as purposefully arranged. In cases of lesser deviance, the structure was identified as more influenced by topography.

Another method was to compare the orientation of the structure in relation to the directionality of the nearest accessibly network. The purpose of this analysis was to determine the role of the nearest water course in influencing the orientation of the structure. The Nabataeans were known for their control of water (Ortloff 2005) and some suggest that the placement of tombs was inherently tied to hydrology (Wadeson 2011), therefore assessing this relationship was necessary. Using the Near tool within ArcGIS and some additional programming, it is possible not only to identify the location of the nearest feature to a structure,
but also the azimuthal relationship between the features. These were used to analyze the coordination of buildings in relation to networks, both the pathways and waterways.

As was common in Hellenistic cities (Gates 2003), higher elevations were preferable to lower elevations for specific sets of structures. It is also possible that specific natural slope gradients or terrain azimuths were given greater preference that led to the clustering of structures. Therefore, the nodal topographical features were extracted in the form of elevation, slope, and terrain-based azimuth. These were analyzed in histograms to determine if particular slopes or elevations were preferred within the overall planning scheme of Petra. These attributes were then compared to the more socially formalized attributes of urban spaces.

Figure 5.3: Conceptual model detailing the workflow for extracting that physical geographic attributes for all spatial data.
C. Perceptual Methods

"...the Hellenistic city was designed to project a New Order of enlightened polity and Greek civilization in non-Hellenic areas. The axial layout and formal architecture represented dynastic power, the official cult, and the centers of cultural and social interaction. Ethnic and assimilated Greeks clustered around the city core, lending prestige to the adjacent streets. ... The Hellenistic city was, in fact, designed to impress and to acculturate these indigenous, Near Eastern peoples." (Butzer 2008: 83)

Architectural communication theory, or the "communicative tradition" (Smith 2011), involves a nonverbal approach to the "rhetoric of architecture" (Hattenhauer 1984). Much of this theory is derived from
Amos Rapoport's initial book *The Meaning of the Built Environment* (1982[1990]) and later writings on 
*levels of meaning* in the built environment (1988: 317-336). In architectural rhetoric, power, identity, and 
status are *readable* features within physical elements of the built environment through *monumentality* and 
*formality* (Smith 2007: 35). Kevin Lynch, in considering the city as a conceptual image of social values and 
proposed some basic formal elements that may be related directly to urban spaces (1961; 1981). 
Additionally, within the urban landscape, residents, visitors, and observers *perceive* the city through the 
formation of mental mapping pertaining to experiential elements: pathways, edges (or boundaries, barriers), 
districts, nodes (intersections), and landmarks (Lynch 1961). These enable the viewer to gather an image of 
the city through visual experience. Methodologically, the experience of these elements are related to their 
imageability, or visibility which then lead to formalized arrangements of public architecture, or urban 
formalities. Formality shifts the perception slightly in terms of scale where entire arrangements of elements 
produce a formal spatial order across the landscape. These often take the form of orthogonal, axial, 
cardinal, or symmetrical arrangements (Smith 2007) are empirically identifiable in the landscape. 
Still monumentality played a crucial role in the perceptual patterning of structures in the Hellenistic 
world in establishing a “New Order” (Butzer 2008:83). In addition to axiality, formalized architectural 
institutions conveyed forms of power and dominance in more direct perceptual terms of scale. The 
monumentality of structures and the dominance over the perciipient was central to these forms of power 
that was “designed to impress and to acculturate” (83). I found Moore’s (1996) visual analysis of 
monumental architecture on individual perception especially useful for the more significant monuments of 
Petra. 

**Visibility**

Visibility analysis within this framework pertains to spatial perception and is directly related to 
studies of accessibility (Smith 2003). The ability to view a monumental structure is just as important as the 
monumentality of the structure within the physical space. The inclusion or exclusion of populations by way 
of accessibility was a common tool of elite forms of early societies in establishing clear domains of 
power-filled spaces. This may include limited access to palatial or temple structures and spaces from the 
exterior or increased limitations to accessibility within their interiors. Topographical constraints, such as a
mountain, hill, canyon, or waterway additionally limit accessibility and therefore the ability of the percipient to shift modes of perception. In some cases the surrounding spaces may encourage a rather holistic view, whether internal or external, of the structure where the percipient gains visual access to a monument from multiple angles. In other cases the percipient may be purposefully restricted in their visibility due to man-made or natural features in the landscape. Each of these lend to a symbolic rendering of publicly accessible forms of architecture in early societies and relate to spatial perceptions of power (Moore 1996; Smith 2007; Trigger 2008).

For this study the visibility of public architecture and spaces were considered through the use of ArcGIS and the Spatial Analyst extension. Power may either encourage or prohibit particular views within the landscape. Points may be purposefully included or excluded from the most commonly accessible locations. Additionally, specific foci, such as landmarks, may be encouraged to dominate the majority of the landscape to reinforce the role of an institution or regime through the ordered urban space. Therefore, each point was investigated in terms of whether:

1) other regions were included in the visibility from the given location,
2) regions of the city, especially pathways, were excluded from visibility of this point,
3) whether specific structures were specifically viewable by many other structures.
Figure 5.5: Conceptual workflow of the script of the visibility analysis implemented from Appendix B that iterates through each point and derives a viewshed for each and a final composite viewshed for every structure in the input.

**Legibility & Imageability**

“*Formal, monumental urban architecture communicates a number of messages, including the ability of the state to carry out large projects, convert disorder to order, and convince or force individuals to conform to societal needs.*” (Smith 2007: 35)

The movement of people through urban space was a central component of Kevin Lynch’s *The Image of the City* (1960). Two essential conceptual components of this study was the legibility of the city, or “the ease with which its parts can be recognized and can be organized into a coherent pattern… a related pattern of recognizable symbols…[that] are easily identifiable” (1960: 2-3); and its imageability, where social notions of identity and structure have a “high probability of evoking a strong image in any given observer… shape, color, or arrangement which facilitates the making of vividly identified, powerfully structured, highly useful mental images of the environment” (9). The legibility is closely related to formality discussed earlier where urban coherence and the coordination of spaces improves its ability to be understood by a percipient. The imageability is closely related to visibility analyzed earlier as evocative
imagery was meant to be seen by large populations (ie. public symbols) in order to facilitate a coherence to an identity.

Monumentality may be measured not only in terms of quantitative scale, but also in terms of its visual encounter. Moore (1996), borrowing from the visual analysis of landscapes by Higuchi (1983), referred to this form of encounter as the angle of incidence measured through the implementation of isovists. At various distances, the angle of incidence, measured by the tangent angle of the percipient in relation to the monumental feature, produces various communicative effects upon the viewer. Higuchi (1983), following Lynch (1960), based this on the account of landmarks, or monuments, maintaining clearly identifiable and quantifiable physical properties (Moore 1996). These may be analyzed by investigating four qualities: “they have clear forms, they contrast with their backgrounds, they are prominent” (98), and they maintain a sufficient scale to “emphasize their presence” (Higuchi 1983: 183).

For this study these properties were analyzed through a GIS implementation of isovists (or single view), which refers to the spaces that are able to view a specific point (Moore 1996). Within this approach is the premise that beyond the horizontal line of sight of the average viewer, “vision is limited to 50-55 degrees above and 70-80 degrees below the horizontal line of vision, but within this range certain visual modes have even more restricted fields” (1983:98). Color discernment rests in the field of view between +30 degrees and -40 degrees “while eye rotation is +25 degrees and -35 degrees” (98). The average viewer maintains a “normal line of sight while standing” about -10 degrees (98). Both the height of the monument (scale) and the relative position of the percipient influence the required shift in degrees which inevitably affect the movement and stability of the viewer when the angle of incidence is high enough to require the viewer to look upward (see figure 5.6). As Higuchi pointed out:

“A downward view is free and open whereas an upward view is limited and apt to be closed because the process of looking up at an object tends to limit the mobility of the human body and to cut off the line of vision at a point above the horizontal. With the most stable line of vision for the average person being about 10 to 15 degrees below the horizontal, it follows that the very process of looking up involves a certain amount of stress. Presumably this is why the term ‘look up to’ connotes the idea of paying respect or reverence. ‘Looking up to’ someone or something requires visual effort.” (Higuchi 1983: 46)
Figure 5.6: Angles of vision and how fields of view affects the perception of the percipient. Adapted from Moore (1996:99).

Figure 5.7: Isovist views both at nadir position and from a profile position. Adapted from Moore (1996:106)
As the viewer changes their relative geographic position by traversing the landscape, the perception "changes at 18 degrees when an object first takes on monumental nature, 27 degrees when it fills the viewer's range of vision, and 45 degrees at which details are visible" (Moore 1996: 100-1; citing Higuchi 1983: 47) - see figure 5.7. The ability to view and perceive a monumental feature may be obstructed by man-made or natural features, which is another perceptual requirement that was considered.

Monumental structures that forced the viewer to halt movement in order to perceive the monument in full, were those that demanded greater power over the viewer. It was determined that these monuments and structures were central to the establishment of new forms of order within the urban system as whole. Monuments that were easily perceived within normal sightlines where movement was still possible demanded less power over the individual. These were determined to be reproductive of spatial order rather than productive of new forms of order.

Figure 5.8: Conceptual model explaining how isovists were generated within ArcGIS for each structure.

D. Representational Methods

"Early cities generally appear to have been regarded as places where the human and divine realms came into especially close contact...Today more cross-cultural regularities are being found in the cosmic symbolism of early civilizations than many cultural anthropologists would have expected."  
Bruce Trigger, 2008: 62-3)

Within these conceptual methods one may come to understand the city on higher levels, or in the terms of Amos Rapoport how "meaning relates to cosmologies, worldviews, and the domain of the sacred" (Smith 2007: 30). These approaches are similar to symbolic methods described above, but deviate in terms
of conceptual spatial scale. The totality of the city being laid out as an image was a feature common early cities (Lynch 1981), and especially to early Hellenistic cities like Pergamon (Kostof 1990). The urban fabric of cities emerged as centers of spectacle and theater, either for the ordering of political authority throughout the experiential landscape (Kostof 1990; Trigger 2003:495-521) or through the cosmic ordering of society constituting relations between humans, regimes, gods, and supernatural order (Trigger 2003:445-471; Pauketat 2013).

The ordering of entire landscapes might evoke meaningful imaginations of urban order that integrated man-made and natural environments - or what Spiro Kostof termed the *Grand Manner* (1990:209). In other cases the entire cosmos may be rendered spatially through specific forms of architecture (Pauketat 2013), the layout of an entire city (Wheatley 1971; Trigger 2003), or the structuring of cities throughout a polity (Marcus 1993). Many of the methods herein derived from normative urban theory (Lynch 1981), where the city may be viewed as a symbol or as an image (Smith 2007). These methods are inherently multi-scalar as it considers individual institutions, structures, and spaces within the realm of urban experience and perception, but also considers the totality of the urban imaginary as a microcosm of assemblages, whether exclusively terrestrial ("the Grand Manner" - Kostof 1990) or extensively cosmological (Lynch 1981). These methodologies rest within the higher-level domain of empirical theory in that they investigate "a kind of symbolic representation that only exists within the context of a specific cultural and religious system" (Smith 2011: 181; citing Rapoport 1990).

Still the objective of these methods were to understand the relations of space within Petra as a social product of urban order. Just as the symbolic ordering of structures and spaces entail the coherence of an urban *milieu* as formalities understood through its legibility and imageability, so too does the conceptual ordering of society and space in Petra need to be considered in terms of horizontal-terrestrial and vertical-cosmological conceptual relationships. Considering that discourses of spatial imagination were "unintelligible without reference to the experiential dimensions of landscape" (Smith 2003:74), conceptual and imaginative cartographies of the supernatural may be manifested and measured within the built environment directly. In some cases the spatial discourse of cosmology were meant to center the divine squarely on the role of the king as the producer of urban monumental spaces. An experiential reinforcement
of political legitimated by establishing physical control of, or "close contact" (Trigger 2008: 63) to the supernatural. Archaeoastronomy is one of the most common methods implemented to investigate such conceptual formalities (Pauketat 2013).

The principal criticism with archaeoastronomy is that the haphazard measurement of empirical data within early cities too often leads to highly subjective interpretations of absolutist notions of complex spatial dynamics. The entirety of an urban area with a spatially and socially dynamic set of elements are often reduced to single, quantifiable categories with little regard for the nuances of society and space. This is my primary concern with the recent study of the archaeoastronomy of Petra conducted by Belmonte, Gonzalez-Garcia, and Polcaro (2013). Little concern was given as to how or why these forms came to dominate the religious experience and political social productions of space in Nabataea. This study, like others in archaeoastronomy, often leave the intellectual community asking the question: “So what?” (Pauketat 2013). Questions of religion, agency, politics, and especially urbanism are left out of these absolutist statistical analyses of spatial dynamics. While the data itself is certainly valuable, and was used as a basis for comparison within this study, the premises upon which their study was based allows for their conclusion - “the light and shadow effects confirmed in several monuments of the city related to the consistent use of… astronomical features,... points towards the importance of astral elements in Nabataean religion” (Belmonte et al. 2013: 499) - to be easily dismissed.

Perhaps the most common problem with archaeoastronomy "lies squarely in the archaeological samples" and the selective biases that researchers used to defend alignment arguments (Pauketat 2013: 60). These researchers often refer to "one line of evidence, usually a single monument or archaeological site" in order to prove a presupposed conclusion (60). An example might involve a researcher measuring orientations for a few significant monuments or structures that were identified as important to the researchers themselves with little concern for socio-spatial contexts. It is then difficult, if not impossible to assess whether a structure's particular orientation might be a function of other explanations in the absence of corroborating evidence. Statistically, the odds of a single structure in a single location aligning to a random celestial body is quite high, especially given the seemingly chaotic perturbations of celestial bodies like a planet or the moon (2013).
Another problem is that alignment studies encourage a false dichotomy between those sites/structures that are a "precise predictive device" and those that are "astronomically meaningless" (Aveni et al. 2003: 172). If a structure or monument is found to have an alignment, it is tempting to conclude that the alignment was a means of predicting a particular celestial event rather than considering whether the alignment was about engaging and interacting with celestial phenomena. In other words, an alignment study will implement hasty generalizations to describe why societies implement astronomical alignments and ascribe them to mystical forms of religious adherence. Rather than seeing the alignment as a human cultural construct relative to a given society in a given time at a given location, the researcher glosses over these cultural, temporal, and regional differences by reducing the meaning of an alignment to a universal ideal often applied indiscriminately (Pauketat 2013).

The motivations for the majority of celestially oriented monuments and structures in ancient societies pertained to commemoration rather than prediction. As Pauketat points out "after all, one does not need monuments to tell time" (66). Motivations and interpretations varied, but what is clear is that for those societies that concerned themselves with celestial happenings, their primary goal appears to be conceptual engagement. That is to say an engagement between humans and the supernatural and vice-versa (2013). Paul Wheatley, a geographer analyzing urban configurations in early Chinese cities, termed this engagement as an "intimate parallelism" (1971: 414). When assessing these motivations, it is more useful to consider orientations and alignments as a function of relational ontologies, where aspects of human agency and intentionality was spread across entire landscapes, especially urban landscapes, so that "no one building was... intended to embody the entire cosmos" (Pauketat 2013: 66). Essentially, by incorporating multiple aspects of the landscape, such as the multitude of methods above, the researcher can alleviate the issue of selective bias so as to follow multiple holistic avenues of evidence.

In order to counteract these problematic premises, I found it useful to follow Kevin Lynch’s and Amos Rapoport’s list of common architectural expressions associated with “magical correspondences” (Lynch 1981) within cosmically oriented urban spaces (Smith 2003: 226). Rapoport’s elements were used as indicators for high-level meanings within Petra's built environment which “includes city walls with gates, orientation to the cardinal directions, vertical markers at the center, open sacred plazas, and tombs in key
locations” (2007: 31). Additionally, Kevin Lynch (1981) noted a series of common form elements within cities that demonstrated “magical correspondences”: axial lines of procession, encircling enclosures with gates, an emphasis on “up” as opposed to “down” or big versus small, bilateral symmetry, orthogonality of forms, cardinality in relation with solar events, and highly visible landmarks associated with these (75-79). Many of these form qualities were assessed in the perceptual methods above.

Azimuth, Bearing, and Inclination

![Figure 5.9: A generalized model of archaeoastronomical measurement and technique using azimuth and inclination.](image)

Archaeoastronomical methods were implemented to analyze such conceptual and imaginative spatial interactions between the terrestrial and celestial (sky) by investigating alignments, visibility, and cardinality. These involved the use of standard field survey equipment (usually a compass, inclinometer, and/or a theodolite) to measure the orientation and directionality of a monument, structure, or feature (see figures 5.9, 5.10, 5.11). Occasionally, statistical methods were applied to reveal common orientated patterns within the entire landscape. Finally, astronomical events were generated through mathematical, computational techniques specifically related to the time frame of the feature in question. Investigating
terrestrial and astronomical relationships within GIS presents a few challenges. The majority of GIS analyses are well suited for terrestrial, topographic, and distributive analysis along two and three-dimensional landscapes. However, it is currently difficult to calculate astronomical data in a GIS, especially when the calculation and representation of historical astronomical events is needed. I combined these analyses with astronomical data by merging the ArcGIS python library (ArcPy) with the highly accurate PyEphem library, which adequately accounts for changes in precession and atmospheric refraction.

**Figure 5.10:** This figure demonstrates how the azimuth were taken of each external architectural structure.

**Figure 5.11:** This figure demonstrates how internal alignments and azimuths were measured. Each niche, room, or bas relief will be taken into consideration.

The key to this research was to identify the celestial pathways that traversed Petra’s skies, then and now. These pathways were generated by defining observer locations that were based on the spatial attributes for each point (elevation, latitude, and longitude). In this case, PyEphem accepts a start date (such as 1 January 50 BCE) to identify each solstice and equinox. The returned date was used to determine the previous rising and the next setting times for that day. Within these time constraints, it was
possible to pass through time by adding five minutes to the previous rising and return both the azimuth and the altitude of the sun throughout that day. Due to limitations of processing and visualization, five minutes emerged as the most useful and practical temporal resolution for this analysis. These values are then overlaid on the horizon diagrams (see figure 5.12 for an example) that represented the astronomical event's rising and setting locations. Using ArcGIS's python library, ArcPy, in conjunction with PyEphem and matplotlib, I developed a script that accepts vector point data to extract topographical data from a Digital Elevation Model (DEM) in order analyze celestial pathways in an horizon diagram. These relationships were visualized using the python-based matplotlib library.

Figure 5.12: A generalized model of an horizon diagram indicating structural orientation and the rising and setting points of the celestial object in question in relation to the topographical setting.
Figure 5.13: Conceptual model detailing the creation of the horizon diagrams using ArcGIS and PyEphem.

By integrating these accounts of spatial order within practical analytical approaches, it is possible to gain a firmer understanding of the productive and reproductive properties of urban space throughout Nabataean Petra. The functional domain focused on the physical geographic contexts of the individual structures where the functional ordering of structures was considered to be directly related to the coordination of building arrangements (Smith 2007). These arrangements were investigated in relation to topography and accessibility networks. The perceptual domain focused on the visual relationships between the structures and the viewers capable of perceiving those structures. Perceptual order was considered in terms of visibility, through the use of viewsheds, and legibility and imageability, through the use of isovists. Finally, the structures, patterns of structures and spaces, and the overall urban layout were analyzed as possible representations of order through the implementation of horizon diagrams emphasizing the terrestrial and celestial relationships. Together these components enabled an holistic account of Nabataean ordering of space.
VI. Results & Analysis

The majority of data collected and analyses involved focused on the spatial relations associated with the monumental structural field of Petra. There are a few known monuments and dwellings located beyond the main Valley of Petra throughout areas of al-Madras (Nehmé 2013) and so-called “Little Petra,” however these locations were not considered for this study due to their strong spatial dissociations with the main valley and center of political establishments and institutions within the valley.

Figure 6.1: Cartographic distribution of significant points collected throughout the main valley of Petra including the digital elevation model. The sites were combined with archival materials to determine basic functional categories.

Following the field seasons and data collection in the summers of 2010, 2012, and 2013, over 130 points were collected that included tombs and facades, processional ways and pathways, major arterial roads, major structures, and principal landmarks. These points were corrected and adjusted accordingly following the orthorectified GeoEye image. At the same time their orientations were gathered using a
Brunton compass and were later corroborated with the satellite imagery as well. These are documented in Appendix A.

Accessibility networks, roads, and pathways, were identified by Nehmé (2013) however mostly the eastern portions of Petra were published in her findings. These were combined with processional ways, pathways, and roadways identified in the field and through satellite imagery.

![Figure 6.2: A cartographic representation of the generalized accessibility networks identified in this study.](image)

The water networks were both modelled in terms of water runoff using Idrisi 16 Taiga and were combined with water networks identified through field methods and satellite imagery:
The physical features of each structure were identified through *in situ* methods and remote sensing. Each structure was layered and analyzed in reference to the digital elevation model and the elevation data collected with the Juno GPS unit. These were also combined with measured orientations for the majority of structures and sites. These were also compared to measurements by McKenzie (1990) and Belmonte et al. (2013). These were also catalogued in Appendix A.

### A. Functional Results

The primary objective of the functional analysis was to examine the physical environmental relationships to each of the points collected within Petra. Once the physical attributes were collected with regard to elevation, slope, aspect, constructed orientation, and road and water networks, spatial relationships were examined through histograms.

The distribution of elevation demonstrated a high concentration of points within the range of 866 - 970 meters. While the full range of available landscape within the valley consists of 690 - 1320 meters.
This demonstrates a clear preference for lower elevations that match the Via Sacra that connects the opening of the Siq to the main valley (~980m - 860m). The linear profile of the Via Sacra that includes the Siq pathway, its exit into the Wadi Musa, and the Colonnaded Street, was generated by i) creating points of the paths by using ET GeoWizards’ “Polylines to Points” tool, ii) extracting elevation values to these points, iii) and visualizing these within Microsoft Excel. There appears to be a strong relationship between the elevations and between the pathways exiting the Siq and the situating of tombs and structures along this path. Additionally there appears to be strong limitations of construction at higher elevations although these areas include some of the more level plateaus at primary exit points along the accessible pathways.

**Figure 6.4**: Histogram demonstrating the physical topographical elevations extracted from the digital elevation model or the GPS unit for each point. There exists clear preferences for the lower elevations within the main Valley of Petra.
**Figure 6.5:** Elevation profile of the pathway through the Siq and exiting at the Wadi Musa onto the Main Colonnaded Street. The majority of facades and structures are positioned after the exit of the Siq and its descent into the Wadi Musa/Main Street.

**Figure 6.6:** Histogram demonstrating the idiographic distribution of topographic slopes extracted from the digital elevation model. There appears to be little relationship between structures and their slope, however this may be due to the limitations of the DEM in depicting vertical cliff faces.
Figure 6.7: Histogram demonstrating the physical topographical azimuths (aspect) extracted from the digital elevation model or the GPS unit for each point. Note: this is not equivalent to measured structural orientation (see figure 6.8).

Figure 6.8: Histogram of measured orientations of points focusing on those with clearly defined azimuths with highlighted clustering of clear breaks indicating strong relationships with cardinality. Note the discrepancy with figure 6.7 and how the modal distributions appear purposely orientated towards the cardinal points - in contrast to their natural topography.
Table 6.1: Statistical results of the proximity analysis between all points measured and their relationship to networks. These focused on both distance and the difference in orientation between the architectural orientation and the angle to the nearest linear feature in the network.

<table>
<thead>
<tr>
<th>Statistical Attribute:</th>
<th>Relationship to Water</th>
<th>Relationship to Paths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Distance (m)</td>
<td>81.860</td>
<td>61.95</td>
</tr>
<tr>
<td>Min. Distance (m)</td>
<td>&lt; 1</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Max. Distance (m)</td>
<td>351.696</td>
<td>532.155</td>
</tr>
<tr>
<td>Average difference in measured orientation of structure in relation to computed orientation to feature</td>
<td>139 degrees</td>
<td>78 degrees</td>
</tr>
</tbody>
</table>

Distance analysis was conducted using the proximity toolbox modules available within ArcGIS, specifically the Near analysis tool. These were summarized using Microsoft Excel. The orientations were measured using geodesic angles forcing north to begin at 000 degrees. The angles measured to +180 clockwise and -180 in the counterclockwise direction. A simple nested if statement was implemented in Microsoft Excel to adjust: \( IF(X < 0, (360 - \text{ABS}(X)), X) \) - where \( X \) is the value returned from the Near tool in ArcGIS.

The results demonstrate no clear relationship between the overall points and these networks. There is a rather wide range of distance between the structures and available water and accessibility networks and the overall architectural alignments seem not to be related to the nearest network. It should be noted however, that when the data considers only those near the main street, the metrics were quite different.

Table 6.2: Statistical results of the proximity analysis between only those points near the main street and the Wadi Musa measured and their relationship to networks.

<table>
<thead>
<tr>
<th>Statistical Attribute:</th>
<th>Relationship to Water</th>
<th>Relationship to Paths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Distance (m)</td>
<td>65.57</td>
<td>39.08</td>
</tr>
<tr>
<td>Min. Distance (m)</td>
<td>24.8</td>
<td>14.9</td>
</tr>
<tr>
<td>Max. Distance (m)</td>
<td>24.8 (Royal Palace)</td>
<td>58.8 (Winged Lions)</td>
</tr>
<tr>
<td>Average difference in measured orientation of structure in relation to computed orientation to feature</td>
<td>4 degrees</td>
<td>69 degrees</td>
</tr>
</tbody>
</table>
The relationship to the main street and the Wadi Musa reflects the orthogonality of this region and attests to this area constituting the center of Petra’s urban center as a whole. The relationship to water, based on their orientation, indicated the role that water likely played in the situating of this center of Petra and the clustering of some of the more religious and administrative centers around the primary confluence of water resources at the lowest levels of elevation in the Wadi Musa. The distance to water appears to be less of a determinant than the distance to pathways, however, which lends to their ability to be accessible in purely functional terms. Along the Wadi Musa, the mostly free-standing structures appear to favor both accessibility and access to water resources while the tombs and facades were primarily situated along pathways. In essence, the administrative structural core of Petra was coordinated and arranged in relation to centralized water resources. The functional control of water was synonymous with the functional control of power at Petra.

B.  Perceptual Results

A script was developed that iterated through each structure that calculated the outward viewshed, the orientation bearing and distance in relation to that viewshed, and the total viewable area. Not surprisingly the results of the total viewshed produced no common viewable locations that considered all points. A narrower analysis was implemented in this case that considered only the primary monuments in highly public locations, the urban monumental core and the high places. Still no significant result was obtained leading me to conclude that no one structure was situated to be central within the view of primary or secondary structures within the valley. Samples of the viewshed and isovist results were collected and organized in Appendix B.

Results suggest that visibility was highly limited to lower elevations for those entering the city from the east via the Siq. Those within the city were required to reside within the westernmost portions in order to be visible from and to be perceptually aware of the high places. Interestingly each high place considered was visible from this location (Khubtha, Deir, and Jabal Haroun). Additionally the altar itself was oriented directly towards the pilgrimage site of Jabal Haroun possibly elevating its importance within the political/religious landscape. Also worthy of note was the visual alignment with the recently cited
monumental platform that is thought to exist in the southern portion valley although its social relationship is yet to be determined.

The angles of incidence were determined to be implemented at specific locations. Their most common forms were in key positions related to new forms of monumentalization associated with the Qasr al-Bint, Khasneh, Monastery, Palace Tomb, and Corinthian Tomb. Each of these structures appear to focus the viewer into a fixed positions in space. These structures may be considered monumental in that they evoke a sense of scalar dominance over the viewer. This is due to the fact that the limitations of accessibility and visibility frame the viewer's visual encounter with the monument or structure in such a way that promotes a shift in casual visual fields. These shifts may require the viewer to slow or halt movement depending on the viewing angle (Moore 1996).

At greater distances the angle of incidence is often lower, or closer to the viewer's horizontal plane, and the overall monumental properties of the structure, including its iconography and symbology, are greatly reduced. In these cases the visual field is less likely to require physical strain or effort to maintain a visible sightline or to perceive the entirety of the monument or structure. The Qasr al-Bint is an example of such a case where the initial angle of incidence is relatively low considering that the structure is visible from considerable distances where the relative elevation difference is marginal. The initial angle of incidence is about -0.5° at a distance of about 700m located at the easternmost portion of the Colonnaded Street. With an assumed natural line of sight at around -10° (Moore 1996; Higuchi 1983), the line of sight for the Qasr al-Bint requires little effort while moving along the street. Interestingly, the Qasr al-Bint is located within the temenos which has a trajectory that is slightly offset from the Colonnaded Street forcing the Qasr al-Bint into full view from any point on the street. While the angle of incidence for the Qasr al-Bint along the Colonnaded Street is useful in determining general visibility, the distances along the street give little impression of the monumentality of the structure. The structure does not take on a monumental perceptual scale until one is within 43m of the structure's main entrance where eye rotation exceeds 25° above the horizontal.
Figure 6.9: Isovist map of the Qasr al-Bint. Note that the structure does not take on a monumental scale until one is within about 43m of the structure.

The Qasr al-Bint is certainly a monumental structure in terms of physical scale with a square plan of about 32m x 32m and a height of about 23m, but its presence within the visual landscape stands apart from other findings in that its position ensures a visual ubiquity throughout the entire Colonnaded Street while at the same time requiring little effort to visually consume its entire presence. For the Qasr al-Bint, an overt form of visual dominance was not necessary during its production. This form of ordering appears to be less about establishing a new (or oppositional) form of Nabataean order and more about sustaining and reproducing previously established understandings and meanings about the role of this structure within the temenos and the broader landscape of Petra.

Conversely, the Khasneh and the Monastery are two examples of overt, visually dominant establishments of spatial order. Due to their locations along narrow pathways that restrict alternative movement, the initial angles of incidence for the Khasneh and the Monastery are 30° and 35° respectively.
The Khasneh is initially encountered through the narrow passage of the Siq where the orientation of the viewer must shift to a more northwesterly direction towards the Wadi Musa. The redirection of movement forces an orthogonal view of the Khasneh directly. This junction, its limitations on movement, and the angle of incidence require the viewer to stop movement to visually consume the facade.

![Figure 6.10: Isovist of the Khasneh. Note that the resolution of the digital elevation model results in a viewshed that extends farther than reality. In truth, the majority of the viewing angle for the Khasneh is >25° resulting in a perceptual monumental scale at most viewing angles.](image)

Situated near the end of the processional way leading to the top of Jabal ad-Deir, the Monastery is slightly less forceful in its placement. While viewers exiting the Siq to the west have little choice but to perceive the Khasneh, the exit point of the Jabal-ad-Deir processional way does not force such a constraint. The viewer must physically turn and perceive the Monastery at an oblique angle from a distance of about 40m. With a height of 48.3m (McKenzie 1990), the monumental properties are highly pronounced. In fact, of the few points in Petra where the Monastery is truly visible, these locations require significant elevation. Two significant positions are atop Umm al-Biyara, especially the possible ritual structure built...
along its northeastern cliff face, and the summit of Jabal Haroun. Both of these sites were known sites of ritual and the location of the Monastery is occasionally referred to as a high place itself (Alpass 2013).

It is clear that these two monuments set out to establish new forms of spatial order that was not only dominant in the landscape but also compelled the viewer to consume its presence. Their locations allow for a small range of viewing angles, most of which result in overt forms of monumentality. Still their differences in accessibility provide interesting clues as to the objectives of establishing these forms of order. While the Khasneh was accessible to and was undoubtedly accessed by all who were admitted into Petra, the Monastery was secluded. The knowledge of the Khasneh appears in stark contrast to the spatially induced ignorance of the Monastery. The public awareness of the Khasneh reinforces its role as a political production whose function served to constitute the authority of the regime based on the memory of

**Figure 6.11**: Isovist of the Monastery. Note that the resolution of the digital elevation model results in a viewshed that extends farther than reality. The primary focus for this isovist is the Monastery’s forecourt as no approach allows for an angle of incidence less than 35°.
previously deceased rulers, while the public ignorance of the Monastery reveals conspicuous efforts by smaller, elite groups to constitute their social coherence around forms of ritual associated with elevation.

The Palace Tomb and Corinthian Tomb are two examples of monumentality that maintain high initial angles of incidence and high levels of ubiquity within the Valley of Petra especially along the Colonnaded Street. These were maintain forms of spatial order rather than establish new forms of order. This is due to their orientations and high levels of visibility in relation to the Colonnaded Street and the temples along the northern portions of the Valley of Petra. Still much of their presence remains hidden from view for visitors entering Petra from the Siq, but once the visitor reaches the main thoroughfare of the Colonnaded Street the Corinthian Tomb is immediately visible as its orientation (of 276° W) matches the street’s orientation (276° W). If the viewer is located at the easternmost section of the Colonnaded Street, the angle of incidence is within optimal angles of eye rotation at 18°. This demonstrates that the Corinthian Tomb was less concerned with forcing the viewer to halt movement to perceive new forms of spatial order and more concerned with framing the viewshed of the Colonnaded Street to the east. While the Corinthian Tomb is ubiquitous throughout much of the valley, the visual purpose of its positioning was to adhere to the previously established spatial order associated with the Colonnaded Street. It suggests that the elite member of Nabataean society entombed within the Corinthian Tomb, who was most likely of royal descent, sought to be associated with the new forms of political order that was already constituted in place along the Colonnaded Street.
In addition to their relation to the Colonnaded Street, their high angles of incidence for the pathways that lead to the processional ways that ascend Jabal Khubtha demonstrate a form of dominance over the viewer just prior to their ascent to the Khubtha high places. Near the entry point for the access point of the processional way leading to the Khubtha high place the angle of incidence for the Palace Tomb is around 37° and it is likely that the viewer was required to walk in front of both facades requiring viewing angles >56° for each facade. While the facades were certainly related to the previously established ordering of the Colonnaded Street, it is also possible that these facades were establishing new spatial forms of dominance and power over patrons of the institutionalized ritual spaces atop Jabal Khubtha.
The Nabataeans implemented visual spatial strategies in planning the positioning of monumental facades throughout the Valley of Petra. Some of these facades were meant to establish and constitute new forms of spatial order within public, highly legible contexts such as the Khasneh, while others established new forms of order in secluded and limited contexts, such as the Monastery. In other cases, order was less about dominating the visual landscape to enforce new forms of order but instead framed (or reframed) previously established spatial orders by facilitating visual relationships between spatial forms, such as the Colonnaded Street and the Qasr al-Bint, Palace Tomb, and Corinthian Tomb. Still their dominance in the visual landscape at specific positions along processional ways involving ritual suggests new forms of dominance over previously established ritual spaces, such as the Qasr al-Bint and the temenos, and the Palace Tomb and the processional way ascending Jabal Khubtha. Together these spatial manipulations reveal a more profound awareness of the complexities associated with shaping and ordering built...
environments by the Nabataeans. The Nabataeans were effective in implementing planning schemes that ordered spaces that were both reflective and constitutive of political order.

C. **Representational Results**

Horizon diagrams were generated to include astronomical relationships that focused on external and internal alignments with structures and features. Significant alignments were identified at the following locations:

**Table 6.3**: Collection of significant findings related to ritual order including alignments and non-alignments.

<table>
<thead>
<tr>
<th>Tomb/Structure</th>
<th>ER</th>
<th>ES</th>
<th>WSR</th>
<th>WSS</th>
<th>SSR</th>
<th>SSS</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>ad-Deir</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corinthian Tomb</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Three niches</td>
</tr>
<tr>
<td>Garden Tomb</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Madbah Altar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temenos Gate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Khasneh</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Visibility blocked</td>
</tr>
<tr>
<td>Obelisk Tomb</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obelisks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Relational meas.</td>
</tr>
<tr>
<td>Palace Tomb</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qasr al-Bint</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>None observed</td>
</tr>
<tr>
<td>Roman Soldier</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Visibility blocked</td>
</tr>
<tr>
<td>Theater</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Visibility blocked</td>
</tr>
<tr>
<td>‘Uneishu</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Above Madbah</td>
</tr>
<tr>
<td>Um Tomb</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>All three niches</td>
</tr>
<tr>
<td>Winged Lions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>None observed</td>
</tr>
<tr>
<td>Khubtha Altar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>at Umm al-Biyarah</td>
</tr>
</tbody>
</table>


The results of the horizon diagrams indicate a strong preference towards sun setting events in all three categories. In some cases an alignment was disregarded due to its visibility being blocked by the
physical horizon. Only one location returned a positive result for a sun rise relationship and that was the western obelisk atop Jabal Madbah and the orientation it shares with the eastern obelisk. While the Theater, Khasneh, and Roman Soldier Tomb were capable of direct alignments, the horizon clearly blocks this relationship and was therefore determined to maintain little to no relationship. The structures located along the Colonnaded Street consistently showed no relationships, however the temenos gate (which matches the pathway of the temenos) shows a potential alignment with the setting sun on the summer solstice.
VII. Discussion

The purpose of this study was to investigate the reformations of Nabataean space with regard to the structuring of spatial order within Petra’s urban milieu through experiential, political, and ritual forms of order. The results of this study demonstrate that Nabataean space was not only produced by social relations in accordance with specific functions, but also was meant to be reproductive in directing Nabataean society towards new forms of order. Therefore what follows is a discussion of Nabataean spatial order through a relational lens that focuses on the environmental dynamics of space as a product of social relations and the recursive properties of space on Nabataean social relations within Petra.

A. Movement and Flow of Authority

While walking through the Valley of Petra it is clear for any observer that the terrain was a principal component in Nabataean spatial order that was carefully integrated into the overall urban experience of the city and its networks. The main pathway from the Bab as-Siq (i.e., the entrance) provides a clear example of this where the elevation begins at an average of 1000m and descends at a mostly consistent gradient until finally reaching the Wadi Musa at about 860m. Along the Siq is a continuous set of rock-cut channels and pipes that routed waterflow alongside the box canyon walls at about the same gradient. Concurrently, during this descent the spatial experience and perception is heavily inundated with cultic niches, betyls, and dedicatory inscriptions. The same holds true if one enters Petra through the much narrower Wadi Muthlim in the northern portion of the valley.

What is most profound about the movement through the Siq is the limitations of width ranging from about 3 - 30m. City walls were a common experiential feature among Hellenistic cities (Kostof 1990; Gates 2003), Judaean cities, and was attested in Damascus by Paul in reference to Aretas of Nabataea specifically (2 Cor. 11:32). In Petra it is clear that the topography served as the city’s walls. The primary point of entrance, where the springers confirm the location of a possible monumental arch, boasts a width of about 12m. Considering this, the Siq produced experiential qualities associated with social control by limiting the entrance of large groups (or invading armies) at any one time. Interestingly, there are no known tombs or forms of architecture located within the entirety of the Siq’s 1.2km pathway. Instead there are a number of different niches, cult sites, betyls, including the monumental betyl carved in a sandstone outcrop.
in the middle of the pathway where the viewer must choose to walk around one side or the other. Not to mention the number of dams that were likely in place to block water runoff from flooding the Siq (Bellwald et al. 2003).

There appears to be a clear relationship between water resources and institutionalized religious spaces, whether high places, processional ways, or altars. Many attribute the spatially ubiquitous relationship between altars and water basins to be related to blood sacrifices (Erickson-Gini 2015). The processional ways were often rock-hewn and carved in relation to the water runoff from the top of the relative mountain. The high places are unique in that these almost always feature a pool or reservoir with some sort of channel or drain. The institutions that controlled these spaces did not develop water catchment systems to fill these reservoirs as their physical location at usually the highest peaks of the mountain or outcrop restricts such an endeavor. Instead this water was likely carried from other locations and deposited in these basins.

The spatial representation of the processional ways was manifested in the Siq where there is a rock-hewn relief depicting men leading camels, possibly from a caravanserai. It is debated as to whether the men or the camels are carrying a block idol in the image that would be later deposited in an idol niche; a tradition common in Nabataea. What is interesting about this is the corresponding relief located across the valley atop the plateau of Jabal ad-Deir where a similar depiction is presented but with the men clearly facing a niche and aniconic betyl. The spatial disparities between these reliefs are quite profound as these span the full extent of Petra with one relief located just before the Siq’s exit near the Khasneh with an elevation of ~990m southeast of the valley, and the other located atop Jabal ad-Deir to the west of the valley at an elevation of ~1110m. This indicates that the imaginative role of the spaces associated with these pathways and high places were to serve as nodal beacons of spatial fixation for travellers that facilitated a representational ordering of the city within the consciousness of individuals. Travellers routinely bundled this ritual spatial representation within block idols that were then used to reproduce anchoring effects at various nodes throughout the region. The earliest establishment of these fixed nodes and spaces appears to be in Petra while subsequent temples and institutional establishments began during the reign of Obodas III in the middle of the first century BCE (Segal 2013; see discussion in chapter three). The high
places and rock-cut niches with empty spaces for setting mobile idols was ubiquitous throughout Petra (Alpass 2013). This anchoring effect may be seen as a reproductive gravitational force that encourages a spatial imagination for a highly mobile population to a specific place - in this case Petra.

In functional terms the processional ways, including the Siq, served to distribute and route water in specific directions such as the aqueducts that directed water from ‘Ain Musa through the Siq down to the urban center. Many of these pathways follow pre-existing wadis while the Siq exits onto the Wadi Musa. Here the spatial experience changes in that more of the sky is in full view. It is possible that water ran along this part of the path on its east side as part of the channeled waters running off Jabal Khubtha. These waters flowed alongside the visitor towards the main valley, the Wadi Musa, and the main Colonnaded Street.

Figure 7.1: Accessibility near Royal Tombs showing the proposed small theater, weirs, pathways and the processional way to access the high place atop Jabal Khubtha. These are examples of how institutions were experientially and perceptually connected to water management and control.
During wetter periods of the year, especially winter, water was an auditory experience throughout the Siq as the aqueducts were embedded directly in the cliff face at a height ranging from 1m from street level, throughout the Siq to roughly 4-5m as the channels near the Theater and the Colonnaded Street. Where water flowed down from cliff faces that fed into these channels, sacred spaces and high places were established that perceptually connected the origin of the water’s source to the authorities of these institutionalized spaces; their authority was therefore constituted by this perceptual control. The spatial order of the high places themselves attest to this flow of power associated with water as sacrificial offerings and altars were often accompanied by cistems, basins, and channels that also flowed over the cliff’s edge. Water must not be underestimated in its role in constituting the regime at Petra. The establishment of the water catchment system, in the beginning, was essentially non-invasive, sustainable, and considerably more efficient than later Roman renderings of desert-based water management systems (see desertification analysis at Wadi Faynan - Barker 2002).

**The Confluence of Authority**

At the Colonnaded Street, it should not be considered incidental that the Royal Tombs and the street itself were positioned in direct relation to the Wadi Musa and that the Corinthian Tomb was directly aligned with the street. At significant ebbs in the direction of the Wadi Musa, there were two possible establishments of social space: the rock-cut theater where water likely collected during wetter periods to the east of the main Theater, and a small temple located where the Wadi Musa meanders from the north to the west and into the Main Valley. The possibility of an *odeon* is uncertain, but there is a clear sense of orthogonality at this bend that suggests the presence of a structure oriented directly towards this bend. These socio-spatial establishments, especially the main Theater, served to reproduce the perception of authority of water where notions of power was continuously tied to these locations. At the main Theater viewing outward towards the east, the view focused on the more elite facades and complexes that were common to later periods. The positioning of this view in relation to the water course reproduced the role of wealthy elites in the constitution of authority over the order of water. Similar relationships may be stated for the *odeon* as the view focused towards the residences on ridge south of the Paradesios, not to mention the massive complex situated at its highest peak (Schmid 2013).
When passing the junction between the exit of the Siq north of the Theater towards the east end of the Colonnaded Street, one views the initial angle of incidence of the Royal Tombs, especially the Corinthian Tomb. To get a full view of the monumental tomb, one must continue moving towards the Colonnaded Street until finally pausing to see the tomb in its entirety. In order to reach these tombs, the spatial experience merits crossing the Wadi Musa before entering this particular royal precinct. Thus far it is still unclear if bridges existed near this bend or whether the percipient was required to double back or continue farther down the Colonnaded street in order to cross. Additionally, the orientation of the Corinthian Tomb is directly aligned to the Colonnaded Street and the Wadi Musa.

It is unclear at this point where the historic paths were located for navigating around Jabal Khubtha, but what is clear is that either walls or weirs were in place that were sited orthogonal to the Royal Tombs (and visible from the satellite imagery. Figure 7.1). Their placement also appears to coincide with the platforms and underlying cisterns of the tombs lending to speculation that these were weirs and/or dams rather than walls meant to retain, impound, or divert the water runoff from Wadi Muthlim. Considering this, the pathways were either routed to the east of these weirs, immediately in front of the Royal Tombs, or to the north at a distance of about 200m from Jabal Khubtha near Wadi Mataha. This forced one to perceive the monuments in imposing detail up close or in full detail at a distance. The width of the pathway indicates a highly encouraged and accessible pathway, but a view of the monumental facades was perceptually mandatory. These are indicators that the high place at Jabal Khubtha, including the pathway, was relational to the monumental facade tombs.

At the beginning of the Colonnaded street is the confluence of the Wadi Mataha and the Wadi Musa is the positioning of the so-called “lower market” and the Pool and Garden complex (Bedal 2003). While the Pool and Garden complex were mostly accessible from the Great Temple, their positions were uniquely located directly in front of this confluence. If in fact the denotation of the market is correct, and Bedal (2007) warns against such summations, then this large open social space was positioned in full view of this confluence. It is also possible the beginning of the Colonnaded Street pavement begins near this junction. During the Roman period the Nymphaeum was constructed at this confluence.
At the western end is the confluence of the Wadi ad-Deir and the Wadi Musa which represents the greatest accumulation of water runoff within the valley (see figure 6.3). It is no coincidence that the *temenos*, arguably the most ritually authoritative space within Petra and possibly Nabataea, was situated near this confluence. The Colonnaded Street gives the first impression of pathway-based orthogonality with an orientation in reciprocal directions of 276° W | 096° E. At the monumental temenos gate, the orientation adjusts slightly to more northerly routes 282° W | 102° E. The spatial experience of the *temenos* is specifically offset from the orthogonality of the street pivoting the perception of the structures within the *temenos* more forcefully on the Qasr al-Bint as viewed from the main street (figure 7.2). From this point the perception of water is removed from experience altogether as water systems beneath the Great Temple, Pool and Garden complex, and bridges connecting the street to the structures in the north likely blocked this view. The water was still audible, but the perception was limited to the new sense of spatial order towards authority centered at the *temenos*. The constitution of authority was now centered squarely on the role of ritual space being the primary power of water and the end of publicly accessible movement.
Following the emergence of institutions being physically constituted by water at Petra, these spatial productions were reproduced throughout the polity. At Khirbet et-Tannur, the role of the priestly class was tied to place and the role of hydrology is represented in an inscription on a Temenos Enclosure which states: “Which Natir’el son of Zayd’el, head of the La’aban spring, built for the life of Aretas, king of the Nabataeans, lover of his people, and (for) the life of Huldu, his wife, in the year 2” dated to 8-7th BCE (McKenzie 2013: 49). This indicates the role of clergy in the power over the La’aban spring at the site during Aretas IV. At Oboda in the Negev, inscriptions at the temple located atop the so-called “acropolis” refer to a dedication of a building, likely related to water supply, in the name of Dushara stating: “... the members of this mrzh’ the mrzh’ of Dushara the god of Gaia in year 18 of our lord Rabbel, the king, king of the Nabataeans, who brought life and deliverance to his people” (quoted in Alpass 2013:153; citing Negev
1963). Within this context, it seems that late within Nabataean history under Rabbel II, this particular association of builders (the *mrzh’*) were worshippers of Dushara who in this reference is situated in place at Gaia - a name commonly used to reference a small settlement just outside Petra in modern-day Wadi Musa (Alpass 2013). At least in later years, the “religious practices of Nabataean Oboda [were linked] with Petra” (154). Dushara is likely foreign to the temples within Oboda however as the city’s temples were most likely dedicated in service to Obodat, which many have argued for Obodas I, II, or III with many favoring the latter (2013). Still this indicates a clear presence of Petra-based engineers being commissioned to establish the water management system at this institution.

The ability to control the movement of water and social perceptions of its presence through space reproduced the role of institutions as the primary authority over the nature of water capture and storage. In many ways this may have facilitated the service of adherents in various institutions, such as the engineers sent to Oboda, to invest labor and energy in the production of water surplus. The production, management, and maintenance of many of the water engineering technologies throughout Nabataea may be structured around this principle. The establishment of multi-scalar institutions throughout Nabataea, especially Central Nabataea and the Negev appear to facilitate the reproduction of institutional authority over the role of water. It is possible that any authoritarian decree to install water management systems at various institutions or irrigation systems at various agricultural locations throughout the kingdom was rendered as a religious act with the purpose of reproducing the political authority of the Nabataean regime.

**B. Framing New Forms of Order**

Within the Siq one particular form of order is clear, the lack of facade tombs. The space of the Siq as well as the entrance through Wadi Muthlim was mostly reserved for niches, betyls, and cultic rituals while en route to the main valley. This spatial restriction is maintained until one emerges rather suddenly in full view of the Khasneh al-Faroun. A rather imposing visual structure with a profound angle of incidence (figure 7.3). One had little choice but to stop in order to visually consume the breadth of the Khasneh. While its monumental scale, artistry, and position are certainly noteworthy (McKenzie 1990; 2005; Kropp 2013), what is most profound was its significance in constituting a new form a political order within Petra.
In terms of spatial representation it presented a new form of architectural discourse within Nabataean contexts that emphasized anthropomorphic depictions of deities; celestial renderings of Hellenistic and Alexandrian gods and goddesses in figural form. This form is only attested to at the Um Tomb, the Obelisk Tomb, and the Roman Soldier tomb (Kropp 2013:201). The recesses of the lower storey depict reliefs of the *Dioskouroi* - the twins Castor and Pollux (ie. the Gemini) who were gaining popularity throughout the Near East during the late Hellenistic period (2013). The second storey features a *tholos* depicting “a heavily draped, crowned female figure holding a cornucopia in her left and an unidentified object in her right hand” suggesting her depiction as either Isis or an assimilated form of Isis-Tyche. Additional
figures represented include Amazons, Nikes, and eagles (2013). One peculiar feature of the monument is above the top broken pediments is featured an implementation of two obelisks, or nefesh, tapering into the cliff face of Jabal Madbah (see figure 7.4). Water again was significant within this space as a small shallow basin was carved near the main entrance in order to pour libations in offering to the deceased.

Figure 7.4: The Khasneh in full vertical view. Note the obelisks tapering into Jabal Madbah above the split pediment (photo T. Paradise: used with permission)
More interestingly however is its recent discovery in the production of new forms of socio-spatial order. In recent excavations at the Khasneh it was discovered to have been constructed directly on top of at least two previously existing facades that showcased a courtyard and a small altar (Farajat & Nawafleh 2005; the protected excavations are visible in figure 7.4). The street of the Siq was literally raised in elevation to cope with this new rendering of order and the monumental staircase (propylaea) to the Khasneh was highly destructive of the facades beneath it (Kropp 2013). The pottery within the tombs was dated to c. 25-20 BCE (Graf 2006:448). The dating of the Khasneh itself closely matches the Qasr al-Bint dating to the last quarter of the first century BCE, under the reigns of either Obodas III (30-9 BCE) or Aretas IV (9 BCE - 40 CE) (Kropp 2013). Farajat and Nawafleh (2005), and Graf (2006) suggest an even later date of the early first century CE. In either case, the political authority of their siting and construction may be positioned directly under the reign of Aretas IV.

When leaving the Khasneh forecourt and heading towards the Theater district along Wadi Musa, similar forms of order were produced. The Theater rests on the eastern cliff face of Jabal Madbah. Along the cliff face on all sides of the Theater are the simpler Pylon tombs and facades. These are ubiquitous throughout the valley and in Mada’in Saleh as well. Their presence is especially profound throughout the outer Siq however, and the construction of the Theater required the destruction of many of these simpler tombs (Nehmé 2003). This is another example of how spatial production and expansion in Petra led to the deconstruction of previously established spaces. The Theater is dated to the first half of the first century CE, under the reign of Aretas IV as well. Apart from the Khasneh, it is the next form of monumental construction experienced within the valley after entering the Siq. During one’s approach to the Theater, the initial angle of incidence is less imposing (5°) until one is immediately in front of the Theater at which point the viewing angle increases to a mandatory 31°. It is at this location where the outer Siq widens to a maximum of about 45m and water collection is greatest before exiting to Wadi Musa. Again the intensity of the angle of incidence at this ebb of water flow in the outer Siq coupled with the overt destruction of previously established tombs and facades demonstrates that the regime of Aretas IV implemented visual strategies in the construction of the Theater that constituted the authority of the regime over its primary resource. This form of constitution, much like the high places and the Qasr al-Bint (see discussion below).
was routinized in forms of spectacle, performance, and ritual at the Theater in order to continuously reproduce this perception of political order.

The southern portion of the main street appears to serve the majority of the economic and administrative functions beginning in the early first century CE, although Bedal (2007) argues convincingly against wholesale renderings of “markets” as explanations for the open plazas south of the Colonnaded Street considering that the so-called “upper market” was discovered to be the Pool and Garden Complex (2003). What is most profound in terms of accessibility to the south of the street is the overall elevation of the structural fabric which is at least 20m in some locations meriting the need for monumental staircases to the Great Temple, the lower market (see figure 7.5), and the Qasr al-Bint. Prior to the construction of the street, the majority of the valley, including the cliff faces of Umm al-Biyarah and the hills of az-Zantur, were more visible. The spatial experience and perception was quite different where movement and visibility was restricted due to the natural ordering of the landscape.

The development of the Qasr al-Bint provides a clear account of the constitution of political authority. Prior to its establishment, it is clear that according to recent excavations a rather large, possibly monumental, structure (wall thickness of 65cm) existed “obliquely” beneath the Qasr al-Bint dating to the Hellenistic period (Kropp 2013; Mouton, Renal, and Kropp 2008). Its position demonstrates that the temenos was already a religiously delineated space well before the establishment of the Colonnaded Street. The establishment of the Qasr al-Bint likely required the clearing of this structure in some form. The production of the Qasr al-Bint was a result of reproductive ritual forces. The deity worshipped within the temple is still debated, but it is likely the principal Nabataean deity Dushara (Kropp 2013; citing Gawlikowski 1990; Hackl, Jenni, and Schneider 2003). Within the space of the temenos is perhaps the more important form of political constitution; the positioning of royal statues at the behest of priests (Hackl, Jenni, and Schneider 2003). The most cited example is the inscription from the base of a statue of Aretas IV which is traditionally used to date the temple, “This is the statue of Haretah [Aretas] who loves his people, the king of the Nabataeans, which ‘Abdu the priest has erected for him” (Starcky & Strugnell 1966:236-44; quoted in Kropp 2013:289). It is a clear example of how an institutional representative, “’Abdu the priest” legitimized the political authority of Aretas IV by spatially positioning his image in direct relation
to the newly constructed temple and historically sacred space in full view of the line of royal kings in Nabataean history. In this case the spatial production of the Qasr al-Bint and the *temenos* constituted his political authority by being confirmed through direct representation within the most sacred spaces of Petra. This may provide a clearer perspective as to why the Qasr al-Bint dominates the spatial perception of the Colonnaded street en route to the *temenos*.

Following the monumentalization of the Colonnaded Street, the visibility beyond these new forms of political order were highly restricted. Unfortunately due to the resolution of the models in this study, it is not possible to model these restrictions, however the visual barriers lining the street present a clear portrait of these restrictions as seen in figure 7.5. Although debated that it is possible that Aretas IV did not ascend to the throne through an ancestral mandate and was the first monarch of Nabataea to acquire to the throne under contentious circumstances (Bowersock 1994). Considering this it was necessary for Aretas IV to constitute his political authority. The establishment of power was granted at the acquiescence of Augustus in 9 BC, but the legitimacy of such a decree likely carried little weight among the subjects of Nabataea then made up of mostly disparate tribes. The spatial disparities and isolationist sitting of elite residences throughout az-Zantur demonstrate a fragmentary relationship between Nabataean tribal elites.

This may explain why Syllaos appears to respond violently against politically relevant leaders at Petra where during Syllaos’ second trial in Rome Josephus claimed “Syllaos was also accused by Aretas, that without his consent, he had slain many of the chief of the Arabians at Petra; and particularly Soemus, a man that deserved to be honoured by all men” (*AJ* 17.3.2), not to mention the attempted political assassination of Herod. These statements are indicative of the role of Petra’s elites, or *chiefs*, in legitimizing the authority of Aretas. These elite groups were likely spatially rooted within the institutions at Petra prior to the construction of many of the aforementioned monumental structures. The focus of the Khasneh, the Theater, and the Qasr al-Bint along Alexandrian lines of architectural construction may be explained as spatially oppositional to Augustus. Whereas Herod’s monumental building programs at Jerusalem and Caesarea Maritima reflected an intense focus on the spatial perception of Roman geopolitics, the persistence towards Hellenistic styles of spatial order, form, and representation may be
indicative of the precise opposite. Aretas in this case literally positioning his authority within the realm of Hellenistic kingship rather than as a Roman client state.

Figure 7.5: Monumental staircase to enter the Lower Market from the main street (image source: author).

Thereafter, the entire experience of Petra’s valley was reconfigured along new forms of order that is akin to acculturation practices common in Hellenistic colonies (see Gates 2003; Butzer 2008). The two reliefs of men leading camels in the Siq and the high place at the Jabal ad-Deir attest to possible spatial imaginations linking the two locations, and possibly other high places. The reconfiguring of the street along these constraints frames political and ritual order in ways that possibly severed these connections. It may indicate why there appears to have developed a surprising push for simpler, earlier forms of Nabataean expression in art and architecture towards the end of the first century CE. It is out of this tradition that the monumental Monastery emerges (Schmid 2001). Following the death of Aretas IV it was possible that
these new spatial orders were unsustainable and a resurgence of institutional practice and spatial production took place.

The spatial productions of the Khasneh, the Theater, the elevated structures south of the Colonnaded street, and the Qasr al-Bint all occurred during or after a time of considerable stress within the polity. This followed Aretas’ contentious claim to the throne and the subsequent acquiescence of Augustus (see chapter three for full review). The establishment of monumental architecture are sometimes reflective of times of stress (Moore 1996; Trigger 2008). The energetic investment into new forms of spatial production not only display forms of power but also produce new forms of political order (Smith 2003). Its visual prominence was less about being a display of order and more about constituting new forms of order and authority by removing the presence of any previous forms and reconfiguring space to reproduce a newly emerging and powerful regime.

C. The Elevation of Spatial Order

The insistence on ritual institutional spaces not only being located at the most elevated locations in Petra but also situated near the cliffs to provide the greatest amount of visibility, indicated the strong significance of sites among the many institutionalized high places. In purely functional terms, their location was certainly useful for defensive purposes, especially atop Umm al-Biyarah (Schmid et al. 2012; Kennedy 2013). Still the spatial experience of accessing these locations was profoundly specific where the pathways themselves received considerable investment in order to be established often carved directly into the sandstone. In some cases the institutions limited the accessibility of these spatial domains to a select few, as seen in the establishment of the Roman Soldier complex in the Wadi Farasah at the base of the paths descending Jabal Madbah.

The functional experience of the high places is easily separated from other locations. This is primarily due to their focus on elevated natural plateaus as key points of interests, sites, and landmarks. There are at least four elevated sites that were included in this spatial analysis that were found to be relational to the productions of space within the main valley (Robinson 1930 identified possible additional high places). The spatial experience of these sites commonly include a series of rock-cut features such as an open court (or stibadium/biclinium/triclinium), a cistern or “pool”, an elevated altar oriented to a specific
direction, and/or a series of interconnected drains (see figures 7.6 and 7.7). These high places are also clustered within a narrow range of elevations (see figure 7.8). Along the ascent towards higher elevations, the presence of funerary architecture dissipates and the presence of communal architecture or ritual spaces become commonplace. Stibadia and triclinia are ubiquitous in the uppermost elevations of Jabal Habis and Jabal Khubtha.

Figure 7.6: Schematic map of the high place atop Jabal Madbah (adapted from Robinson 1930).
Nearly all high places demonstrate a sense of orthogonality in their implementation and in most cases a strong sense of cardinality. The orthogonality of the high places is visible when comparing the orientations of the cisterns, pools, altars, and drainages that were carved into the sandstone. Right angles are consistently aligned among each of the elements of the high places. This pattern is ubiquitous throughout all of the high places (see figures 7.6 and 7.7). This suggest a sense of order set apart from the surrounding landscape that delineates this space as significant, while the altar and sacrificial basins assist in defining the space as sacred. Many of the altars and courts appear specifically oriented towards cardinal
points. It is possible that the cardinality of these elements elevated the importance of these spaces as representative of broader spatial imaginations. In this case, combined with consistent emphasis on physical elevation, ritual performances within these spaces were not only applicable to the actors involved but also methods of engagement with cosmic events.

Figure 7.8: The clustered distribution of elevation for most known high places throughout the main valley.

Table 7.1: Visibility matrix demonstrating the terrestrial relationships between elevated locations.

<table>
<thead>
<tr>
<th>From Point of Interest</th>
<th>Type of relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Madvah</strong></td>
<td>Direct</td>
</tr>
<tr>
<td><strong>Biyarah</strong></td>
<td>Visible</td>
</tr>
<tr>
<td><strong>ad-Deir</strong></td>
<td>none</td>
</tr>
<tr>
<td><strong>Khubtha</strong></td>
<td>Visible</td>
</tr>
<tr>
<td><strong>Urn Tomb</strong></td>
<td>none</td>
</tr>
</tbody>
</table>

Considering the data in table 7.1 above, the only position within the valley that is capable of viewing the most sites from atop Umm al-Biyarah. With the exception of Jabal Haroun, it maintains direct visibility of the Urn Tomb, the Monastery, and ad-Deir high place, Khubtha, and Jabal Madbah. Visibility
within the Valley indicates that the Um Tomb appears oriented directly towards the summit of Umm al-Biyarah, specifically its northeastern edge. Incidentally, Schmid (2012) makes a compelling case for the establishment of a palatial structure, possibly a residence at this particular site. In fact, Schmid concludes that these associated structures sought to capitalize on “their visual impact on all permanent or temporary occupants of the region of Petra” (77). The importance of this location within Nabataean contexts coincide with Judaean constructions at Masada by Herod that were also grafted along the edge of the cliffs (Kropp 2013). It is possible that this represents one of two locations for a royal palace within Petra and its elevated location stresses its importance within the landscape. The spatial production of a structure such as this was highly visible and its focus along the cliff’s edge towards the valley, specifically oriented towards the main street, enable it to constitute a powerful form of authority. Additionally, the Monastery and the ad-Deir high place is easily visible from this location suggesting a strong perceptual connection between these institutions.

Figure 7.9: Viewshed map of the proposed palatial structure located atop Umm al-Biyarah. Its location affords it full visibility of most of the Valley including the secluded Monastery, the Qasr al-Bint, and the Um Tomb. It was also in full view of all who walked along the Colonnaded Street.
This may be indicative of two components of Nabataean authority. One is that this may indicate the limited role of the monarchy of the Nabataeans in directly controlling the direction of these institutional elites. The persistent elusiveness of palatial structures in material evidence may support this fact. The other is that we may be misunderstanding the role of the monarchy altogether. Kropp (2013) argues for a relational palatial space within the Great Temple that maintained direct access to the temenos, its baths, small temple, and the Qasr al-Bint. It should be noted that Kropp (2013), following Zayadine (1987), interprets the so-called baths within the temenos to be a small palatial residence. But considering this, the role of the monarch may be extended to fulfill priestly obligations as well. Within this view, the monarch may be less inclined to reside permanently at lower elevations, perceptually lower than the rest of the valley, but instead prefer a spatial perception that exceeds all others within the valley - Umm al-Biyarah.

The high place altar at Jabal Khubtha is also oriented towards the summit of Umm al-Biyarah but focused more towards the geographic center of the mountain. It maintains clear visibility with the high places at Jabal ad-Deir, although the Monastery itself is not visible, Jabal Madbah, and Jabal Haroun. The perception of accessibility leading to the processional way was discussed above. The investment in the processional way as one grafted onto the landscape directly indicates significant investments in the maintenance of this site. It is possible that this summit is relational to the myriad of elite facades hewn into its western cliff face, just below this location. This suggests that this high place was reserved for either specific elite royal and/or priestly members of society associated with the palace/temple atop Umm al-Biyarah or were meant to reproduce the role of the elite by encouraging larger processional groups to ascend to this location, in full view of the street and nearly every other high place.

The Jabal ad-Deir high place is unique in that it is directly related to two important monumental features: the Monastery and the significantly large circular feature or adjacent pool(?). While Jabal Haroun is certainly visible from the ad-Deir high place and the Monastery, it is not necessarily directly aligned. Still the fact remains that the Monastery itself is mostly invisible to nearly all locations in the valley, except Umm al-Biyarah, indicating a significant perceptual relationship between the Monastery, the ad-Deir high place, Jabal Haroun, and Umm al-Biyarah.
Interestingly, the altar at Jabal Madbah is directly aligned to the highest peak of Jabal Haroun which confirms a previous assessment by Ma'oz (2008) claiming that the High Place of Sacrifice shared a directly visible religious connection with Jabal Haroun. The Nabataean temple that was established at Jabal Haroun was situated on a lower plateau (Fiema 2012), however the peak was likely a pilgrimage location already by the first century BCE in reference to Moses’ brother, Aaron (2012).

Figure 7.10: Photo demonstrating the direct sight line between the altar at the High Place of Sacrifice atop Jabal Madbah and the pilgrimage site at Jabal Haroun (image source: author).

The direct line of sight between the altar at Jabal Madbah and the peak at Jabal Haroun, the relationship between Jabal Haroun and Jabal ad-Deir, and the visible relationship to Jabal Khubtha, forces us to reconsider the role of Jabal Haroun within the production of urban space in Petra. Much of the structural establishments associated with political authority considered thus far concern the reign of Aretas IV. Many of these structures were focused primarily on the main street and the Wadi Musa even when the structures atop Umm al-Biyarah are taken into consideration. What is most interesting is that the earlier establishments of the high places at Jabal Madbah and Jabal ad-Deir appear to be better suited to
perceptually refer to sites outside the valley proper. This may indicate a clear attempt by the Nabataean regime under Aretas IV during the early first century CE to exclude Jabal Haroun and its institutions from the imaginations of those within Petra's main valley. An exclusion that was absolved with the reconfiguring of Jabal ad-Deir’s spatial order with the construction of the Monastery and the renewal of sightlines between the two peaks.

D. Cosmic Order

In Achaemenid society, kings derived part of their legitimacy by controlling or mediating the supernatural. They “enjoyed an exalted role as mediators between the human and the divine world” (Kropp 2013: 228). Kings would support or employ priestly communities and institutions for the explicit purpose to legitimize political authority and power. The title of Shahanshah - ‘king of kings’ - was commonly applied to Persian kings and an inscription of Darius reads: “I am king by the will of Ahura Mazda” (Craig et al. 2011: 122). Religious rituals were performed by kings themselves and “a royal fire… burned throughout his reign [that] symbolized his role as cosmic ruler” (122). This extended into the daily lives of individuals where religious action were often oriented towards political power where Herodotus explained “a Persian does not have the right to wish for good health for himself; he prays for the prosperity of all the Persians and the king” (1.132). Kropp points out that this approach maintains an “interestings parallel to Nabataean practice, where numerous dedications contain the standard formula ‘for the life of king X’” (Kropp 2013: 228).

In the first century BCE, Parthian kings were often referred to as the “Brother of the Sun and the Moon” referring to their political authority as being directly constituted by cosmic order. Cleopatra VII fashioned herself after Isis in opposition to these Parthian renderings and named her twin children Alexandros Helios and Cleopatra Selen, or the epithets “sun” and “moon” respectively (Grant 2004:173). In Nabataea, Kropp (2013) argues convincingly that the wives/queens of Nabataean kings, following Aretas IV, were also assimilated as either Isis or Tyche. In some respects this echos the continuous expectation of the influences of Alexandria and Ptolemaic Egypt upon the Nabataeans, especially their architecture (McKenzie 1990). Additionally, beginning in the first half of the second century CE under Aretas IV, the
Nabataean kings began shifting their style of dress that was more reflective of Parthian influences rather than Hellenistic Egypt (Kropp 2013) - see discussion in chapter three.

In many of the Hellenistic dynasties, kingship was perceived to be “guaranteed by the good will of patron deities, and many claimed descent from gods and heroes” (Kropp 2013: 228; Walbank 1992; Herz 1996; Edelmann 2007; Ehling 2008). The founding of a new city, or more likely the refashioning and renaming of pre-existing cities was more than vanity but instead was a politically constitutive action that held religious significance, often in tandem with public ceremony and sustained rituals (Chamoux 2002). Local cults were promoted enough to strengthen their rule, but each dynasty promoted specific cults they portrayed as having descended from such as Dionysos and the Ptolemies, Apollo and the Seleucids, or Herakles and the Attalids (Kropp 2013). A pre-existing civic center might be kept in place and its architecture repurposed to coincide with new leadership or a new civic center was built adjacent to the old civic center or a distant competitive center was developed that caused the previous center to decline or decay, such as the new city of Ephesus that was built under Lysimachus that was closer to the port with newly fortified walls and was named Arsinoica (Chamoux 2002).

Identifying political authority with the divine order of the cosmos appears ubiquitous throughout the Hellenistic Near East. The most common of these cosmic events that was cited was the sun. In the earlier periods of Nabataean Petra, it is unclear as to how much influence solar events had on society or whether this constituted authority, but if Strabo is to be believed then the Nabataeans “worship[ped] the sun” (16.4.26). The Nabataeans did not worship the sun directly, but certainly considered it to be an important aspect within the pantheon and/or understood its vital significance in seasonal water management, agricultural, and timekeeping practices (Healey 2001). At Tayma, near the later Nabataean site of Mada'in Saleh, during the fifth century BCE, the so-called “Tayma stone” depicts the god Slm of hgm with a winged sun disc (Alpass 2013:116). Isis was certainly worshipped within Petra by the first century BCE and both Isis and Tyche were commonly featured in iconography throughout the valley. The Isis/Tyche figure with her iconic sun disc was featured on the tholos of the Khasneh and “a betyl with star eyes and a crown with a solar disc [was] uncovered in Zantur” that was interpreted as Isis (Erickson-Gini 2015:316; Meza 1996; Zayadine 1991). Additionally an inscription identified at Sweida in the Syrian Hauran referred to the principal
Nabataean deity Dushara as the “unconquered,” an epithet often reserved for solar deities (Healey 2011). Nehmé (2012) followed this line of reasoning and identified a possible “sun-god” sanctuary at Mada’in Saleh oriented directly north-south maintaining characteristics common to high places within Petra.

If solar events were important to the Nabataeans, how do we know which events and what times of the year were important? McKenzie (2013) points out that the Nabataeans followed the Babylonian calendar in that the New Year began on the first full moon following the autumnal equinox (i.e. ~August).

The most profound sense of celestial representation was manifested in institutionalized form at Khirbet et-Tannur with the discovery of a sculpture of Tyche centered in the wheel of the zodiac supported by Nike (see figure 7.11), dated to the second century AD (McKenzie 2013). While another zodiac was discovered at Khirbet ed-Dharîh (Villeneuve & al-Muheisen 2003), the order of the zodiac at Tannur is peculiar in that the six astrological symbols on the right are flipped along the horizontal axis. Due to its location, the institution at Tannur was most likely visited during specific times of the year. The split in the astronomical events at Aries and Libra in the sculpture which was mounting on the wall within the temple, indicate a focus around the equinoxes. The left symbolizing spring and summer and the right autumn and winter (McKenzie 2013). In addition to the sculpture, it is also clear that the institution itself was oriented along a near perfect east-west axis with the entrance and inner altar facing east (figure 7.12) which matches the correlative orientations of the obelisks atop Jabal Madbah.
Figure 7.11: Tyche sculpture centered in the zodiac supported by Nike. Note the flipped astrological signs along the right side of the wheel (from Libra to Pisces). The split astronomical events occurred during the equinoxes and may suggest the underrated significance of the Sun in Nabataean studies (McKenzie 2013:121, fig 208).
Figure 7.12: Layout of the institution at Khirbet et-Tannur (adapted from McKenzie 2013:122, fig 209). Note the specific siting along the cardinal points.

The focus of the analysis in the previous chapter was on the solar events that were demonstrated to have significance to the Nabataeans in some form or another. Therefore, the events were the rising and setting skyways of the sun for the solstices and the equinoxes. Throughout the valley there were four primary locations where the results showed clear patterns that may be associated with socio-political
production. These were the Palace Tomb, the Monastery, the Um Tomb, and the relational orientation of the Jabal Madbah obelisks. What was surprising in this study was the alignment of the Palace Tomb. The overall orientation of the facade is certainly set apart from the rest of the Royal Tombs. The Corinthian Tomb and possibly the Silk Tomb maintain clear visual relationships with the main Colonnaded Street while the Palace Tomb’s orientation is nearly angled towards the Jabal ad-Deir high place. The Palace Tomb maintained a visually prominent role within the overall landscape, but was positioned mostly towards the north. For those entering Petra via the Siq, the Palace Tomb was among the last monumental structures experienced. It is difficult to determine whether this particular alignment held any meaning for the Nabataeans however, as there are no known other relationships that may be used to confirm this spatial representation. The Palace Tomb was also constructed quite late in Nabataean contexts, possibly under Rabbel II. This coincides with similar dating for the Monastery (Schmid 2001).

Figure 7.13: Viewshed and orientation map of the Palace Tomb demonstrating visual relationships with both the Colonnaded Street and the high place atop Jabal ad-Deir.
The Monastery itself is aligned to the setting of the winter solstice. This location is unique in that the monumental facade is the second largest within Petra and maintains a powerful angle of incidence. The facade itself was meant to be visibly imposing on the percipient. The forecourt facing the facade was hewn out of the sandstone directly and much of the surrounding niches, betyls, and minor tombs likely pre-date the facade itself. The limited visibility of this facade and high cost of access lends to a strong sense of isolation for much of the plateau. The only two other points capable of viewing this location are from Umm al-Biyarah and Jabal Haroun both discussed above. Its primary function remains elusive, but the internal dynamics appear similar to that of late Nabataean temples where an altar, or podia in this case, was approached by a small group of stairs on one side. Interestingly the layout of the inner chamber is slightly offset in relation to the facade's entryway (figure 7.15) forcing a slight adjustment to the orientation from within the niche which actually pushes the alignment more accurately towards the setting of the winter solstice (see figure 7.14).

![Horizon diagram of the Monastery with orientations directed towards the setting sun of the winter solstice. Notice how the internal offset of the podia and chamber within the Monastery increase the accuracy of this solstitial relationship (see figure 7.15).](image)

**Figure 7.14:** Horizon diagram of the Monastery with orientations directed towards the setting sun of the winter solstice. Notice how the internal offset of the podia and chamber within the Monastery increase the accuracy of this solstitial relationship (see figure 7.15).
When combined with the data of the Palace Tomb, perhaps some relationship may be understood. These were the two primary monumental constructions during the time of Rabbel II. It is possible that these are representative of competitive spatial productions between the traditional forms of institutions situated at the ad-Deir and the more ornate royal institutions constituted along Jabal Khubtha. It is also possible that these represent two distinct times of the year where rituals were performed that reinforced and constituted the roles of political elites that included processions atop Jabal ad-Deir and Jabal Khubtha. Still, if we remove the relationship with the Palace Tomb altogether, the Monastery may be better understood as a single institutional expression whose role was constituted at specific times of the year. The wettest periods were likely during the winter months coinciding with the winter solstice. Near the courtyard of the Monastery is the monumental circle/foundation, or pool/cistern which was relational to both
the tomb to the west of the circle and to the Monastery. The role of water is again reinforced in its role to
delineate authoritarian forms of ritual space at elevated levels within Petra.

The Urn Tomb maintained three possible solar alignments, as well as its focus on elevation. It is
difficult to discern whether the ritual focus was specifically terrestrial or solstitial as its prominent position
within the landscape affords it unique visibility of much of the main valley. The most significant of the three
relationships, the equinox, coincides with the alignment confirmed at Khirbet et-Tannur, including the zodiac
represented on the statue embedded in the temple. However in this instance the alignment is reciprocal to
that alignment, facing west towards the setting sun instead of east. Its orientation towards Umm al-Biyarah
must not be discounted however, especially if the findings are confirmed with regard to a palatial structure
existing along the cliff of the summit. Regardless, the existence of any structure along the cliff’s edge at
this particular junction between the visible sightlines of the Urn Tomb and the pathway of the sun suggest a
highly significant role that this structure played within the whole of Petra’s urban experience. Without the
existence of the structure at Umm al-Biyarah the alignment may be dismissed as statistically irrelevant.

Figure 7.16: Horizon diagram of the Urn Tomb oriented towards the solar equinox.
Therefore, the establishment of the ritual institution at the Um Tomb may be regarded as reproductive of the political or religious authority of the structure positioned atop Umm al-Biyarah. Regardless of the function of the structure atop Umm al-Biyarah, whether religious or administrative, it is clear that this structure is significant. Its location atop one of the tallest mountains in Petra results in it being one of the least accessible structures within Petra. And yet the structure’s sitting along the cliff’s edge allowed it to be perceptually ubiquitous throughout the entire Valley. Considering this alongside what we now know of the positioning and aligning of the Um Tomb, it is likely that some connection exists between the two structures. Additionally, it is one of the few locations capable of maintaining a complete view of the Monastery, the Um Tomb, and the Palace Tomb. The role of elevation in constituting the authority of political elites is echoed here again, but in this case the scope of authority appears tied to the happenings of the setting sun. For the Monastery the focus is clearly on the setting sun on the winter solstice. The Um Tomb appears to focus primarily on the setting sun of the equinox and the Palace Tomb on the setting sun of the summer solstice. Efforts to situate the equinox on a political authority, especially a king, and the architecture constructed to represent that authority would be especially important considering that the Nabataeans celebrated the New Year on the first full moon following the autumnal equinox (McKenzie 2013).

In the cases of the Um Tomb, the Monastery, and the structure atop Umm al-Biyarah, the structures/facades appear forced into their location, possibly taking the place of previously established facades/tombs much like I discussed with the Theater. I discussed earlier the location of the structure at Umm al-Biyarah and how it was grafted onto the northeastern cliff face. In addition to this sitting, both the Monastery and the Um Tomb were deeply embedded within the cliff face, creating a forecourt in each case. The Monastery’s forecourt spans about 20m x 44.5m and the Um Tomb’s at 14m x 20m. The conspicuous effort required to accomplish this embedded construction suggests that their siting, positioning, and orientation were purposeful acts rather than random placement. The only other known location where type of conspicuous investment exists is atop Jabal Madbah and the two carved obelisks located there.
The two obelisks atop Jabal Madbah are similar to the Um Tomb in that they are aligned to the equinox, both rise and set in this case. What makes these Obelisks interesting is that these monuments exist due to the complete removal of a sandstone hill. These monuments were not erected, but were hewn in place from the top down. This was likely to make way for a monumental structure that was never completed. What is most profound about their existence is their proximal relationship to the embedded obelisks emerging from the broken pediments above the Khasneh. The Khasneh itself representing multiple astral and solar artistic elements as discussed earlier. The Khasneh itself maintained an alignment to the rising of the summer solstice, however this event was blocked due to the limitations of the terrain of the outer Siq and its steep walls. Still the embedded obelisks tapering into Jabal Madbah and these two monuments hewn to emerge directly from the top of Jabal Madbah must give us pause when considering...
the constitution of political authority, especially considering what we know of Aretas IV’s ascension to the throne. Once more studies and excavations are conducted to investigate the foundation of this unfinished structure on Jabal Madbah, it is possible to be more conclusive as to whether there is a clear connection between these two obelisks and the two obelisks directly embedded into the mountain; a trait not seen elsewhere in Petra. If confirmed, it extends the constitution of Aretas’ authority through the ordering of cosmic space. Combining this with what is suspected of the structure atop Umm al-Biyarah and the adoption of the Babylonian calendar by the Nabataeans as seen at Khirbet et-Tannur (McKenzie 2013), the role of the equinox may be central to the cosmic ordering of Nabataean political space.

Many of the structures, facades, and monuments that were found to pertain to cosmic order were constructed either during or after the reign of Aretas IV. This is important as it suggests that the city of Petra emerged as a crucial component in the constitution of political authority. Petra was certainly important prior to this time as a beacon of Nabataean ancestry and religion, not to mention the availability and control of water within the Valley. The mention of Petra alongside Alexandra by Moschion, a diplomat from the Greek city of Priene, in 129 BCE attests to its early regional significance (Taylor 2007). And yet there appears to be limited building activity within Petra during this time. Most of the modifications prior to Aretas IV pertained to religious or funerary institutions, such as the previous establishment of the temenos, possibly the high places, and the smaller tombs/facades. This changed under Aretas IV. The utility of crafting built environments to suit the needs of political authority was applied with force within the Valley of Petra. New forms of spatial order were established that fundamentally restructured the experience, perception, and representation of Petra. Water networks were established, the Colonnaded Street was constructed, and facades grew in scale and frequency. This suggests that the political order of the Nabataean regime was also restructured following the ascension of Aretas IV. Petra emerged as a political instrument capable of redirecting Nabataean society towards a new way of considering a king’s legitimacy. By this time, legitimacy was established by their relationship to Petra and its cosmology.
VIII. Conclusion

The purpose of this study was to investigate the manipulations of urban space within Nabataean Petra by integrating practical analyses through experiential, perceptual, and representational domains of spatial order. The results of this study demonstrate that Nabataean space was not only produced by social relations, but also was meant to be reproductive in directing Nabataean society towards new forms of order. The experiences and perceptions of visitors and residents were structured to reproduce the authority of the prevailing regime. Considering this, a series of patterns and relationships were identified that are the result of specific political methodologies that sought to order the built environment of Nabataean Petra towards new forms of social order. Therefore, the spatial ordering of Nabataean Petra was fundamental to the establishment of sustainable political order.

Through the implementation of innovative data-driven methodologies structured around the experiences, perceptions, and representations of spaces within Petra, it was possible in this study to analyze the variety of spatial forms that span the Nabataean urban landscape. The results demonstrated that the Nabataeans implemented a variety of methodologies in the ordering of space and the creation of the Nabataean capital city.

- The confluence of water was spatially representative of the confluence of Nabataean authority
- The manipulation of water flow was similar to the social controls placed on the movement of people through the landscape
- The ability to control the movement of water and social perceptions of its presence through space reproduced the role of institutions as the primary authority over the nature of water capture and storage
- The establishment of the Colonnaded Street, main Theater, Khasneh, and Qasr al-Bint were specific forms of order meant to reconfigure the landscape around new forms of political authority
- The temenos and the construction of the Qasr al-Bint served a reproductive role in legitimizing Aretas IV through the acquisition of previously constituted ritual space
- Elevation was representative of political power and authority
- The Colonnaded Street and the temenos are representative of political cohesion
- The fragmentary nature of the residential spaces contrast with overt representations of cohesion
- Visual relationships among the altar at Jabal Madbah, the high place at Jabal ad-Deir, and Jabal Khubtha, merits a reconsideration of the role of Jabal Haroun regarding the urban space of Petra
• The structure atop Umm al-Biyarah was perceptually significant in establishing and/or reinforcing political authority.

• The visual relationship and alignment between the Urn Tomb, Umm al-Biyarah, and the path of the sun made spatial order synonymous with cosmic order.

• The Urn Tomb, the Monastery, and the Palace Tomb demonstrate alignments to the settings sun of the equinox, winter solstice, and summer solstice respectively.

• Cosmic order was established by integrating spatial relationships among and between Umm al-Biyarah, the Urn Tomb, the obelisks atop Jabal Madbah, the Palace Tomb, and the Monastery.

Within Petra, water was an especially significant motivator of spatial production. The arid landscape limited its accessibility which in turn elevated the need for it to be a controlled resource. The ability to control and route the flow of water was certainly a conspicuous display of Nabataean power and wealth (Bedal 2002; Bedal & Schryver 2007), while the spatial ordering of experience reinforced the role of water as a constitutive force within the political order of Nabataean authority. Water was spatially interrelated with ritual and politics where access was often tied to religious practice and institution. This is seen in the multitude of cultic niches and betyls that line the Siq and Wadi Mataha and yet these locations are curiously lacking facades or rock-hewn architecture. It is also reinforced at the high places where basins, pools, and drainage systems were installed near altars, block idols, or niches that were meant to house betyls, and atop Jabal ad-Deir a large conspicuous circular pool/basin was constructed and grafted into the landscape near the Monastery further connecting the role of hydrology to elevated forms of ritual. Additionally the greatest confluence of water within Petra occurs at the most significant political and religious site within Petra, the Qasr al-Bint and the temenos where statues of kings were on display reinforcing the stability of Nabataean authority in place. The perception of authority over water was on display at the main Theater and the smaller odeion, both situated at two of the wider bends of water flowing into the Wadi Musa.

These relationships to water are indicative of underlying connections and consistencies that were maintained throughout much of Petra’s history. Nearly every production of social space throughout Petra shares some relationship to a ritual water source (cistern) or deposit (rock-hewn bowl for libations). Similar findings were identified for other sites throughout Nabataea (Alpass 2013). The control of Petra’s water constituted the power to control Petra, but what of legitimacy? Until Aretas IV, kingship in Nabataea was
acquired and legitimized through lineage. In geopolitical terms, Aretas IV was legitimized by Roman recognition, but in terms of the polity it is clear that legitimacy was accomplished through spatial constitution. The building program under Aretas IV was an effort to produce legitimization schemes in place that reinforced and reproduced the authority of the new regime. The requirements placed upon individual perception and experience regarding the Khasneh, the Theater, and the Colonnaded Street indicate significant reorientations of landscape to frame a new political order.

The landscape of Petra emerged as a representation of Nabataean social order. It appears that it was necessary to extend this representation towards controlling the supernatural order. In late Nabataean installations such as the Urm Tomb, the Monastery, the Palace Tomb, and the unknown structure atop Umm al-Biyarah, there are strong relationships to solar events. It is possible that these are related to a more consistent form of political constitution - water. Considering that the Nabataeans still maintained a predominantly mobile population throughout much of their history, it is not unreasonable to suggest that solar (and lunar) events were pivotal fixtures of annual life throughout Nabataea. These likely served as temporal indicators for when to return to specific locations for significant social events. Throughout this region, the majority of rainfall occurs in the winter months, or months closest to the winter solstice. As a form of political constitution, it might be considered politically necessary and important to highlight the regime’s relationship with these solar events that often lead to high (or low) amounts of a natural resource (ie. water) that is intimately tied to institutionalized forms of ritual. Therefore, the cosmic ordering of space within Petra may be representative of Nabataean political constitution.

Further research is necessary to position these findings within greater historical and spatial contexts. As was mentioned earlier, beginning in the first century BCE, Parthian rulers were constituting their authority through cosmic order. While the relationship between Persian and Nabataean architecture was explored by Anderson (2002; 2005), additional studies are necessary to explore possible Parthian cultural influences rather than leaning heavily on Hellenistic and Roman sources of influence. Additionally, more studies need to be conducted that consider the role of space in the political constitution of Hellenistic and Parthian authorities. While many studies examined the layout and function of Hellenistic cities, few examined the role of these cities in reorienting and reframing political narratives towards new forms of
social order. Additional studies of Parthian cities are needed as so few exist that examine the layout, much less the role of these urban spaces in constituting forms of political order. Finally, these findings are useful in discussions pertaining to how tribal confederacies, or complex polities rooted in diverse mobile populations, may construct permanent spaces that seek to constitute authority in place while simultaneously encouraging experiential and perceptual awareness for these highly mobile populations through the routinization of annual rituals.

Within the field of Nabataean studies, these findings indicate that the Nabataeans understood that spatial relations were productive agents in constituting political action and that within their capital city of Petra these spatial relations emerged as essential components in the establishment and constitution of Nabataean political authority. Initially the landscape of Petra focused on funerary functions associated with ritual and memory where power was structured around the control of natural resources (ie. water) and access to elevated ritual spaces was restricted. Political authority and institutions emerged around these ritual and sacred spaces. Increasingly new forms of spatial order were applied to reinforce and reproduce shifting political power dynamics common to hierarchical social structures where monumentality, cardinality, and orthogonality emerged as constitutive components of the Nabataean political landscape. With an increase in new forms of political constitution focusing on spatial order, there was a similar increase in emphasis on solar relationships linking political and ritual spaces with cosmological order indicating a growing need to legitimize authority of the regime to regional wealthy elites and within broader geopolitical contexts.

Additionally, these findings provide an important/significant new framework for assessing the urbanism of Nabataean Petra and resulted in a better understanding of the mechanisms that drove its evolution over time. Rather than focusing on the genius of Nabataean engineering and architectural design, the constraining typologies of Petra’s funerary and monumental landscapes idealized onto a monolithic mappable plane, or forcing a conclusion that frames the entirety of the city’s dynamic landscape into a bifurcated archetype such as Sacred/Secular, Hellenistic/Roman, or Orthogonal/Organic, this new approach shows that the Nabataeans ordered the spaces of Petra through functional, political, and sacred domains of landscape production. The results of this work provide a clear framework through which to
integrate the social and spatial processes of Nabataean Petra and allow researchers to better assess how functional, political, and sacred orders came to dominate the spatial practices of Nabataea.
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Josephus. Jewish Wars. (abbr. AJ)


Tacitus. Annals.


## Appendix A: List of Significant Points Considered

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Appendix C - Python Script to Reproduce Viewshed

```python
import arcpy
from arcpy import env
from arcpy.sa import *
import tkFileDialog, Tkinter, Tkconstants
from Tkinter import *
from tkFileDialog import *

print "DEM"
inDEM = askopenfilename()
print "Points"
points = askopenfilename()
workFolder = askdirectory()+"/"
outPath = workFolder+"points"
outView = workFolder+"viewsheds"
outBearing = workFolder+"bearings"
env.Workspace = workFolder
arcpy.env.outputCoordinateSystem = inDEM
arcpy.env.snapRaster = inDEM
arcpy.env.scratchWorkspace = env.Workspace
arcpy.CheckOutExtension("Spatial")
##Set raster environments
env.extent = inDEM
env.cellSize = 10
env.overwriteOutput = True

arcpy.MakeFeatureLayer_management(points, "pts")

x = 0
with arcpy.da.SearchCursor('pts', ['FID', 'Names']) as cursor:
    for row in cursor:
        fid = str(row[0])
        print ''.join(e for e in row[1] if e.isalnum())
arcpy.SelectLayerByAttribute_management ("pts", NEW_SELECTION, "'FID' = '{}'".format(fid))
arcpy.FeatureClassToFeatureClass_conversion("pts", outPath, fid+".shp")
viewshed = Viewshed(inDEM,pts["NEW_SELECTION"],"CURVED_EARTH",0.15)
viewshed.save(outView+"//"+str(fid)+".tif")
arcpy.BearingDistanceToLine_management(outPath+"//"+str(fid)+".shp", X, Y, "FakeDist","KILOMETERS","calc_orien", "DEGREES", "GEODESIC")

if(x == 0):
    plus = viewshed
    empty = viewshed
else:
    plus = arcpy.sa.Plus(plus, viewshed)
    empty = arcpy.sa.Times(empty, viewshed)
x+= 1

empty.save(workFolder+"//total.tif")
plus.save(workFolder+"//total_plus.tif")
```

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Appendix D - Python Script to Reproduce Isovists

```python
##relative elevation = height of structure at the beginning
import arcpy, os.path
from arcpy.sa import *
import math, tkFileDialog, Tkinter, Tkconstants
from Tkinter import *
from tkFileDialog import *
def createDir(path):
    if not os.path.exists(path):
        print "Creating folder @ " + path
        os.makedirs(path)
    else:
        print "Folder exists @ " + path
    return path + "/"

print "Select a workspace folder with write permissions"
workFolder = askdirectory() + "/"
print "What DEM will be used?"
inDEM = askopenfilename()
workSpace = createDir(workFolder + "workspace")
outPutFolder = createDir(workFolder + "output")
outPoints = outPutFolder + "pts.shp"
isovists = createDir(workFolder + "isovists")
clipppedIsovists = createDir(workFolder + "clipppedIsovists")
relElevFolder = createDir(workFolder + "relElev")

##Collect points data
print "Select a points shapefile"
inPoints = askopenfilename()

##ArcPy Environments
arcpy.env.Workspace = workSpace
arcpy.env.outputCoordinateSystem = inDEM
arcpy.env.snapRaster = inDEM
arcpy.env.extent = inDEM
arcpy.env.cellSize = 5
arcpy.env.overwriteOutput = True
arcpy.CheckOutExtension("Spatial")

arcpy.MakeFeatureLayer_management (inPoints, "pts")

## Attribute Settings
fieldFID = "FID"
Elevation = "elev_1"
Height = "Height"
Names = "Names"

def create_isovist(row):
    fid = str(row[0])
    elev = row[1]  # Assuming common view to be about 3/4 of height
    name = fid + "." + ".join([e for e in row[2] if e.isalnum()])
    riseVal = row[3] * 0.75
    arcpy.SelectLayerByAttribute_management ("pts", "NEW_SELECTION", "'FID' = "+str(fid))
    arcpy.FeatureClassToFeatureClass_conversion("pts", outPutFolder, fid + ".shp")
    print "Created for " + fid + ".shp"
```

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relElev = Minus(elev+riseVal, inDEM)
relElev.save(relElevFolder+name+".tif")
euclidean = EucDistance(outPutFolder+fid+".shp")
viewElev = ATan2(relElev, euclidean)
viewElev = Times(180, viewElev)
degreeIsoVist = Divide(viewElev, math.pi)
degreeIsoVist.save(isovists+name+".tif")

## Clip to viewable area only
viewshed = Viewshed(inDEM, outPutFolder+fid+".shp", 1, "CURVED_EARTH", 0.15)
croppedRelElev = Times(viewshed, relElev)
croppedEuclid = Times(viewshed, euclidean)
croppedViewElev = ATan2(croppedRelElev, croppedEuclid)
croppedViewElev = Times(180, croppedViewElev)
narrowIsoVist = Divide(croppedViewElev, math.pi)
narrowIsoVist.save(croppedIsovists+name+".tif")

with arcpy.da.SearchCursor('pts', [fieldFID, Elevation, Names, Height]) as cursor:
    for row in cursor:
        if row[3] > 0:
            create_isovist(row)
        else:
            print "Skipping "+row[2]
Appendix E - Horizon Diagrams
Appendix F - Python Script to Reproduce Horizon Diagrams

### Create horizon diagrams ###

```python
from __future__ import division
# from scipy.interpolate import import spline
import arcpy, os
from arcpy import env
from arcpy.sa import *
from os import *
import io
import math
import tkFileDialog, Tkinter, Tkconstants
from Tkinter import *
from tkFileDialog import *
import matplotlib.pyplot as plt
import numpy as np
from matplotlib.pyplot import rc, grid, figure, plot, rcParams, savefig
import ephem
rad2deg = 180.0 / math.pi ### Convert radian values to degrees
deg = rad2deg
```

```python
# Get pyephem event
#event = raw_input("Enter event for 'SS':Summer Solstice; 'WS':Winter Solstice; 'VE':Vernal Equinox; 'AE':Autumnal Equinox ** = ")
event = "A"

## Setup environments and get working files
print "Where to save all generated data?"
workFolder = askdirectory() + "/"
print workFolder
print "Please select a DEM!"
inDEM = askopenfilename()
env.Workspace = workFolder+"workspace"
arcpy.env.outputCoordinateSystem = inDEM
arcpy.env.snapRaster = inDEM
arcpy.env.scratchWorkspace = env.Workspace
horizonFolder = workFolder+"ALL/h_diagrams/"
##print "Please select a remap file"
##reMapFile = askopenfilename()
##reMapFile = askopenfilename()

## Create workspaces
if not os.path.exists(env.Workspace):
    print "Creating Workspace @ "+env.Workspace
    os.makedirs(env.Workspace)
if not os.path.exists(horizonFolder):
    print "Creating Workspace @ "+horizonFolder
    os.makedirs(horizonFolder)
folders = ["dbase", "output", "tables"]
for x in folders:
    if not os.path.exists(horizonFolder+x):
        os.makedirs(horizonFolder+x)
for x in folders:
    y = horizonFolder+"output"+x
    print "Creating folder @ "+y
    if not os.path.exists(y):
        os.makedirs(y)
```
## Set raster environments
env.extent = inDEM
env.cellSize = 5
env.overwriteOutput = True

## Set points locations and fieldnames
print "Please select a points shapefile"
inPoints = askopenfilename()
outPoints = horizonFolder+"output/pts/pts.shp"
outPath = horizonFolder+"output/observers"
outputPath = horizonFolder+"output/
fieldFID = 'FID'
Elevations = 'elev_1'
names = 'Names'
orient = 'calc_orien'
arcpy.CheckOutExtension("Spatial")

#### Calculate XY Coordinates
print "Finding Coordinates for Points..."
arcpy.env.outputCoordinateSystem = arcpy.SpatialReference(4326)
arcpy.AddXY_management(inPoints)
LAT = "POINT_Y"
LON = "POINT_X"
arcpy.env.outputCoordinateSystem = inDEM

ExtractValuesToPoints(inPoints, inDEM, outPoints)
arcpy.MakeFeatureLayer_management(outPoints, "pts")

# Function that will draw each diagram
def drawDiagram(R1, R2, orientation, horizonFolder, name, eventname, fullname, e):
    plt.close('all')
    ## Build horizon diagram
    angles = []
radius = []
infile = io.open(horizonFolder+"output/testarea/"+str(fid)+".txt","w")
for(a, r) in R1:
    angles.append(a)
    if r < 0:  ## Avoid negative horizon values that incorrectly skew the diagram
        r = 0
    infile.write(unicode("Azimuth " + str(a) + " Inclination " + str(r) + "n"))
radius.append(90-r)
infile.close()

#angles_x = np.array(angles)
#radius_x = np.array(radius)
#angles = np.linspace(0,360,360*3)
#radius = spline(angles, radius, angles_smooth)
theta = np.radians(angles)  ## azimuths must be in radians for matplotlib
r = radius

ax = plt.subplot(111,polar=True)
ax.plot(theta, r, color='gray', ls='-', linewidth=1)
ax.fill(theta,r,'w')
#ax.set_theta_offset(np.radians(360 - orientation))
ax.set_theta_zero_location('N')
ax.set_theta_direction(-1)
ax.set_rmax(90)
ax.set_rmin(0)
ax.set_yticks(range(0,90,10))
yLabel=['90','','','60','','','30','','','']
ax.set_yticklabels(yLabel)
#
ax.xaxis.label.set_color('black')
ax.yaxis.label.set_color('black')
[i.set_color("black") for i in plt.gca().get_xticklabels()]
[i.set_color("black") for i in plt.gca().get_yticklabels()]
# color for the grid lines
ax.grid(True, color='black')
#set outer edge color of circle
ax.spines['polar'].set_edgecolor('black')
##if orientation > 0:
##Structure Orientation
oangles = []
oradius = []
orientations = [(orientation,0),(orientation,90)]
for (a, r) in orientations:
    oangles.append(a)
    oradius.append(r)
theta = np.radians(oangles)
r = oradius
ay = plt.subplot(111,polar=True)
ay.plot(theta, r, color='red', linewidth=3)
for event, rads in R2.iteritems():
    ephemAngles = []
    ephemRadius = []
    az = plt.subplot(111,polar=True)
    for (a,r) in rads:
        ephemAngles.append(float(a))
        ephemRadius.append(90-float(r))
    theta = np.radians(ephemAngles)
r = ephemRadius
##['SS','AE','WS']
if event == 'SS':
    thisColor = 'green'
if event == 'AE':
    thisColor = 'black'
if event == 'WS':
    thisColor = 'blue'
az.plot(theta, r, color=thisColor, ls='--', linewidth=2)

#ax.set_title(fullname, loc='right')
ax.annotate(fullname,xy=(0.1),xycoords='figure fraction',color='black',fontsize=16,xytext=(.20,0.95),horizontalalignment="left",verticalalignment="top")
#ax.annotate(eventname,xy=(1.0),xycoords='figure fraction',color='black',fontsize=14,xytext=(.98,0.02),horizontalalignment="right",verticalalignment="bottom")

plt.savefig(horizonFolder+'output/diagrams/*+e/*+name+.png', transparent=False)
def sunazimuths(event, elevation, lat, lon):
    def f(event):
        return {
            'SS':'0001/3/27',
            'VE':'0001/1/1',
            'AE':'0001/5/1',
            'WS':'0001/9/23',
        }[event]
    def buildArray(event, date, elevation, lat, lon):
        x = 0
        i = 24
        print lat
        print lon
        sun = ephem.Sun()
        obs = ephem.Observer()
        obs.lon = str(lon)
        obs.lat = str(lat)
        obs.elevation = elevation
        obs.epoch = '0001'
        obs.date = date
        sun.compute(obs)
        if event[1] == 'S':
            obs.date = ephem.next_solstice(date)
            sun.compute(obs)
        else:
            obs.date = ephem.next_equinox(date)
            sun.compute(obs)
        print obs.date
        obs.date = obs.previous_rising(sun, use_center=True)
        startDate = obs.date
        sun.compute(obs)
        obs.date = obs.next_setting(sun, use_center=True)
        endDate = obs.date
        step = ephem.minute * 5 ### 5 minute intervals
        pathValues = []
        while float(startDate) < float(endDate):
            startDate = startDate + step
            obs.date = startDate
            sun.compute(obs)
            azi = str(sun.az).split(':')[0]
            alt = str(sun.alt).split(':')[0]
            if int(azi) > -1 and int(alt) > -1:
                pathValues.append([azi, alt])
        return pathValues
    date = f(event)
    return buildArray(event, date, elevation, lat, lon)

def n(event):
    return {
        'SS':'Event: Summer Solstice',
        'VE':'Event: Equinox',
        'AE':'Event: Equinox',
        'WS':'Event: Winter Solstice',
    }[event]
with arcpy.da.SearchCursor('pts', [fieldFID, Elevations, names, orient, LAT, LON]) as cursor:
    for row in cursor:
        fid = str(row[0])
        names = str(row[2])
        name = names.replace('·', '').replace(' ', '').replace('?', '')
        name = name + ''.join(e for e in row[2] if e.isalnum())
        print "Creating table for row " + name
        arcpy.SelectLayerByAttribute_management("pts", "NEW_SELECTION", "'FID' = '{}'".format(fid))
        arcpy.FeatureClassToFeatureClass_conversion("pts", outPath, fid + ".shp")
        print "Creating viewshed for row " + name
        viewshed = Viewshed(inDEM, "pts", 1, "CURVED_EARTH", 0.15)
        print "Masking DEM by viewshed for row " + name
        #maskDEM = ExtractByMask(inDEM, viewshed)
        print "Creating relative elevation for row " + name
        elevation = row[1]
        print "Elevation is " + str(elevation)
        relElev = Minus(inDEM, elevation)
        relElev = Times(relElev, viewshed)
        relElev.save(horizonFolder + "output/rel_elev/" + fid + ".tif")
        print "Finding Euclidean distance for row " + name
        euclidean = EucDistance(outPath + "/" + fid + ".shp")
        euclidean = Times(euclidean, viewshed)
        euclidean.save(horizonFolder + "output/euclidean/" + fid + ".tif")
        #print "Masking Euclidean distance by viewshed for row " + name
        #maskEuc = Times(euclidean, viewshed)
        print "Creating aspect of masked distance for row " + name
        aspect = Aspect(euclidean)
        #maskAsp = Times(aspect, viewshed)
        print "Discretizing Aspect for row " + name
        intAsp = Int(aspect)
        print "Finding tangent (view) angles for row " + name
        viewElev = ATan2(relElev, euclidean)
        ##viewElev = ATan(viewElev)
        ### Zonal Statistics
        print "Finding Zones for each aspect (azimuth) for row " + name
        ZonalStatisticsAsTable(intAsp, "VALUE", viewElev, horizonFolder + "tables/table" + fid, "DATA", "MAXIMUM")
        arcpy.AddField_management(horizonFolder + "dbase/" + name + ".dbf", ["VALUE"], "ANGLE")
        arcpy.DeleteField_management(horizonFolder + "dbase/" + name + ".dbf", ["COUNT", "AREA", "MAX"])
        arcpy.TableToTable_conversion(horizonFolder + "dbase/" + name + ".dbf", horizonFolder + "dbase", name)
a = float(row[0]/1)
## tAngle = row[1]*deg
## print tAngle
tAngle = (row[1]*180)/math.pi
print a, tAngle
# q = a
# tAngle = math.degrees(math.atan(row[1]))
if(a >= 0 and a <= 180):
    #print "Original Value was => " +str(a)
    q = a + 180
    R1.append([q,tAngle])
    #print "Should be less than 180 => " +str(q)
if(a <=360 and a > 180):
    #print "Original Value was => " +str(a)
    q = a - 180
    R1.append([q,tAngle])
    #print "Should be 180 or greater => " +str(q)
print event
if(event == 'A' or event == 'a'):
    print event
events = ['SS','AE','WS']
radii = {}
for e in events:
    print e
    R2 = sunazimuths(e, elevation, lat, lon)
    eventname = n(e)
    radii[e] = R2
    #drawDiagram(R1, R2, orientation, horizonFolder, name, eventname, names, e)
e = 'A'
drawDiagram(R1, radii, orientation, horizonFolder, name, eventname, names, e)
else:
    R2 = sunazimuths(event, elevation, lat, lon)
    eventname = n(event)
drawDiagram(R1, R2, orientation, horizonFolder, name, eventname, names, event)
cursor.reset()
print "Done"