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DEVELOPMENT OF THE AEGEAN-ARABIAN CONTACTS DURING THE 1ST MILLENNIUM BCE: A HISTORICAL AND ARCHAEOLOGICAL OVERVIEW

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ABSTRACT

An outline of some major contacts between societies from the Arabian Peninsula to the Aegean world during the 1st millennium BCE is presented. It considers the trade progression from the Late Bronze Age to the end of the 1st Millennium BCE and discusses the value and insight of long historical arcs and structures, the importance of large-area historical surveys through different strands of historical, and archaeological evidence for the interpretation of persistent patterns of trade. Trade routes, exchanges of products, technological developments, diplomatic relations, as well as climatic, migratory, and demographic features, are discussed.

On the basis of evidence from trade in metals and aromatics, navigation and transportation technologies, as well as water management strategies in remote and arid locations which is further supported by contemporary historical sources, inscriptions, and recent archaeological discoveries, this publication describes the long-term structures of interaction and exchange between the Arabian and the Aegean worlds. These structures, we argue, can be summed up into the notion of an "*Aegean-Arabian axis*" in which products and culture were tangibly shared.

With regards to the Hellenization of societies in Western Asia, the case of the Nabataeans demonstrates the cultural and economic impact of trade and the selective import of cultural and aesthetic tropes, as seen in the architectural evidence from Petra and Mada'In Salih.

This approach, alongside the growing complexity and regulation of trade, provides a basis from which to estimate the scale and degree of the impact and effects of events and structures such as, climate, economic crises and large demographic migrations, have had on regional economies by pinpointing changes in consumption, or deviation of a route due to shifting realities that make-or-break societies along nodal points on the Arabo-Aegean Axis. By outlining aspects that connect the Arabian and Aegean worlds such as technologies, customs, seafaring, water systems, and domestications that supported the intensification of trade throughout the 1st millennium BCE, we elucidate some diachronic contacts along the Aegean-Arabian axis. This newly defined case area examines qualitatively the development of connectivity between distant societies of the Aegean Sea and the Arabian Peninsula. The arbitrary delineation of unconventional regions shows how tangible historical links can be produced which emphasize different axes of connections that would otherwise be less visible, less recorded, or omitted. The description of long-term interactions and exchanges between the Arabian and the Aegean worlds demonstrably form an "*Aegean-Arabian axis*" where products and culture were shared.

KEYWORDS: SE Mediterranean, Saudi Arabia, Near East, Trade, frankincense, Anatolia, Hellenistic, Nabateans, Late Bronze Age, dromedary, shipping, artifacts, cultural, periplus

1. INTRODUCTION

The contacts between societies from the Aegean and the Arabian world during the 1st millennium BCE have not been reviewed properly, although, direct or indirect contacts have been well documented towards the end of the 1st millennium BCE (Singer, 2006; Gupta, 2006; Sidebotham, 2019). The relationships between the Aegean, the Levant and Arabia during the 1st millennium BCE have been fragmentally reconstructed from ancient historical and archaeological witness, and occasionally, reported to us by explorers' and travellers' accounts. The evidence consists of inscriptions in Greek, Latin, South Arabic, and Aramaic, as well as historical documents from authors of the Graeco-Roman world and Arabian Peninsula which provide, with varying degrees of detail, information about the ancient environment (Wilson 2013), or the tariffs and prices on trade (Matthews 1984). We examine the interaction between people leading to the emergence of the Nabataean kingdom as a result of long-term historical processes of structural, economic, and technological developments, and gauge their impact and importance through the archaeological and historical record. The locus of this paper is at the crossroad where Asia, Europe, and Africa meet geologically, geographically, and culturally. The development of institutions and politics within settlements, cities, and states, the interactions between realms and the effect of environmental forces (i.e.: climatic change) are factors for the historical evolution of the Aegean-Arabian region. The physical and cultural geographical context is the stage for the development of long-distance trade routes between far-flung places and cultures, which increased in regularity and reliability during the first millennium BCE. This phenomenon was a conduit that transited products and people and influenced the economic and political agenda of the societies which they traversed. Because of both historical and geological context, this region has been the stage for recurrent natural events and societal conflict.

This approach, alongside the growing complexity and regulation of trade, provides a basis from which to estimate the scale and degree of the impact and effects of events and structures such as climate, economic crises and large demographic migrations, have had on local and regional and supraregional economies by pinpointing any changes in consumption or the deviation of a route due to new shifting realities that can make or break the economic success of societies and nodal points along this Arabo-Aegean Axis. In short, we examine aspects that connected the Arabian and Aegean worlds such as seafaring, water systems, and domestications, among others, that supported the intensification of trade throughout the 1st millennium BCE and led to what we term the "Aegean-Arabian Axis". (Fig.1). The connectivity between distant societies through an arbitrary linking of regions can lead to discovering hitherto underappreciated tangible links. These physical and cultural elements fostered the success of the Nabataean kingdom and epitomize the Helleno-Semitic syncretism on the Aegean-Arabian Axis.

2. AN AEGEAN-ARABIAN AXIS - NETWORKS OF TRADE, POLITICS, TECHNOLOGY, AND CULTURE

The term "Aegean-Arabian Axis", or variants such as "Arabo-Aegean Axis", welds together these two regions. It roughly encompasses the "Frankincense Road" where our historical-archaeological investigations links these regions' societal, technological, climatic and economic changes that shaped their shared history (Hitgen 2013) (Fig.2).

From the 12th century BCE, are lain the structures and fundamentals led to the extensive contacts of the following millennia. Social organizations, technologies, and strategies evolved in stages of long-term and cumulative changes. During the 1st millennium BCE, the worlds of the Aegean Sea and Arabian Peninsula grew closer to each other as technological developments rendered possible consistent travel over greater distances, both seawards and landwards (e.g.: domestication of the camel, naval technology, roads, writing and alphabet). The societies of the Aegean and Arabia were at times politically and culturally integrated thanks to the spread of Christianity to northeastern Africa and southern Arabia during the Eastern Roman "Byzantine" Empire, and then during the height of the Ottoman Empire whose territory stretched from the Balkans and as far south as Mecca. The Hellenic world stretched from the Mediterranean, from the Hellenic kingdom of Macedonia to the islands of Crete and Cyprus, and the territories of the Ptolemies, Seleucids, and the Diadochi states.

Due to the size and topographical variety, we encounter along the Aegean-Arabian Axis, proposing a cogent environmental or cultural synthesis is challenging. The different climates, topography, hydrography, and ways of life (urban, rural, nomadism, transience, maritime, desert, lowland, highland, and low/high population densities) can, nevertheless, be advantageous. This heterogeneity of circumstances ideally allows us to explore a range of interfaces, such as overland and maritime transport technology and infrastructure, urbanism and nomadism, Hellenic and Arabian culture, and other aspects of human interactions.

Along those strengthening trade and diplomatic networks, products, ideas and people were carried from one place to another gradually forming a shared network.

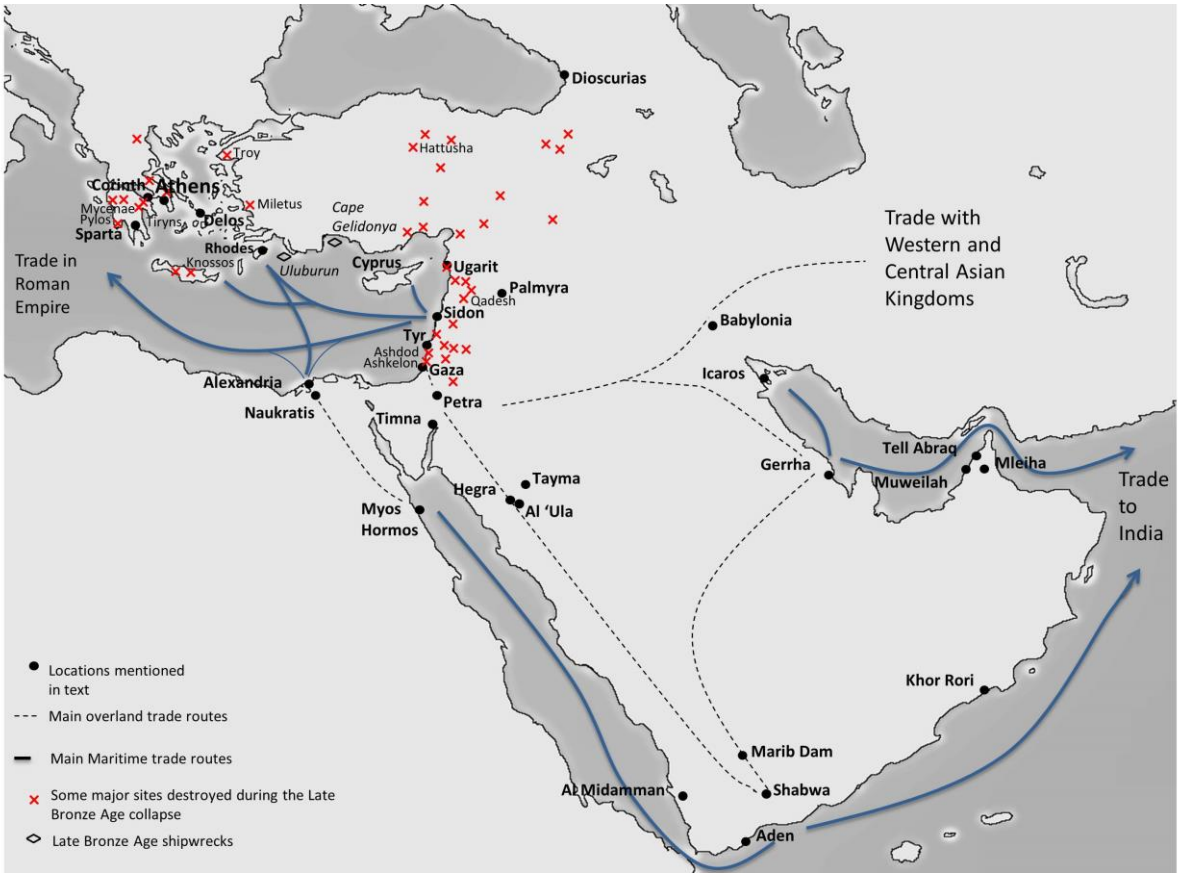

Figure 1. Map displaying some of the main sites mentioned in the text as well as routes representing the main trade lines in the period (© to the authors)

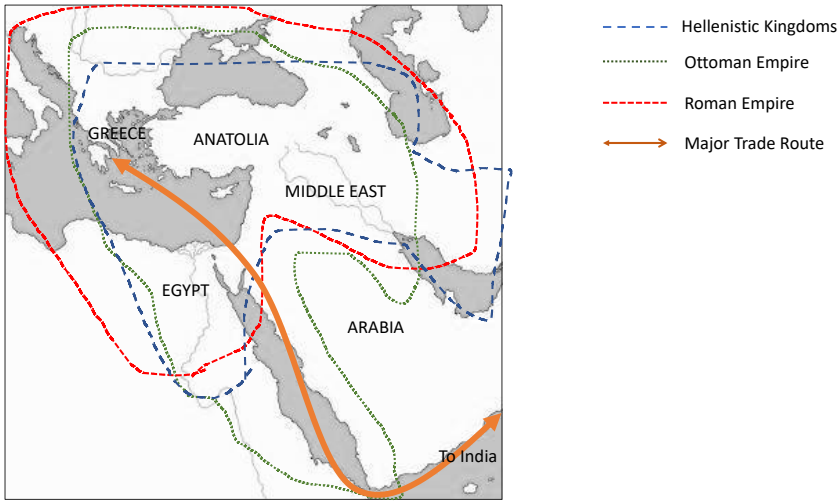

Figure 2. Sketch map showing the approximate extent of succeeding empires which linked the Aegean and Arabian worlds.

3. ENVIRONMENT & CULTURE OF THE HOLOCENE ARABIA AND AEGEAN

3.1 Aegean-Arabian Environmental History

The available data on the environmental history of Arabia is limited; only a few proxies indicate several shifts in palaeoclimatic conditions (see Parker et al., 2006; Parker et al., 2006; Parton et al., 2015) but a series of studies and discussion has been carried out in the last decades (for example Clemens et al., 1990; Sanlaville, 1992; Cleuziou and Tosi, 1998; Bailey et al., 2007). Thus, ecologically contextualising the Arabian Peninsula's ancient societies remains speculative. The Arabian Peninsula's topography consists of alluvial plains and deserts delimited by high mountains (e.g.: Jebel Shams). Arabia's vast landmass (over 3 million

km²) contains a variety of topographies and environments. Its coastline stretches for over 7000km, and its interior has several large paleorivers and paleolakes (general description of Arabian geology and geography, see: Alsharhan, 2007; Vincent, 2008). The evolution of Arabia's environment is affected by precipitations which are due to the Mediterranean winter rains and the Indian Ocean monsoon systems. Together with the latitudinal movement of the Inter-Tropical Convergence Zone, these form the basis of paleo-environmental research in Arabia which oscillates between dry and wet phases (Magee, 2014).

During the Holocene, the Mediterranean climatic patterns and Indian ocean monsoons varied. At times, Arabia, situated between them was a wetter area. This movement of wetter weather patterns is understood through the Inter-Tropic Convergence Zone (ITCZ) climatic model. Ecological and environmental models have been used to explain population dispersal in Arabia in the Neolithic. (Dreschler, 2007). Seasonal water courses, wadis, cut deep gorges through the mountains creating wadis (or widyan), and form the alluvial sediments and gravel plains. These alluvial plains and wadis create soils and groundwater (Magee, 2014: p11), that support agriculture. The geohydrology of the region suggests seasonal visits to the area, which translates to, when the water flowed down the usual streams it enabled people to carry out their mining activities in these regions. The gradual attempts at the 'domestication' of water in the region of Jordan, northern Saudi Arabia, are visible in the Neolithic and in the Bronze Age in Wadi Faynan (Mithen, 2010). Furthermore, lithic technologies, animal domestication, and seafaring are also developed in this period as either autochthonous developments or external influences of the Arabian Holocene period. Between the 9th and 7th millennium BC, people occupied sites such as Faya and the coastal site of Wadi Wutayya in Oman and UAE (M. Uerpmann 1992), and Al-Hawa in the Ramlat as-Sabatyn mountain range, other sites in the Yemeni highlands, and at Maynayzah in the Wadi Hadramawt (Lézine et al., 2010; McCorriston and Martin, 2009).

By the 6th Millennium BC, the Holocene Moist phase begins. The increased rainfall creates grasslands suited for pastoralism. This allowed for inland activities that were in later centuries abandoned. Settlement and survival strategies adapted to the new realities in the region. In addition, the import of lithic arrowhead technology, domesticated animals (o*vis, capra, bo*s), and domestic architecture as seen at the site of Marawah, Abu Dhabi which resembles the architecture at Ain-Ghazal in Jordan (Beech et al., 2005) suggests that people from the Levant migrated to the Arabian Peninsula.

3.2 Water

In 1944, Grahame Clark (Clark, 1944), put forward the notion that water was at the base of the emergence of complex societies and civilisations. Wittfogel's notion of Oriental Hydraulic Despotism (1957) places water management at the forefront of Chinese society. Water is of core importance for societies which, in turn, generated cultural and societal notions with regard to its abundance, scarcity, danger, benefits, and social organisation. Palaeo-environmental studies, archaeological evidence, and historical texts demonstrate how different cultures address water within their topographies. The domestication of water is an ongoing process, to this day, taming rivers and floods, or addressing a drought, is an ever-present threat to local, regional, and global economies, states, and trade. Water possesses a destructive and life-giving quality, and political, economic, and spiritual importance. For a historical overview of water management in societies (Mays et al., 2007)

Cisterns, wadis, dams, irrigation and aqueducts are important investments made by a city for its own self-preservation. The Nabataeans, in the area to the south of Jordan (Mithen, 2010) had an advanced water management culture. Archaeological and historical evidence of advanced ancient water management is found in various sites in Arabia and the Aegean.

The Sadd El-Kafara dam was the oldest of its kind in the world and was constructed about 4,500 years ago across a desert wadi known as Wadi Garawi. It was destroyed by a flash flood before completion believed to have been a failed experiment in dam construction which used the pyramid-building methods (Garbrecht, 1997). The construction and maintenance of the famous Marib Dam in the Yemen (figure 2) was a matter of economic and political survival for the ancient Yemenis as it the collected water supplies the surrounding landscape (Ganchikov and Munavvarov, 1991).

Since the Bronze Age, Greeks display a developed knowledge of water management (Angelakis et al., 2005; Knauss, 1991) either as protection from natural elements such as floods or drought or for harvesting for their benefit (Angelakis et al., 2020). In the Aegean region, there are several notable hydraulic water management examples, such as the Minoan urban drainage and sewage system (Angelakis et al., 2005), notably at Pseira (Betancourt, 2013), the Minoan 'viaduct' at the Knossos palace (Angelakis et al. 2014), the Mycenaean Lake Copais drainage (Knauss et al., 1984; Kountouri et al., 2013) and at Kastrouli (Liritzis et al., 2022), the Mycenaean dam at Tiryns (Balcer, 1974).

The debate about the chronological and geographical origins of the *qanat* technology has been a point of contention for decades (for example English, 1968;

Kobori, 1973; Lightfoot, 2000; Magee, 2005). As a *qanat* is a response to increased aridity and lack of groundwater and rivers, recent evidence suggests the south-East Arabian *qanats* found are potentially dating to 1100-1000BC which reverses the historic paradigm which always stated that *Qanats* were developed in Persia in the middle of the 1st millennium. It stands to reason that an origin can be suggested to be somewhere between the Saharan and Arabian deserts during an arid phase that sediment analysis (Lückge et al., 2001) and humped cattle (Matthews, 2002) suggest took place between 1200-800 BC.

Figure 3. Photo of Marib Dam in Yemen in the present day (1988). By H. Grobe - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=13283317

Nevertheless, the current belief is that subterranean aqueducts were first conceived in Persia and then spread to the Arabian Peninsula sometime in the mid-1st millennium BC (Lightfoot, 2000). The *qanat* technology transferred to several civilizations from China to Europe where it became known under different names: *falaj* (UAE), foggara (north Africa), kǎnrjǐng (坎儿井; China), the karez, the aqueduct, and the hydragogeion (Voudouris et al., 2013). In ancient Hellas, the *qanat*-technique appears with Eupalinos' (*ca*. 530BC) tunnels and shafts on Samos (Voudouris et al., 2013), as well as on other sites in Athens (Chiotis, 2012), Naxos, Korinthos, and other sites in Greece (Crouch, 1993) such as Polyrrhenia, Crete and Phyllida, Serres. It is also found in much of Europe (Weingartner, 2007). Finally, if one was to equate *qanat* to aqueducts one should find a great deal of similar technology in the world (Voudouris et al., 2013). By 300BC, the *qanat* is found from Egypt to Afghanistan and even in Europe. Is the development of these hydraulic technologies are connected to a period of simultaneous megadrought (see: Weiss, 2017; Kaniewski and Campo, 2017)?

The settlements in the arid conditions of the eastern Mediterranean and the Arabian Peninsula required the development of sophisticated and ingenious water collection, supply and management systems and facilities. These allowed the creation of self-sustaining settlements that acted as the nodal points across the ever-growing trade lines between the Aegean and the Arabian world.

Contacts: crises, expansion, migration

The eastern Mediterranean Bronze Age is brought to an abrupt end by the commonly referred to as 'collapse' (Cline & Knauss, 2014). The Arabian and Aegean zones shared a certain degree of indirect contact throughout the period via the intermediary of Egypt. As the collapse mostly affected the demographic and economic conditions of the Mediterranean region (Middleton, 2020). We may speculate that its effects would not have been felt strongly among the southern Arabian polities. The social decline from ca. 1200 to the 9th century BCE is attributed to a range of factors including drought, earthquakes, and the Sea Peoples (Nur and Cline, 2000; Kaniewski et al., 2013; Broodbank, 2013; Middleton, 2020). The social, economic, and cultural links between the civilizations of the Eastern Mediterranean and Near East — Egypt, Crete, Greece, the Hittite Empire, Mittani, Assyria, and Kassite Babylonia are evident from the shared crises and demise. The effects of the eastern Mediterranean downturn on the Arabian Peninsula cannot be gauged with any certainty as the archaeological evidence dating from the LBA/EIA transition is limited.

By the end of the 1st millennium BC, the Mediterranean world is an integrated world whose cultural and economic influences reach as far as the Indus River, the Aral Sea, Xinjiang and potentially China

(Scheidel, 2009). The Arabian Peninsula and the Mediterranean world are linked and the Nabataeans play an important part in this enduring network (Rosen, 2019). Yet, the essential elements for long-distance contact were lain during the Bronze Age. Textual and artistic evidence from ceramics, faience and semi-precious stones indicate that Aegean-Arabian links can be dated back to the Bronze Age. The discovery of Bronze Age shipwrecks (e.g.: Uluburun and Cape Gelidonya) brought a better understanding of the Late Bronze Age trade networks and cemented the notion of long-distance trade in the LBA as a firm historical reality (Bachhuber, 2006; Katz, 2008). The Egyptians had, since the 18th dynasty (1543–1292 BCE) and the reign of Hatshepsut (1507–1458 BCE), long-standing trade contacts with the southern Arabian kingdoms have been debated (Sayed, 1989). As the Egyptians controlled many of the ports along the southern Levantine coast, they also controlled the trade between the Aegean (Minoan-Mycenaean 1600–1100 BCE) and the Arabian world. The notion of Egyptian supremacy over the eastern Mediterranean (see: Säve-Södebergh, 1946; Furumark, 1950; Kemp, 1990) is problematic (Knapp, 1993).

In the 14th century BCE Uluburun shipwreck's cargo was heading to supply a Mycenaean demand for metals and ivory (Cline and Landau, 2007). It contained Cypriot ceramics, Aegean stirrup jars, 150 Canaanite jars of terebinth resin (circa 1 ton), olives, 175 blue glass ingots, and 354 copper oxhide ingots, 121 smaller pillow-shaped ingots, and one ton of tin (Pulak, 1998) (see figure 3). The pistachio resin has been a residue of wine-containing amphorae (Stern et al., 2008) or a raw material used in aromatics and medicine.

Figure 4. Canaanite jars and oxhide copper ingots from the Ulu Burun shipwreck. Modern reconstruction of the shipwreck with the original finds in the Archaeological Museum of Bodrum (© photo by I.L.).

The Amarna letters (Feldman, 2002; Kristiansen and Suchowska-Ducke, 2015) provide us with insight into the relationships in the Eastern Mediterranean polities, especially in cities on the Levantine coast, such as Tyr and Sidon. In the Late Bronze Age, trade mechanisms operated in a non-monetary world, relying on a gift-exchange basis and tributary system or barter systems, and palatial trade and diplomatic relations between palatial elites and rulers of realms such as Egypt, Hattusha, Assyria and Mycenae (Knapp, 1990). However, the extent to which rulers and palaces controlled all production, population and territory (Broodbank

2013), and totally centralized economic, political, religious and cultural life should not be overestimated. Tensions or mutual needs between the palatial assets, mining zones and companies, manufacturing artisans and fellowships, supply equipment, tools, and services (such as transhipping and *villes portuaires*), and free enterprising groups have been downplayed (Artzy, 2006; Feldman, 2002; Knapp, 1990).

Yet, trade was to an extent regulated by the palaces (Broodbank, 2013, p444-449). The Amarna letters and numerous clay tablets inform us that measures by palace governments were taken to protect and control the movement of valuable commodities, as well as to provide some legal recourse for merchants (Schiller, 2009). Writing remained the privilege of the palace organization and, by extent, the composition of legal and contractual documents. Reversely, the desire for control suggests that uncontrolled trade took place beyond the palaces' purview. How comfortable was it for the Palatial rulers to leave the sea to the control of 'pirates' or stateless sailors?

Networks of interactions and exchanges go further than the geographical range of a single. The Bronze Age world had sustained communication between individuals through intermediaries across large maritime distances (Tartaron, 2013). Writing and the development of alphabetic scripts was a key dimension in the transition between the LBA palatial world and the emergent world of the Iron Age (Papadopoulos, 2015).

The 1st millennium BCE saw the pre-eminence of empires across from Mesopotamia to the eastern Mediterranean coastlines, such as the Assyrian (10th-7th centuries BCE), the Persian-Achaemenid (6th-4th century BCE), and the Hellenistic-Seleucid (4th–2nd centuries BCE) mediated a lot of the trade going west towards the Mediterranean. In the Hellenistic period, the intensification of trade is facilitated both by a large expanse of a common Hellenic cultural currency which is adopted by many societies from the Mediterranean to Central Asia. The annexation of the Near East by the Romans, in the 1st century BCE and until the Late Antiquity, the level of continuous trade between Arabia Felix and the Aegean is at an unprecedented level. The structures that supported the creation of long-distance trade between the two regions in the 1st millennium BCE are manifold. For instance, the development of any of these trading activities is tied to the creation and maintenance of settlements for trade and exploitation of copper and iron or extracting sap from the frankincense trees.

A thousand years after the LBA collapse, the Aegean-Arabian contacts in the eastern Mediterranean and western Asian regions are part of a highly interconnected world. At its height, the Greek and Roman trade network stretched from the northern end of the British Isles to the southern tip of the Arabian Peninsula, the Indian subcontinent and Sri Lanka (Bouzek and Deraniyagala, 1985; Casson, 1989), of glass as far as southeast Asia (Lee, 2009), as well as the distribution of Rhodian amphorae in sites on the Euphrates, the western coast of the Arabian-Persian Gulf, Oman, and Yemen (Monsieur et al., 2013).

4. 1ST MILLENNIUM BCE – ARABIA

The development of societies in the north-eastern and western Arabia is connected to population migration from the eastern Mediterranean world to the Levantine coast. The models of population migration are not clear enough yet, although some hypotheses have been put forward (see Middleton, 2020). The overall extent of the effects the Late Bronze Age crises had on Arabian societies is unclear. During the 12th century BC, Semitic languages emerge in the south of the Arabian Peninsula (Voigt, 2012), as Semitic-speaking populations resettled in the area. The arrival of new populations is attested in the Phoenician inhabited areas (Yasur-Landau, 2010). With the introduction of plants and animals such as poppies, sycamores, cumin, coriander, laurel and sow which would form the main agricultural products and foodstuff associated with this area up until this day.

During the 1st millennium BCE, the Arabian Peninsula played a vital role in connecting the Mediterranean, Central Asia and Western Asia (Hoyland, 2001). For a synthesis of the archaeology of Arabia from c. 800BC see Breton, 1999 and Hoyland, 2001). The domestication of the dromedary camel and the development in pastoralist and nomadic living is observable (Rosen and Saidel, 2010). Historical sources about Arabia dating to the end of the 1st millennium BCE (e.g.: Theophrastus, Pliny the Elder, *Periplus Mari Erythraei*), the inscriptions found during the excavation of Al-'Ula revealing a previously unknown king of Da¬dan (Al-Said, 2011), and a growing number of archaeological evidence and satellite mapping projects (Kennedy and Bishop, 2011; Breeze et al., 2015) have vastly improved our understanding of the region (al-Rashid, 2005).

The communities along the coast of the Arabian Peninsula were cut off from each other until the late 2nd millennium BCE. Following the development of irrigation technology and the domestication of the dromedary camel, Arabian societies grow and expand eventually creating social formations and an 'Arabian' cultural interlanguage – or *koine*. The social practices, the emergence of urban centres and the unprecedented connectivity across Arabia are observable in the clustering in topographical niches, the development of water management strategies and hydraulic engineering technologies that were instrumental in fostering larger settlements. Whether this

impetus stems from migrants from the Mediterranean, Mesopotamia, or from autochthones is an open question as the Arabian cultures adopted water catchment strategies from Mesopotamia, Egypt, and Greece alongside clear indigenous strategies.

Information about the 12th-8th centuries Arabia is limited (Masry, 1977) and can be summed up to an increase in sedentary societies across the peninsula in part due to the hydraulic successes, like the Marib Dam, which allowed for the irrigation of large tracts of land (Singer, 2007). The irrigation systems used wadis and dams to deliver water to cultivation zones with the use of long trenches that transport water from upland regions (Magee, 2014). At the al-Ain oasis, settlement *falaj* systems were found (al-Tikriti, 2010). The emergence of the falaj irrigation system, which taps into aquifers by building kilometres-long tunnels that transport water to low-lying arable areas is characteristic of the Iron Age II period (1000-600BC) (Magee, 2003). The Himyarite kingdom of southern Arabia had developed a similar extensive system for water storage and diversion, a *falaj* water system (Charbonnier, 2011).

Yemen was home to civilisations with ingenious hydraulic engineering. The Yemeni civilisations' (Saba, Hadramawt) agricultural terracing and the water-collecting dams, like the Marib Dam, fuelled the growth of large agricultural spaces (Ganchikov and Munavvarov 1991). The Marib Dam in Yemen (see figure 2) was erected approximately in the second half of the 10th century BCE (Garbrecht and Garbrecht, 2004, p36-40). It functioned intermittently from at least the 8th century BCE to the 6th century CE. It was repaired several times over the centuries, indicating its enormous importance for sustaining large settlements and agricultural areas. It could irrigate over 10000 ha of land (Ganchikov and Munavvarov, 1991; Francaviglia, 2000; Vogt, 2004). These structures, which retained water for the purposes of irrigation, were maintained over centuries and formed part of the cultural identity of the inhabitants (Hehmeyer, 1989). Marib on the mouth of the Wadi Abida is located in the territory of the Sabaean kingdom and dates at least as far back as the 6th century BCE.

The harsh, hot, and humid climate of the eastern region coastland, the Arabian Gulf, is balanced with an abundance of groundwater that provides cities with the means to sustain a local economy and production. Dilmun (modern Bahrain) had a thriving maritime trade due to its privileged central location and easy anchorage that linked up the Mediterranean coast, the Mesopotamian cities and the ports on the Indus Valley ("Meluha"?) (Yule, 2009), hence its importance in the trans-shipment of goods like copper. Northern Oman was a key source of metals like copper. The site of Muweilah, an Iron Age settlement, from the 10th to 7th or 6th centuries, existed for the purpose of trade. Interpreted as a large campsite, surrounded by a large fortification, it yielded several ceramic, bronze, softstone and iron artefacts indicating a local trading network (Magee et al., 2005). Benoist's research in the UAE reveals the presence of similar 'snake' cults in the area suggesting the development of a common cult or religion (Benoist, 2007; Mouton, Benoist, and Schiettecatte, 2011; Benoist and Méry, 2012). The ceramics data, the great number of dromedary bones, thenumbert of imported materials, and the settlement's geographical location indicate an important commercial role played by Muweilah (Magee, 2014) and the satellite sites like Tell Abraq (Potts, 2009) and Jebel Buhais (Magee et al., 2005). From the Gulf of Oman to the western end of the Persian Gulf, the island of Failaka off the coast of Kuwait was almost continuously occupied or in use by local rulers and Kings as well as the series of empires that stretched across Mesopotamia and large parts of Western Asia (Potts, 2009). The island itself is subject to complex sea-level variations during the Late Pleistocene and the Holocene (Arhan, Pavlopoulos, and Fouache, 2021). Several phases of occupation and trade have been recorded up until the Sassanian period in the early third century CE (Potts, 2009). The Gerrhaeans controlled for a period a trade that went through the Arabic/Persian Gulf and into Mesopotamia (Zayadine, 2007).

During the 1st millennium BC, the cities and settlements of the Arabian kingdoms can support a network of routes, well-stock oases, staging posts, and a regular supply of pack-animals (camels) (Singer, 2007). The southern Arabian states were themselves a staging point for the trade in cinnamon, pepper, Chinese silk, cardamom, turmeric, sandalwood, dragon's blood resign, aloe and hard tropical timber (Singer 2007). The Sabaeans, the Hadramites, the Himyarites, the Minaeans, and others, exploited local natural resources, developed hydraulic infrastructure, and traded overresin long distances across the Arabian Peninsula. Arabia was involved in the trade of products such as south Arabian frankincense into the Mesopotamian and Levantine markets which eventually reached the Aegean (Potts, 2009). Alexander the Great sent several expeditions to the Arabian Gulf to gain access to southern Arabia's famed wealth.

5. 1ST MILLENNIUM BCE - AEGEAN

The LBA collapse in the 12th century BC was disastrous for the eastern Mediterranean civilizations of Mycenae, Hattusha and Egypt. Bronze Age polities receded or disappeared entirely (e.g.: Ugarit), cities were abandoned permanently, and others were later reoccupied (see figure 1). The case of Ugarit is charac-

teristic of the impact of a changing socio-economic order in the LBA/EIA transition. The effects of the LBA disaster also marked the period with large migrations throughout the region. The Mycenaean world faded away over the course of a couple of centuries. The Late Bronze Age collapse was detrimental to the demographic and economic conditions of the region (Broodbank, 2013). The settlements in the centuries after the collapse, in the Early Iron Age, were much smaller, as the cemetery at Lefkandi indicates (Popham et al., 1982; Sackett and Popham, 1972). An absence of written evidence until the 8th century BCE (Sherratt and Sherratt, 1993; Sherratt, 2015). In the period following the LBA demographic and economic collapse, from the 11th to the 9th centuries BC, continuity and rupture has been widely (Dickinson, 2006).

During the Geometric and Archaic periods (9th to 6th centuries BC), aesthetic trends are attested chiefly in pottery, with preeminent geometric and *orientalising* features, with artefacts found in Cyprus and along the coast of the eastern Mediterranean. By the 8th century BC, large numbers of Greeks from the islands and the mainland migrated to South Italy initially and up the Adriatic Sea, Sicily in the West and East and to the Black Sea, founding many new cities along the coast (e.g.: Graham, 2001). During the 8th to 5th centuries, the colonisation of the Mediterranean and the Black Sea coasts by Greek settlers is at its peak. Coming at the heels of the Phoenician expansion, Greek settlers both absorbed new elements from the present culture and disseminated Hellenic cultural and artistic models throughout the Mediterranean. Cities that were peripheral to the heartland of the Greek world, were by no means peripheral to the regional economy in which they were involved. The first centuries of the 1st millennium are foundational for the subsequent Hellenization that reaches as far as Afghanistan and the Indus Valley. In the early Hellenic ventures, the settlers mostly establish themselves in uninhabited areas with good arable land. The motives for this expansion are several, but often they were prospecting missions in search for new sources of raw material to exploit. Migrations were motivated by commercial interests, the result of social or political tensions, or demographic and environmental pressures and contributed to the mobility of people in the Mediterranean during these centuries (Snodgrass, 2006). Settlements had a strong commercial outlook, such as Pithekoussai in Italy, Naukratis in Egypt, Emporion in Spain, and Dioscurias in Georgia among a great many others.

Later, the Greek city-states develop their own aesthetic styles closely connected with their fascination with their own mythology, culture and ethical values system. The iconic Greek art found on pottery, metalwork, sculpture, and architecture would become from the 5th century BC onwards a common cultural currency across the Mediterranean and the Black Sea.

The Aegean Islands and coastlines form a maritime network that stretched from the Levantine coast to the Adriatic. Tyre and Sidon, Cyprus, Crete, and Sardinia were important mercantile centres with imposing cities. The Classical period is then characterised by several power shifts between the large cities (poleis) on the Greek mainland and the Asia Minor coast. During the 5th and 4th centuries BC the Hellenic territories are embroiled in a series of alliances and wars between each other and the Persian Achaemenid Empire.

Besides trade in high-end products, for luxury and display of wealth, the procurement of basic goods for consumption bought in bulk, such as grain, to less fertile territories are a source of constant pressure for those 'trader' societies. Establishing good relations with partners, or creating *apoikies*, became a lucrative enterprise for cities such as Sparta, Corinth Athens and Miletus, and innumerable other poleis along the Aegean-Arabian space to establish these commercial assets. The eruption in the export of black and tredfired-figuregure Attic pottery all over the Greek world, from Massalia (Marseilles) to the Eastern Mediterranean and the Black Sea settlements shows that Greek pottery was a prevalent commodity. The style was imitated by local potters, using local clays and drawing from both local and original designs and art styles.

The Persian Empire controlled on its eastern end huge cities in present Afghanistan and Tajikistan where gold and silver were mined, as well as precious and semi-precious stones, as well as the highly sought blue-ness of Lapis lazuli (Casanova and Feldman, 2014; Strootman, 2013). Hellenic influence in the region of the eastern Mediterranean becomes more palpable after Alexander's conquest (334-323 BCE). After the conquests of Alexander the Great (late 4th century BCE) and his Successors (4th to 1st centuries BCE) (the Hellenistic period), Hellenic culture spread to regions as far as Central Asia, India, Sri Lanka and potentially China. This huge geographic expansion of widely recognisable cultural tropes led to degrees of Hellenization and local *customization* by subjugated and neighbouring societies.

After Alexander's death, the territories and successions were contested by Greek or Macedonian kings and satraps who divided between them the territory of the Alexandrian Empire (Mairs, 2011). The Seleukid Empire controlled a large territory means a large network of interactions linked by an itinerant court. The vast network of trade and transactions at its peak spanned from modern Pakistan to Syria and the Mediterranean coast. Babylonia was the economic and political centre of the empire, more so than the cities on the Levantine coast. Boardman (2015) and

Mairs (2014) both engage with the easternmost Hellenistic realms, the process of 'Hellenisation' in western Asia, the syncretism of art motifs and architectural styles from the Indus Valley to Samarkand (Boardman, 2015; Mairs, 2014).

Failaka island was colonized by Alexander to try and gain direct access to the source of frankincense and cinnamon. Persian Gulf trade, which during the Hellenistic times was an important shipping area, was developed by the Seleucids until the Parthians occupied it in the mid-2nd century BCE (Potts, 2009). The Seleucids and the Hellenistic world had also gained access to trade with the Indian subcontinent and even as far as Sri Lanka where several sherds dating to the Seleucid period have been found (Bouzek and Deraniyagala, 1985). The Roman adoption of Hellenic/istic artistic and aesthetic models would spread them westwards as far as Scotland, central Europe, the Iberian Peninsula, and the North African coast.

The diaspora during the Archaic and Classical periods created numerous colonies from the Black Sea to the western Mediterranean and paved the way for the dominance of Hellenistic trade. The identifiable Hellenistic exports across Western Asia are purchased in exchange for rare products from Central Asian kingdoms. The vestiges of this Hellenistic dominance are found in the world of Graeco-Buddhist art in Gandhara, Northwest India, Bactrian sites in Afghanistan and Tajikistan, Ptolemaic era architecture in Egypt such as Edfu, and Nabataean sites. The diverse and varied settlements of the Hellenic world in terms of government, economy, ingenuity, philosophy and so on, also assimilated parts of the cultures with which they were in contact in the trade quarters or in the newly established settlements. Anatolia and the Levantine coast joined up both ends from the Aegean to the Arabian hinterland.

6. TRADE AND EXCHANGE BETWEEN AEGEAN AND ARABIA

Archaeological material is the first port of call for witnessing long-distance trade. Trade relations are identified through imported materials consisting of pottery, stone, copper, tin, and other raw materials as well as consumables, such as food, drink, oils, unguents, and aromatics, whose discovery is rare due to their organic decay and their consumption (i.e.: destroyed) (Haldane, 1993). Exchanges of material products are often accompanied by cultural diffusions such as engineering or medicine, political science and military, nautical and agricultural technology, political systems, tools for transportation, and artistic influences.

By the Late Bronze Age, Egyptian products were widely distributed across the eastern Mediterranean and Western Asia. Egyptians sought out frankincense and myrrh from the South Arabian kingdoms, wood from Syria, and other products from their tributary kingdoms. But the trade in Egyptian products, one of the changes in distribution and consumption patterns after the LBA collapse across the Levant and beyond, was disrupted. The Egyptian trade network consisted of its provinces and client-states in the Levant. However, objects of Egyptian provenance are even found as far as Northern Europe. The trade in Egyptian wares did not recover during the 1st Millennium BCE, except for its brief revival during its annexation by the Persian-Achaemenid Empire (c. 550-330 BCE). This regression also represents a loss of centuries of political, cultural and economic influence in the Levant, which is supplanted by groups that imported Cypriot and Mycenaean-Type wares at sites on the Levantine coast.

The LBA eastern Mediterranean trade network, Bell (2012) suggests is an oligarchic system where private entrepreneurs and palatial rulers play important political and economic roles. The multifaceted relationship between individual merchants and the Palace is visible in Ugarit. The 'business tycoon' is revealed in the Ugaritic texts which describe the regional and long-distance mercantile transactions that passed through Ugarit. This port-city was at an intersection between overland and maritime routes and was a large international hub for trade (Bell, 2012). New mercantile city-states become the predominant force in the emergent new economic framework following the Late Bronze Age collapse. The upheavals during this period had consequences on the wider economy and network of a region. The flux of successive kingdoms, large empires, dissolution into small states and re-emergence of large territorial empires, in parallel to powerful or wealthy city-states across the region, as well as the growing constant flow of sailors and nomads crossing the deserts, or seas, form the economic and cultural tethers between cities and kingdoms. These are the structures and rhythm that mark the Aegean-Arabian axis' sphere of interaction during the 1st millennium BCE.

6.1 "Smelting and Smelling" - the products – metals and aromatics

Two products of importance to political and economic events of the 1st millennium BCE – metals and aromatics. The extraction, processing, and trade of metals (copper, tin and iron) took place in various areas of the Aegean and Arabian regions. Important mining centres are found in the Northwest region of the Arabian Peninsula (Wadi Arabah), in present-day Jordan, and in Cyprus. The impact of the increased exploitation of iron may be partially responsible for

the economic and demographic upheavals of the eastern Mediterranean in the c.12th century BCE known as the Late Bronze Age collapse. The exploitation of aromatics takes place in several areas from southern Arabia, the horn of Africa, as well as alternative products from Mesopotamia, and the Aegean. However, Frankincense only grows in southern Arabia, East Africa and parts of the Indus River region.

6.2 Metallurgical Products

Mining and smithing produce the necessary tools for the material world, including agricultural tools, arms and weapons, ornate art and jewellery, etc.The necessary ingredients (copper, iron, tin, arsenic) are geographically scattered. This metals and mineral trade relies on a supporting supply network which includes timber products, foodstuffs, textiles and leather artefacts, animals for food and labour, and of course human labour force (Bell, 2012). A cursory cost-benefit analysis of raw material mining from mineral-rich zones which are typically found in inhospitable areas underlines their great economic importance and explains the struggle for their control. Trading systems and networks can be linked with archaeometric lead isotopic analysis for the composition and provenance of metal artefacts (Gale & Gale, 1982). Wadi Arabah has been a contested area in much of its history. It was a copper mining zone during the Egyptian, Persian, Hellenistic, Roman and Islamic periods (Weisgerber, 2006). The sites of Faynan (or Feinan) and Timna are best known for their 2nd and 1st millennium mining activities (Ben-Yosef, 2010). At Timna, large slag heaps and underground mines have revealed a lot of information about the scale and extent of archaeometallurgical production at the end of the 2nd millennium BCE, when the transition of technologies from bronze and copper to iron products started taking place (Ben-Yosef et al. 2012). A large number of metallurgy-related sites in this area suggests that the metal-related market was traded over long distances and collectedino one place in order to achieve the final metal product. Levy (Levy et al., 2002) and Ben Yosef (Ben-Yosef et al., 2010; Ben-Yosef, 2010) have reassessed the archaeometallurgical significance of these sites with radiocarbon sampling and clarified the chronology of the area's activity. For instance, the exploitation of copper in the southern Levant during the Iron Age suggests that the identity of the people who exploited these mines may have been local nomad populations related to the Edomite kingdom of the 1st millennium BCE (Beherec et al., 2016).

The cultural and economic importance of the metallurgy industry is attested in textual and pictorial evidence from New Kingdom (1550 to 1069 BCE) Egypt, with 'Asiatic' copper from Cyprus (Weeks et al., 2009), the discovery of the Egyptian temple at Timna (Rothenberg, 1999), and the site of Timna during the Late Bronze Age (Weisgerber, 2006). A further site in northwest Arabia, Tayma, along with Timna, is one of the few sites studied for pre-Islamic metallurgy in the Arabian Peninsula (Liu et al., 2015). These were major copper production centres, with contacts with the Levant, Egypt, the Mesopotamian and the Aegean worlds since the Bronze Age (Liu et al., 2015; Ben-Yosef et al. 2012); throughout the Iron Age, this area in Jordan was almost continuously exploited (Ben-Yosef, 2010; Ben-Yosef et al., 2010; Ben-Yosef and Sapir-Hen, 2014). The area was occupied by various rulers, such as the Egyptians, the Babylonians and the Achaemenids, during this long period (Eichmann, Schaudig, and Hausleiter, 2006), It was still an important mining site under the Nabataean rule and the subsequent Roman annexation of the region (Al-Najem and Macdonald, 2009; Tourtet and Weigel, 2015). Additionally, during the Late Bronze Age, Cyprus was a supplier of copper to the Eastern Mediterranean empires, kingdoms and so on (Papasavvas, 2012). The site of Enkomi on the east coast of Cyprus, an important LBA settlement occupied during the entire LBA, shows that by the 13th century BCE the copper industry was at its peak (Sherratt, 2015).

Further areas that were significant suppliers of these products were northern Italy, and Cyprus, as well as some sites in Oman and Yemen (Weeks et al., 2009). The evidence for the LBA and the early 1st millennium trans-Mediterranean trade is focused on the sites discovered in Cyprus and Italy. This trade was an important factor in fostering the Mediterranean trade network in the early phase of the 1st millennium BCE.

The lead isotope analysis results from the site of Al-Midamman, on the coast of Yemen, on 15 "copper-base" artefacts, indicate that a network of communication existed that was probably centred on the southern Red Sea region and closely connected Yemen, the Horn of Africa, and the Red Sea regions (Weeks et al., 2009; De Waele and Haerinck, 2006; Fattovich, 2010). These zones, distinct from the neighbouring trading zones in Arabia and the Levant, provide us with a different perspective on the 2nd millennium trade in metals (Magee, 2014). While it is generally known that Saudi Arabia and Yemen were sources of copper, gold and silver (Weisgerber, 2006), the recently accumulating laboratory and archaeological work is beginning to represent the level of activity in the region. Comparatively, areas such as Israel, Jordan and Oman, but there is much fewer fieldwork data for places such as Egypt, Yemen and Saudi Arabia (Weeks et al., 2009).

With the introduction of iron, the trade in metals

and derivative products, and the importance of mining sites changed by the 1st millennium BCE, (Muhly, 1985; Weeks et al., 2009). Broodbank argues that the transition from the Late Bronze Age (LBA) into the Early Iron Age (EIA) is partly due to the increased mining of iron minerals, which shifted the predominance of bronze, copper and tin from sites such as Wadi Arabah and Cyprus (Broodbank, 2013). Dor, an important industrious port along the Levantine littoral provides the largest datasets for maritime and overland exchanges in the Eastern Mediterranean and constitutes a key node of the Aegean-Arabian network (Knapp, 2013). Dor became an important hub after sites such as Ugarit disappeared as a result of the LBA collapse (see Fig. 4).

Yet, copper production continues well into the Iron Age. Site 30 at Timna, identified by Rothenberg (1980) as the only Iron Age II smelting camp, is one of the largest in the area (one acre), surrounded by a stone fence. The site is dated to the 12th/11th to 9th century BCE (Ben-Yosef et al. 2012). In northern Faynan, several groups of copper forges and pit mine fields were discovered. Suggesting that these mines were part of an extensive Early Iron Age (ca. 1200-900 BCE) copper industry (Ben-Yosef, Levy, and Najjar 2009). Recent lead isotope analysis and chemical bulk analysis indicate that the copper of 11 tripod-cauldrons were likely produced in the Wadi Arabah, more precisely in Faynan (Jordan) (Kiderlen et al., 2016). These findings reinforce the existence of a well-organized Arabian - Levantine - Aegean copper trail, active between c. 950 and 750 BCE.

Iron, sourced from upland hills and mountains, bartered exchange contexts, and the 'democratizing' mineral marks the transitional period between the LBA and EIA. The new Iron technology opened up trade and gave rise to new economic realities and opportunities (Broodbank, 2013). In this economic doctrine, previously subjugated cities were able to assert a much greater, if not total, degree of autonomy from the rule of the Late Bronze Age autocracies of Egypt, Mycenae, Hattusha, and Assyria (Merrillees, 1986). This significant shift in the mining activities in the 1st millennium BCE also altered the dynamic of mining commerce. Freed to some extent from palatial control private groups were able to conduct mercantile activities through different channels.

Lastly, Hellenic and Roman sources mention the Arabian Peninsula as an important source (or an intermediator) in the gemstone trade. Although the exact match, between ancient (mostly Greek) terms mentioned in the texts and Arabic terms, is difficult to achieve, onyx, rock crystal, amethyst, garnets, emeralds and lapis lazuli are thought as traded through Arabia. Nevertheless, no archaeological evidence is thus far available in support of the textual testimonies. Yemen is specifically mentioned in classical texts for its trade in alum, salt, sulphur and 'alabaster', some deposits of which are still in use today (Magee 2014).

7. FRANKINCENSE, MYRRH, AND CINNAMON - THE AROMATICS TRADE - THE FRANKINCENSE ROAD.

Studies in the aromatics and spice trade (frankincense, myrrh, cinnamon) are limited. The 'Frankincense route', through which a variety of other products circulated from southern Arabia towards the Mediterranean world, is known through historical accounts and the associated material culture such as ceramics and glass vessels. The transhipment of spices, aromatics, and minerals from further east, such as cinnamon, pepper, and lapis lazuli, through the southern Arabian kingdoms and the Arabian Gulf, or from south Arabia on land through the western route, or through the Red Sea was one of the most lucrative trades since the Bronze Age and throughout the 1st millennium (Durand, 2009) (Fig. 4).

The polities in southern Arabia, Eritrea, and western India exported frankincense, a highly demanded good to the Mediterranean world. The "Frankincense route", or 'routes', is identified by the chain of staging posts, ports, oases, mining zones, farming zones, and cities, linking up goods and people. Principle trading goods in this area were spices, metal and pottery products, other cargo was grain, olive products and incense and myrrh (Beek, 1958).

Aromatics are expensive and highly desirable products. They were used in ritual contexts, for medical purposes, for pleasure and as personal cosmetics. They were a status symbol. The importance of ancient aromatics, unguents and perfumes are visible in the historical accounts from Greek, Egyptian and Mesopotamian societies. Frankincense and myrrh from Arabia are found in historical and artistic sources that specifically refer to these products, such as the Egyptian wall depictions at Deir-el-Bahri from the reign of Queen Hatshepsut, and the accounts of Theophrastus and Pliny, to name a few.

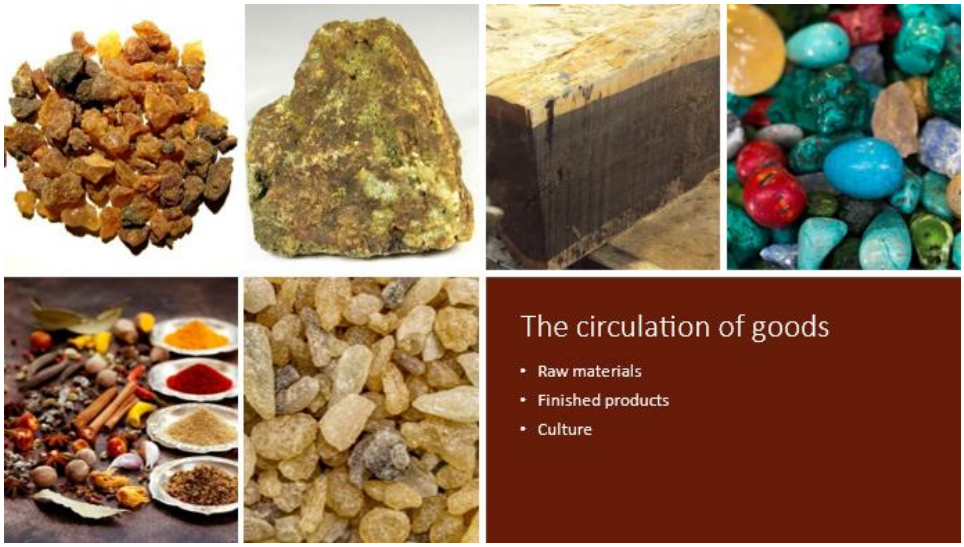

Figure 5. The circulation of goods.

The trade in aromatics in the New Kingdom Egypt, Mycenaean Greece and Mesopotamia. Residue analysis on the pots found in the Uluburun shipwreck has furthered our knowledge of the Bronze Age aromatics trade and the ingredients used to make them. The Canaanite jars from the shipwreck contained an aromatic product that residue analysis revealed to be 'résine de térébinthe' – a substance from a species of pistachio tree growing in Syria. This resin was used in a production process akin to incense (Yon and Sauvage, 2014). The Egyptian Queen Hatchepsut in 1493 BCE sent an expedition to the 'Land of Punt', between the Horn of Africa and southern Arabia. The Egyptians brought back several seeds and seedlings to plant frankincense and myrrh trees in the temple at Deir al-Bahri (Zayadine, 2007). The incident is recorded in the temple of Deir-el-Bahri, which likely failed due to the unsuitable climate of Egypt (Peacock and Williams, 2007). Frankincense from southern Arabia and India was highly prized in the Aegean societies (Guilbert and Le Maguer, 2010; Peacock, Williams, and James, 2007; Peacock and Williams, 2007; Hassell, 2002; Artzy, 1994; Beek, 1958).

The economic and cultural meaning of the aromatics and spice trade in Arabian communities must have been considerable (Singer, 2006). The dried resin/sap derives from the *Boswellia* genus trees, of the *Burseraceous* family grows almost exclusively in southern Arabia and in parts of the Indus valley. The geographical limitation of its origin, its single yearly harvest, and the difficult and dangerous route it had to take until it reached the Aegean markets, making it expensive and hard to obtain (Singer, 2006). The rarity and desirability of frankincense in the Mediterranean markets rendered it a luxurious and culturally important commodity (Peacock and Williams, 2006). As such, it was also the underlying cause of repeated conflicts between the Southern Arabian kingdoms over control of the producing groves, as well as over the routes and ports by which frankincense and myrrh would circulate.

Accounts by Theophrastus and Pliny, and in the Judaeo-Christian scriptures (Exodus 3.22-30), mention kingdoms identified as the Sabaeans, the Himyarites, the Minaeans and the Hadramites. These societies flourished in the first millennium BCE partly thanks to the incense trade (Healy, 2012). Archaeological evidence suggests that settlement intensification occurred in the area during the period 1000-600 BCE (Magee, 2014). Despite the disparate cities and groups of people on the Arabian Peninsula, the term *Arab* is dated to the 9th c. BCE, in its generic form 'Arabs'.

During the first half of the 1st millennium BCE, Assyrian Annals reported Tiglat-Pileser III (745-727 BCE) raiding a booty of 500 bags of all kinds of spice and aromatics, which presumably included frankincense (Zayadine, 2007). Another account by Herodotus says that the 'Arabs' paid a yearly tribute of 1000 talents (circa 26 tons) of aromatics to the Achaemenid King (Zayadine, 2007). Lastly, Diodorus of Sicily recounts the events of the attack of Athenaeus, an Antigonid general, in 311 BCE, when he looted a large amount of frankincense and myrrh from Petra (Zayadine, 2007). Trace residue analysis and material assemblages related to aromatic practices, such as incense burners, perfume bottles, lekythoi, alabastra and others (Brun, 2000) provide the material basis for an archaeological investigation into the ancient aromatics.

The frankincense groves were the cause for neighbouring kingdoms to compete and fight for control over them. In the 1st century BCE, the majority of the trees that produced frankincense and the entrance to the desert routes towards the North were under the control of the Hadramites. The excavations in the Hadramite site of Khor Rori ("Sumhuram") (Avanzini et al., 1999; Bukharin, Lippi, and Orazi, 2002; Darles,

2011), have uncovered a substantial coastal town, which from the 1st century BCE to the 1st century CE, was part of the trade network that connected India, Arabia and the Roman world (Avanzini and Sedov, 2005). This overland route was preferable to the maritime way from Myos Hormos to Aden, because of the dangers of sailing in the Red Sea (Bailey et al., 2007). The importance of the overland routes would gradually decline, as the development of seafaring know-how and technology allowed for more frequent sailings to and from ports.

Frankincense trees were exploited to produce the resin that would be distributed to the neighbouring states (Frangié-Joly, 2016; Beeston, 2005). Furthermore, southern Arabian states traded spices from India, such as Sri Lankan cinnamon, whose source was kept secret from the Mediterranean world. The earliest Greek mentions of myrrh, saffron and cassia/cinnamon are found in the poetry of Sappho *(Lobel-Page* 44.30) from the 7th century BCE "… μὐρρα καὶ κασία λἰβανός τ' ὀνεμείχνυτο …" (Breton, 1999, p5). At the time there was no clear differentiation between Sri Lankan cinnamon (*Ciannamomum verum*) and the cassia (*Cinnamomum cassia*) that grew in Arabia and the Levant. Residue analysis from Phoenician flasks shows that vases were used to transport cinnamon in powder or solution form (Namdar et al., 2013). Herodotus reports that Arabs traded with the Indian subcontinent. Frankincense, as well as the myrrh, cinnamon, pepper, cassia, cardamom, and nard trade are examples of the products circulating as much in the real as in the space between the Aegean and the Arabian societies (Zayadine, 2007). A form of Late Cypriot juglets, shaped as an inverted poppy seed pod, has been associated with opioids trade in the eastern Mediterranean (Merillees, 1989), but recent residue analysis demonstrates that opium traces in them are actually rare and that these jugs were rather used for aromatics (Chovanec et al., 2015). Whether the aromatics and spices formed an important part of the underlying economic structure of the Mediterranean is hard to estimate. Understanding the bulk of the commodities that the late 1st millennium BCE trade lines carried gives us a better understanding of the ancient Mediterranean and Arabian macroeconomics. The economic structure of a region relies on both the manufacture of the basic goods that are essential for human society to thrive, from the tools required to produce and store foodstuff to the clothes and structures that shelter people from the elements, as well as on the importance of imports and trade. How much weight the frankincense trade have in the actual economy of the Aegean and Arabian worlds, and who benefited?

During this period, Rhodian amphorae are traded far and wide (Monsieur et al., 2013), they are found across the Euphrates, and several examples were recovered from Mleiha (Sharjah, UAE) dating from the 250-150BCE. A few pieces have been found in Jordan as well and may have been part of the material culture that accompanied the Hellenistic trade in the area (Bader and El-Khouri, 2009).

Brun (2000) mentions that 250 ml of perfume could go for 500 wage days in Athens during the 6th century BCE. Frankincense and myrrh were only some of the ingredients in a process of pressing and *enfleurage* that used also a variety of other oils and components, extracted from olive, palm or balsam plants. The murals of Pompeii depict the production of aromatics as a visual motif related to a desirable product. In the ancient Aegean world, the use of aromatics was ubiquitous for personal cosmetics and as a significant constituent of the religious rituals described in Dynastic Egypt and Classical Greece. Despite the historical evidence for the use and the importance of aromatics in ancient societies, the process of their manufacture, their ingredients and the tools used in this process, are not well understood archaeologically. Recent studies on aromas during the Roman period on the island of Delos have put forward that the ubiquitous stone presses, usually associated with olive oil or wine production, were also part of the aromatics production process.

By the Hellenistic times, Brun (2000) believes that the production of aromatics changed from small-scale artisan production, often taking place in temples, to quasi-industrial production that required permanent installations. These installations, which leave more vivid archaeological traces, are possibly found on the island of Delos. Delos was from the Archaic times an affluent island. For a time, in the 5th century BCE, it housed the treasury of the Delian League and was a famous Panhellenic sanctuary of Apollo. By 166 BCE Delos became part of the Roman Empire; it was handed over to the Athenians as well as granted free port privileges. By the end of the 2nd century BCE, the island of Delos was a successful cosmopolitan city of merchants and artisans. The fortunes of the island of Delos oscillated by the end of the 1st millennium BCE. The sack of the island by Mithradates in 88 BCE, and its capture by Athenodoros' pirates in 69 BCE, were disastrous both on the financial and the population scale. Delos also suffered economic downturns paradoxically due to the eradication of piracy, until then significantly hampering its lucrative slave trade. Delos accounts for an important part of the aromatics trade. After Alexander's conquest, the Nabataeans established many *emporia* in the Mediterranean basin, such as those of Gaza, Tyre, Sidon, and Delos (Zayadine, 2007), most of which are dating after the annexation of the Nabataean kingdom to the Roman Empire (Brun, 2000).

8. MOVING THE PRODUCTS

Modes of transport and their infrastructure are closely related and support economic activity. For instance, the domestication of the dromedary camel connected to the mining activities of the Wadi Arabah during the 1st millennium BCE, in turn, improved the connectivity across the Arabian Peninsula. Its domestication also became a significant cultural trait for the societies of the Arabian Peninsula and Western Asia. In parallel in the eastern Mediterranean, the Phoenician and Hellenic colonisation throughout the basin, literacy and writing technology, the development of seamanship, naval infrastructures and technologies, as well as the promulgation and enforcement of maritime and merchant laws, treaties and contracts an impressionistic portrait of the eastern Mediterranean Hellenic, and then Roman, marine mercantile activities. By the end of the 1st millennium BCE, the ancient Mediterranean and Arabian worlds achieved a high level of connectivity which relied on more reliable transportation technologies.

The domestication of dromedary camels, the improvement of seafaring and maritime technologies and facilities, the construction of roads, such as the Achaemenid Royal Road built by Darius I, as well as the Roman empire's road network, in a very real sense connected camel routes to wheeled carts on paved roads, and to the deck and hold of an ancient Roman, Greek and Arabian trade ship. Ports or oases, provide merchants and travellers with safety, water, food, perhaps new camels or the opportunity to repair the sails and the hull of a ship, to re-stock on necessities that would allow for the caravan or merchant ship to continue. Oases, like ports, constitute important 'nodal points' in the trade lines. They increase the range for regular travel and, in turn, convert what were occasional expeditions to distant territories in order to collect tribute and acquire necessary materials into a regularly travelled network of stops that come to form these 'routes'. The pace and speed at which information, products and people could travel from one place to the other are one of the core principles which Braudel emphasized in *La Mediterranée* (1966; Braudel and Reynolds, 1975). The particular question of speed of communications and travel has been understood from historical texts, as well as, geographical studies (Scheidel, 2014).

9. DROMEDARY CAMELS

The widespread adoption of the camel in Arabia led to changes in peripheral pastoral adaptations in the domestication of herd animals, the adoption of herd animals by desert societies, the expansion of pastoralists deeper into desert areas, the rise of tribal organisation, exploitation of a new pack and riding animal, the integration into the rising of imperial market systems and important technological change in the Near East and Arabian Peninsula. The site of Al-Midamman demonstrates how the domestication of the dromedary camel in the 1st millennium BC would lead to greater interrelations across the peninsula (Magee, 2014; Artzy, 1994; Beech et al., 2009; Sapir-Hen and Ben-Yosen, 2013; Rosen and Saidel, 2010). The impact of this domestication on the Arabian Peninsula was very deep.

Camels were used as a beast of war in Western Asia, but they originally were pack animals. The value of the dromedary camel as a pack animal in the Arabian Peninsula cannot be stressed enough. These valuable mammals became an integral part of the cultural and economic landscape of Arabian societies (Macdonald, 2009). They served an important role in transporting the products from the copper-producing sites of the Arabah Valley (Sapir-Hen and Ben-Yosef, 2013). The exact archaeozoological moment of their domestication is, however, debated (Sapir-Hen and Ben-Yosef, 2013). The domestication of the dromedary camel takes place much later than the Bactrian camel and probably in the Arabian Peninsula (Rosen and Saidel, 2010; Sapir-Hen and Ben-Yosef, 2013). By the 1st millennium BCE, the domestication of the dromedary camel is a certainty, due to the huge increase of evidence reporting their widespread use in the Middle East (Rosen and Saidel, 2010).

The dromedary camel can be used for transport, subsistence, traction, raw material, racing, and as a symbol of wealth and status. It can provide milk (up to 6.6 kg a day during lactation), milk products, meat (c. 600kg live weight on average), camel hair/wool used in textiles, camel skins, and bones. It can walk up to 60-90 kilometres per day over a long period, and up to 160 km in 16 hours at a push, and if allowed to rest before and after. Its main advantage for desert-dwelling societies is its ability to go several days without drinking water, which is far greater mobility than equids. They allowed people to traverse previously inaccessible terrain. A dromedary camel can carry up to 150-225 kilograms over long distances, and up to 500kilograms for a short distance through in arid, desert areas with little or no road. The camel over the horse became the preferred animal. Interestingly, the camel eclipsed the use of wheeled vehicles in the ancient Near East during the Middle Ages.

There is, however, no clear morphological distinction between wild and domestic camels, and so we must rely on archaeological contexts. The two species of Camels are the Bactrian Camel (Camelus Bactrianus) and the dromedary (Camelus Dromedarius) and are likely evolved from the same ancestor *Camelus ferus*, which exists only today in Central Asia.

The dromedary is found in hot, dry climes, and the Bactrian is in colder regions, which suggests early differentiation, and domestication processes. The site of Umm an-Nar in Abu Dhabi, where 200 camel bones dating to the 3rd millennium BC are believed to be evidence of the "incipient stages of domestication", based on the culling patterns which show an emphasis on juveniles. This early exploitation of camels is restricted to the Gulf region. Later Sumerian Ugaritic texts dating to the early 2nd millennium BC also suggest significant exploitation of camels in Old Babylonian and the Persian Gulf origin. However, analysis by Uerpmann and Uerpmann ref_ from eastern Arabian samples suggests that camels were all hunted before the Iron Age, and that the process of domestication begins in the Iron Age. Early Arabian rock art depicting camels are shown in a natural state or in hunting scenes and give no indication of being domesticates. The earliest phases of domestication according to Zarins (1978) could be in c.2200BC, and incipient domestication begins 2200-1500BC, and concludes with the exploitation of camels as pack animals in later periods. This seems to be corroborated by the evidence from Israel, Tell Jemmeh at the Wadi Gaza Area which shows the earliest evidence of domestic camels in the Levant during the Late Bronze Age during the late 2nd millennium BC, which increases greatly throughout the 1st millennium BC across the Levant. The Assyrian Stronghold of Tell Jemmeh contained many bones, which Wapnish suggests means Tell Jammah was a major terminus for the Arabian Caravan Trade (1981; 1984). Camel caravans would dominate overland trade in the Levant and the Near East, and even found in significant numbers in Greece in the beginning of 20th c. (Fig.5).

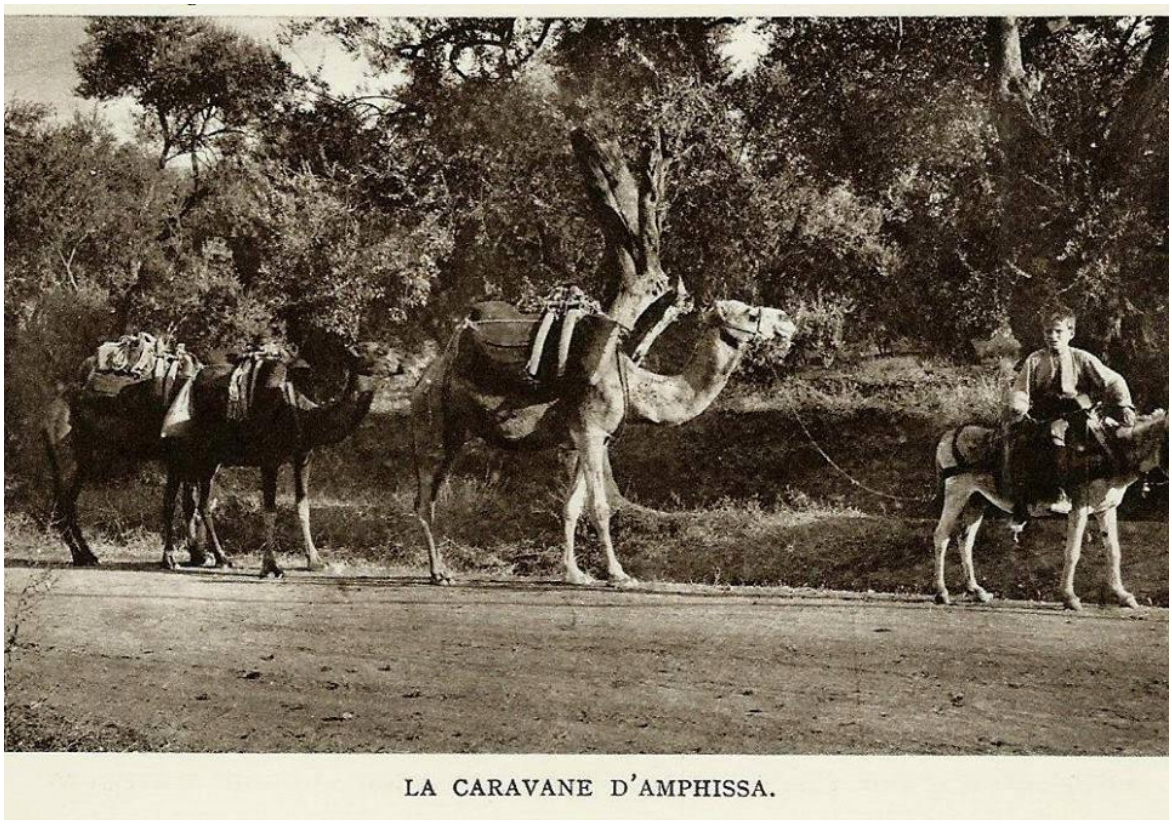

Figure 6. Postcard photograph of camel use at Amfissa in Phokis Greece (from the collection of Giannis Christopoulos, source: http://www.amfissahistory.gr/photos/displayimage.php?album=12&pid=606#top_display_media)

Thus, the domestication of the dromedary camel is a *fait accompli* in the 1st millennium BCE (Sapir-Hen and Ben-Yosef, 2013; Rosen and Saidel, 2010). It relates to the development of mining capabilities of ancient Arabian kingdoms during the Iron Age, and the growth of agricultural activity, that results in an urbanisation of the landscape (Sapir-Hen and Ben-Yosef, 2013). Although, the precise date for its domestication is still debated (Sapir-Hen and Ben-Yosef, 2013), the dromedary, a native animal to the landscape since the Holocene, lived in distinctly different ecological zones than did the domesticated cattle, goat and sheep (Magee, 2014; Rosen and Saidel, 2010).

The Bactrian camel had been domesticated long before since the geographical conditions of its natural habitat and the cultural context of its domestication were different from those of Arabia (Rosen and Saidel, 2010). Early references to camels are not always clear on whether the camels they refer to are

Bactrian or dromedary, but linguistic evidence, supported by archaeo-zoological evidence, tells us that these refer to Bactrian camels, for example, the 'Broken obelisk' has been a source of confusion for scholars for the use of dromedary camels during the Bronze Age (Finkelstein, 1988).

Furthermore, iconographic depictions may not inform us whether the camels were wild or domesticated (Sapir-Hen and Ben-Yosef, 2013). Instead, archaeo-zoological studies on frequency (Horwitz and Rosen, 2005), size change over time (Uerpmann and Uerpmann, 2002; von den Driesch and Obermaier, 2007), exploitation, mortality, sex profiles (Horwitz and Rosen, 2005) and bone lesions (Grigson, 2012) provide some answers. To this day, the accepted narrative is that the Bactrian camel had been used throughout Western Asia long before the dromedary was used as a pack animal (Potts, 2004). The dromedary was largely hunted during the Bronze Age. Its domestication and exploitation as pack animals led to increased interconnectivity between the societies of the Arabia Peninsula (Macdonald, 2009; Rosen and Saidel, 2010). The frankincense trade significantly grew during the 1st millennium BCE supported by the new means of transportation.

10. MARITIME

The maritime transportation, or shipping, of these products from South Arabia was subject to the knowledge sailors had about the wind patterns, the sea currents and the safe harbours in which they could moor their ships.

After the Late Bronze Age, the control of landowning palatial estates waned over matters of economic control. Filling this void, independent cities and ports became important hubs of economic activity. The ports along the Levantine coast, Cyprus, as well as the townships of Sardinia and those along the Adriatic became powerful agents in the exchange of goods between the Mediterranean and along the Levantine coast (Knapp 1990). The maritime network in place by the 8th century BCE is developed through entrepreneurship and their relationship with cities-states on the Levantine coast (e.g., Tyr), various parts of Cyprus, and Sicilian ports, among others (Broodbank, 2013). The shift into commercial power is in part due to the vital role hubs (i.e., ports, oases) play in the exchange of products. Furthermore, the development of seafaring technology, and the improvement of port infrastructure, greatly improved the range and amount of shipping and ports along the eastern Mediterranean which linked up with the caravan trails of the Arabian Peninsula (Wilson, 2011). The economic role of the shipping activities is comparable to the emergence of caravan trails and the oases along the deserts of Arabia and the Levant (de Maigret, 2003).

Because of the industrialisation that occurred on a global scale during the 20th century CE, Yon and Sauvage (2014) used recorded 19th-century wind patterns, which are not affected by the present climate shifts induced by human activity.

The regularity of westerlies during the summer months on the Levantine coast from May to October, and the unpredictability of sailing during the winter months meant that winter sailing was a risky thing to attempt. The study of ancient seafaring is a vast topic that, with some contention, stretches as far back in time as the Late Pleistocene-Early Neolithic (11th- 9th millennia BCE) (Laskaris et al., 2011), from obsidian transportation of Melos Island to the Greek mainland. Our understanding of ancient navigation hinges on two predominant models: cabotage (or tramping) and direct sailing (Arnaud, 2011). Both models presuppose a series of political, social and economic conditions. From the Neolithic obsidian trade, the Bronze Age palatial gift-exchange system, and the growing complexity of mercantilism during the 1st millennium BCE that developed practices in bureaucracy, legalism and dirigisme in the ancient world, the archaeology of seafaring includes the study of sailing patterns as well as of trading patterns (Arnaud 2011). Prevailing winds in the Eastern Mediterranean during the summer months could have played a factor in the rhythms and patterns of trade (Yon and Sauvage, 2014), Traders may take similar routes because of cultural habits, acquaintances and relations scattered across a given region.

The journey along the coasts of the Arabian Peninsula is described in the *Mare Periplus Erythraei,* written by an anonymous Greek speaker in the 1st century AD. It describes the lengths and conditions of trade routes along a north-south axis from Tanzania to Egypt, and East-West from Egypt, Arabia, and India, as well as uncharted lands beyond those routes. It lists important trade centres (Emporia), anchorages, and climatic factors such as the monsoon winds noting the month when one should sail from Egypt to India. The *Periplus Mare Erythraei* guides sailors through the dangerous Red Sea, reaches India, and thus ties together the Mediterranean world, the Arabian Peninsula, and the Indian subcontinent (Casson, 1989). This is the culmination of centuries of gradual Hellenic efforts leading to the formation of a 'Hellenic Silk Road'. The relationship between Arabian societies and the Graeco-Roman world is both a question of sedentary and nomad interactions in the frontier between the Levant and the Arabian Peninsula (Ephʿal, 1984). It involves caravan trails and sea routes controlled by tribes and kingdoms across the Arabian Peninsula. Largely, the Hellenic/istic trade contains less evidence than the Roman period, however, the

Roman period trade can be considered as an extension and indication of the extent of trade under Hellenistic times (Raschke, 1978; Young, 2001). The cargoes transported from the Red Sea to the Indian Ocean are provided by the *Periplus* (Schoff, 1912), proving that by the end of the first millennium BC Greek sailors had discovered the monsoon patterns between India and southern Arabia. The Roman and Greek trade with Arabia and India became increasingly important. Herodotus (4.42) records Phoenician expeditions into the Red Sea, while later Greeks and Romans took it further (Casson, 1989).

The *Periplus*, written during the reign of the Nabataean King Malichus II (40-70 CE), echoes Pytheas of Massalia's circumnavigation to the British Islands 4th c BC (Gisinger, 1963) and Plutarch's account (in *Moralia*, on the face of the Moon, Loeb Classical Library 1957, 26) of sailing up north to celebrate Saturnalia, was a guide for merchants that provided detailed accounts on sailing lines, and valuable information on local rulers and preferences in the markets along the way (Casson, 1989).

During the Augustan Age, a large increase in Roman ware and currency was found in India. At this time, the ports of Myos Hormos and Berenike would become the ports from which merchants would trade with kingdoms and ports as far as Sri Lanka, and beyond (Casson, 1989) (see figure 1).

11. THE FRONTIER ZONES

The dynamics of the use of 'foreign' elements in society are explored by Rachel Mairs (2014) for the impact and the role that Hellenism played in the Hellenistic kingdoms of Central Asia and the formation of identity in the ancient kingdoms. Furthermore, Naomi Standen (2011) has been expanding the concept of 'Frontier' zones in northwest China and exploring the dynamic between sedentary and nomadic societies. The relationship between the steppe nomads and the valley urban settlement according to Standen is not clear-cut. Standen demonstrates that cities and nomad societies functioned in a much more closely connected and symbiotic relationship than is generally believed. The symbiotic relationship that could be fostered between the two is observable in the Nabataean case too.

Bulliet's (1975) account of the dromedary camels, notes an interesting relationship between wheeled and pack animal transport. In the early first millennium BCE, the appearance of the camel altered the organization of copper production in the Aravah Valley (Sapir-Hen and Ben-Yosef, 2013; Ben-Yosef, 2010). At the sites of Timna and Faynan, remains of domesticated camels appear in the same period supporting the idea that with different new governing ideas and the improvement of smelting technology, the domestication of camels coincides with and may be the cause of major changes in logistics and production at these copper mining sites.

With the assimilation of territories in Western Asia and the eastern Mediterranean in the Islamic caliphates, and subsequently in the Ottoman Empire, Roman paved roads are abandoned and pack animals (i.e.: camels) take over the entire land transportation (Macdonald, 2009). Thus, roads and the means of transportation form part of the cultural and economic *koine* of people. Today, there is a global road network, road signs, and driving conventions which are followed by many nations. This global road network is an essential component that shapes and connects people. The cultural and economic effect of transport infrastructure is undeniable. An effective network of roads and staging posts was an incontrovertible aspect of all empires. Knowledge of passes, water holes and resting stops could spell the difference between a three-day journey to the next stop and death by dehydration in an Arabian desert. Furthermore, loading and unloading cargoes from ships to carts or pack animals necessarily creates logistical questions which may have privileged the use of certain vessels (or packaging) over others. The Uluburun LBA shipwreck (Pulak, 2001) raises the possibility that the 'oxhide' shaped ingots were most likely developed at smelting sites such as those of Timna in the Aravah valley to facilitate loading, or strapping, these ingots on the harnesses or saddles of pack animals. On the other hand, the bun-shaped ingots were designed to be transported by ship.

Bulliet (1975) Aspects of the urban planning and settlement layout are subject to environmental and cultural factors, as well as indicate the predominant transportation method. These structures and technologies of ancient transportation consist of mountain paths, camel tracks, paved roads, docks, bridges and canals that form part of a material culture relating to trade and communications and whose shift are indicators for broader cultural, social, and economic changes.

12. THE NABATAEANS

By the early 4th century BCE, the Nabataeans occupy roughly the area where the Edomite kingdom was (Wenning, 2007) and expand it considerably. By the end of the 4th century BCE, a political entity with defined boundaries centred on Petra is identified as the Nabataean Kingdom by Hieronymus of Cardia and in the Bibliotheca Historica of Diodorus Siculus (Diodorus 2.48, 19.94; Arrian 2.2527; cf. Plutarch, Alexandros 25.6; Pliny, Hist. Nat. XI.33.62; Strabo 16.4.21; partly from Wenning, 2007). They remain an independent kingdom from the 4th century BCE until the

beginning of the 2nd century CE when Emperor Trajan annexes 106CE the region into the Roman Empire and the region is renamed Provincia Arabiae (Wenning, 2007). The Nabataeans continue to operate with success in the Roman Empire and the transition to the Roman rule seems to have happened relatively smoothly. The Nabataeans are mostly known for the impressive architectural remains from sites such as Petra and Mada'in Saleh (Hegra or Al-Hijr) (Nehmé, 2013). They played a significant role as traders during the Hellenistic and Roman periods and were successful merchants (Zayadine, 2007). Militarily, Hieronymus of Cardia mentions their role as mercenaries in the conflicts between the Ptolemies and the Seleucids at the end of the 4th century BCE. Furthermore, the Nabataeans defended against the invasion attempts in 311 BCE by Antigonus Monophthalmus of the Antigonid dynasty led by Demetrius (Diodorus Siculus 19.94-97).

The Nabataeans' territory (approx. 4th BCE – 2nd CE) was wedged between the Hellenistic Seleucid Empire and Ptolemaic Egypt, which later contended with the expanding Roman Empire, and the southern Arabian Kingdoms, and the western Asian Kingdoms of Parthia. It had regular interactions with the kingdoms of the Southern Arabian Peninsula (Durand 2009) and gave rise to the "Frankincense Road". They controlled an essential juncture between societies of the Arabian Peninsula and those of the Aegean. The Nabataeans were not conquered by the Hellenes but were sometimes mercenaries or auxiliaries of the Hellenistic and Roman armies (Garbrecht, 1997). The Greek language and several customs and designs from the Hellenes are found at Nabataean sites, probably as a necessity for diplomatic and commercial relations with the neighbouring vast regions under Hellenistic rule who used the koine. This would make diplomacy, trade, political, religious and technological imports, easier with the neighbouring Hellenic rulers (Dijkstra, 1995). The Nabataeans, therefore, offer us the chance to explore themes, related to the theme of Aegean-Arabian 'contacts', such as Environment & Technology: hydrology, transport, resources; Nodal zone and transportation transfer between camel caravans, formal roads for carts, and ships; Cultural imports from Greece, Mesopotamia, and Arabia and preservation of traditional cultural and governmental systems, use of koine; Selective use of writing restricted to administrative and religious usage; nomadism, pastoralism, and urban-sedentarism

The Nabataean society emerged from a nomadic or transhuman pastoral society. In time, they maintained an interesting balance between settled farmers, travelling traders, accomplished hydraulic engineers, and nomadic origins eventually building permanent structures and monuments of water and architecture thus establishing themselves firmly in the region. Their advanced understanding of local climatic and weather patterns, coupled with ingenious hydraulic engineering enabled their civilisation to flourish (Mithen, 2010). Through hydrological ingenuity, the Nabataeans could build veritable 'Garden-cities' in the very arid region of the Transjordan.

The Nabataean network of water supply is a unique achievement in human history. The Nabataean village of Humayma (ancient Auara) had an assortment of cisterns and reservoirs, and an aqueduct (Eadie and Oleson, 1986; Oleson, 1993), much of which had been recently refurbished by the Bedouins (Bedal, 2002). The hydraulic technological feats are acknowledged by ancient historians such as Theophrastus (371–287 BCE) and Pliny the Elder (23 BCE – CE 79) who describes Petra as a veritable 'Garden-cities' (Bedal, 2004; Ramsay and Bedal, 2015). The luscious and verdant city displayed an array of exotic flora and water features. The cool and green oases, surrounded by hot, dry, and yellowish-brown landscapes would certainly have been a wondrous sight for sun-beaten and weary travellers (Mithen, 2010). The ostentatious display of large bodies of water such as the Petra pool complex (Bedal, 2004), would have surely further impressed them as a near-miraculous display of power and mastery over nature.

The village, founded around c.80 BCE by King Aretas III, was a trading post and a farming settlement. Two centuries later, when the Romans annexed Nabataea into the Roman Empire in 106 CE and integrated it into the newly formed *Provincia Arabia*, the water systems were still in place. The Romans built a fort there but made no alterations to the hydraulic systems in place (Oleson 1993), a significant observation as Roman engineering and hydraulic technology is also highly lauded. Humayma (Auara) became a fort along the *Via Nova Traiana* and remained so during the Byzantine period.

The investment and development of the trading infrastructures are visible from the series of forts found along the Petra-Gaza Road (Al-Otaibi, 2011). Gaza, as the terminus point for the Frankincense Road, was often troubled by raiders, war and hostile neighbours (Singer, 2007). The lucrative aromatics trade and the island of Delos sheds light on the social status of traders and perfumers (aromatics, perfume, incense or unguents). Delos, a significant economic hub during the Hellenistic and Roman periods, was a prominent producer of aromatics and oils (Brun, 2000). Several Nabataean coins and busts found in Delos illustrate the connection between Nabataea and Delos (Schmid, 1999). Another significant site in Palmyra, the 'caravan-city', where the 'Palmyra Tax law' specifically mentions alabaster and skin containers that transported aromatics (Matthews 1984).

The Nabataeans are known for their mercantile success, impressive and astonishing architecture, hydraulic engineering and settlement in the arid and desert-like conditions of North-western Arabia (Oleson, 2007). The creation of the Nabataean kingdom is tied to the historical trajectory of the region during the 1st millennium BCE. The Nabataeans, a nomadic society in control of the area since the 4th century BCE, controlled the flow of products (Singer, 2006). The Nabataean kingdom (4th BCE – 2nd CE) was a significant agent in the transport of products from the Arabian Peninsula to the Mediterranean and the Aegean Sea, in this case, frankincense and myrrh from southern Arabia (Zayadine, 2007). Their culture represents historical structures and realities traceable to the Bronze Age. The case of the Nabataeans represents the achievements of a particular group of farmers and pastoralists with nomadic lifeways that settled in north-western Arabia who built cities and the outcome of centuries of development. Finally, transport technologies, the camel and the wheeled cart is a dynamic structure whose use in the area oscillates for centuries (Rosen and Saidel, 2010).

13. DISCUSSION

Structures are flexible and absolved of presupposed evolutionary trajectories. The non-linear evolutionary model does not by default lead to a more balanced appraisal of historical societies.

The overview is not intended as a total anthology of all the societies, materials, trade, sites, excavations and possible contacts in this large area of study during the 1st millennium BCE.

The groups that harvest and exploit dry and unwelcoming landscapes are indicative of the level of social complexity that made these settlements possible to begin with (Cleuziou, 2009), and persistent climatic and environmental factors. This overview presents a cultural route where human-environmental complex interactions determine the cause and effect observed from the archaeological remains and historical accounts. Identifying the occurrence of cultural evolution is a complex problem whose initial conditions and limitations are often unknown and material evidence can reflect the dynamic interaction. Thus, the Greek-Arabian contacts have been developed from the interaction of settlements with social structure and hierarchy, environmental impacts and self-organisation where social responses are transformed into new motives that seek to bring a system into equilibrium despite the pressures of constant change.

A discussion of this proportion is unwieldy. Abstractly linking geographically and culturally distant communities requires the definition of specific points of evidence. The finer points of seamanship, urban planning, hydraulic engineering, and nomadism are broad-stroked. Yet, these phenomena brought distant societies into contact; and other societies seem to develop in parallel (Liritzis and Westra, 2022).

14. CONCLUSION

This article outlines the basic interactions of societies on the Aegean-Arabian axis. The Late Bronze Age international trade and the disintegration of the economic activity, known as the LBA Collapse, nonetheless shows how large and long-distance travel of particular products took place. Contacts were rendered possible with technological and cultural developments. The disparate societies of the Arabian Peninsula owed to the domestication of the dromedary camel and the emergence of the political and cultural *koine* of the Arabian Peninsula. The domestication of the dromedary was a zoological, cultural development, and a technological advancement. The Mediterranean desire for aromatic and medicinal products, unguents, incense, myrrh, pepper, and so on, fostered trade relations between Aegean and Arabian societies. The control of the frankincense tree was a matter of constant rivalry between the kingdoms of South Arabia. By the end of the millennium, the Aksumite kingdom would take over large part of the southern Arabian Peninsula. In sum, engaging with the archaeological and historical narrative in this way allows for history to be studied under a different framework. Without presuming either the inevitability of any of the course of actions that took place and the ever-influential role of environmental and climatic conditions, the connections between social groups can slowly be pieced together.

AUTHOR CONTRIBUTIONS

Conceptualization, I.L; methodology, I.L., A.W.; software, I.L., A.W.; validation, A.W., I.L., C.M.; formal analysis, A.W., I.L.; investigation, I.L., A.W.; resources, A.W., I.L., C.M.; data curation, A.W., I.L.; writing—original draft preparation, A.W., I.L.; writing—review and editing, A.W., I.L., C.M.; visualization, C.M., I.L., A.W.; supervision, I.L., C.M.; project administration, I.L., A.W.; All authors have read and agreed to the published version of the manuscript.

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