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CHAPTER FOUR

GEOGRAPHY MATTERS

Defining Maritime Small Worlds of the Aegean Bronze Age

Thomas F. Tartaron

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INTRODUCTION

Archaeologists of the ancient Mediterranean concerned with maritime interactions of all kinds have been encouraged in recent years to explore networks from both qualitative and quantitative perspectives. In this article I wish to assess the appropriateness of recent social network analysis (SNA) language and models for capturing maritime networks of the Greek (Aegean) Bronze Age, *c.* 3100–1050 BC, in their entirety; that is, at all scales and embracing as many actors as possible. The main point I wish to make is that the realities of the Bronze Age placed constraints on communication that are not relevant to the traditional concerns and subjects of SNA as they emerged from sociology (or of network theory in physics). Indeed, these studies demonstrate that the formation and intensity of modern social networks are often not driven or constrained by physical proximity. I contend that for the vast majority of Bronze Age coastal dwellers, distance was a decisive factor in the maritime networks in which they participated, which were as much social as economic. Thus terminology and models drawn from SNA may not fit particularly well with the conditions of prehistory. This is especially the case for *local-scale* maritime networks, which have also received insufficient attention from archaeologists. I summarize a multi-scalar, diachronic model of Bronze Age maritime networks that is based on nested geographical scales, from local to international. This model emphasizes local and microregional scales, but also reveals how the

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interplay of interactions and events at larger scales shapes life locally. Further, the model is a qualitative one not born of any explicit engagement with SNA, but should be amenable to modification and development as SNA becomes a more useful tool in archaeology.

GEOGRAPHY, DISTANCE, AND THE BRONZE AGE

Carl Knappett (2013, 7–10) and others have pointed out that current network theory is in some ways a poor fit for networks of the ancient past. Network analysis in the field of sociology treats location and distance as metaphorical rather than literal; networks transcend real-world geography. In our era, one can form a network remotely without physical contact, and an acquaintance 2,000 miles away can be closer in network terms than a neighbor down the street. Obviously, technology has made this possible. Technology obliterates geographical distance and very nearly time. It is now an ordinary experience for me to stand in a cotton field in rural northern Greece and speak on the phone with my wife in Philadelphia, often with a better connection than we get locally at home. Distance and geography did matter for premodern sea travel, however, unlike the World Wide Web, the organization of air traffic, or other models that network theory typically invokes.

The factors that facilitated or hindered maritime travel in the Aegean Bronze Age were both environmental and social, including distance, weather conditions, navigational hazards, boat technology, skill in navigation, and esoteric knowledge of distant people and places. The capabilities of Bronze Age boats—seaworthiness, propulsion—and prevailing navigational skills placed practical limits not only on the range and frequency of long voyages, but also on the group of specialized sailors capable of mounting them. These factors, some quasi-quantifiable and some not, have not yet been captured well in SNA or other network approaches. For example, the sea is typically represented as a flat, untextured plain that takes no account of winds, currents, hazards, or stochastic events such as the rapid-onset storms characteristic of the Aegean Sea. Daily distance ranges are mentioned for specific boats, such as forty kilometers per day for a paddled Early Bronze Age Cycladic longboat (Broodbank 2000, 287–289) or 100 kilometers per day for a Bronze Age sailing ship (Knappett et al. 2008, 1014), but they typically do not incorporate specific sea characteristics. A few attempts have been made to arrive at more realistic maritime travel times and parameters—notably in dissertations by David Conlin (1999) and, within a more explicit network analysis framework, by Justin Leidwanger (2011). Leidwanger's research assembles wind and current data for much of the Mediterranean and shows how a voyage out can be very different from the voyage back. The need for this kind of refinement was made abundantly clear in experiments in the Aegean with a reconstructed "prehistoric" reed canoe

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(Tzalas 1995). The voyage in early October from Lavrion to Melos (about 120 kilometers as the crow flies) encountered unseasonable but hardly extraordinary rough weather, with heavy rain, high winds, and choppy waves. The trip required seven days of paddling, but also eight days spent at anchor at Seriphos island, during which time winds of 7–8 Beaufort made conditions too dangerous on the water. The return voyage was not made, but it would have faced headwinds and opposing currents. Thus a voyage calculated to take six days based on a daily range estimate for canoes of twenty kilometers (Broodbank 2000, Table 3) took fifteen, and the round trip could easily have taken a month or more. A rowed galley or a sailing ship may have cut this time considerably, but all Bronze Age journeys were prone to delays and dangers imposed by environmental conditions.

SCALAR ISSUES IN LATE BRONZE AGE MARITIME NETWORKS

I was motivated to write a book about Late Bronze Age Aegean (i.e., Mycenaean, *c.*1500–1050 BC) maritime networks by more than twenty years of coastal archaeology in Greece, during which time I observed some disturbing gaps in research that made it difficult to reconcile the local archaeological record with the prevailing discourse on maritime networks (Tartaron 2013). Specifically, I perceived: (1) a lack of interest in, and serious analysis of, local-scale social and economic networks; (2) virtually no knowledge about where Mycenaean harbors actually were, or about the communities that inhabited them; and (3) little account taken of coastal change or paleocoastal reconstruction when discussing networks or network nodes.

The Mycenaeans were contemporaries of the Hittite New Kingdom, the Egyptian New Kingdom, and the Canaanite cities of the Levant. It is often assumed that the Mycenaean Greeks were great seafarers, interpreting optimistically the empirical evidence of the thousands of Mycenaean artifacts found at coastal sites throughout the eastern and central Mediterranean, from Egypt and the Levant to Italy and Sicily (Figure 4.1). There are also a few iconographic representations of ships in the Aegean. The most famous of these is the so-called Flotilla Fresco, preserved by the volcanic eruption on the island of Thera in the late 17th or 16th century BC (Morgan 1988; Warren 1979). Although not a Mycenaean site or a Mycenaean iconographic tradition, the interest for us is that apart from large, festooned ships in ceremonial procession, there are also a number of small boats: three canoe-like craft pulled up onto a sandy beach, two larger boats lying at anchor in a larger harbor, and another small boat rowing out to meet the fleet. This is virtually the only record we have of such small, local craft in the Greek Bronze Age. Representations of boats found on fresco fragments from Pylos (Brecoulaki et al. 2015) and Iklaina (Cosmopoulos 2011) in Messenia reflect a Minoan iconographic tradition, with differences

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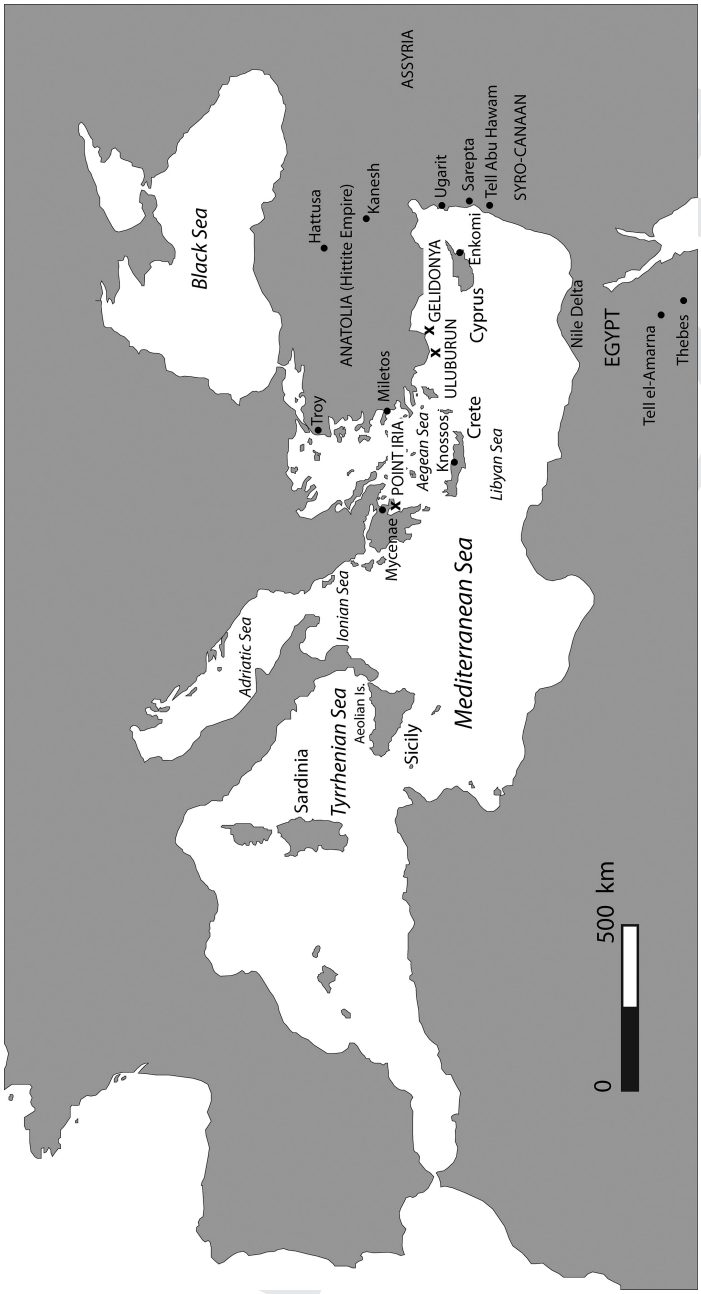

4.1. Map of the Mediterranean (top) and Aegean Sea region (bottom), with important sites mentioned in the text.

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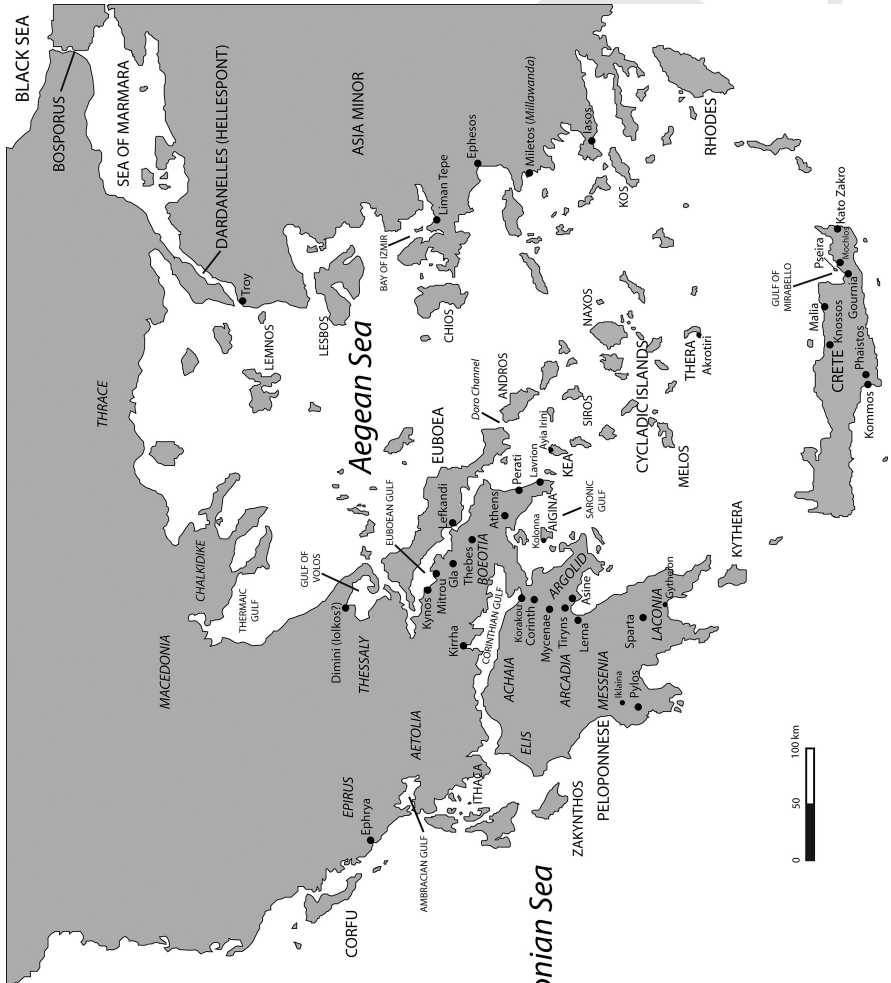

4.1. (cont.)

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that may indicate changing boatbuilding practices or simply interpretation by Mycenaean artists. Finally, the Linear B administrative tablets from the handful of Mycenaean palaces mention nothing directly about trade at any scale, or about interactions abroad, which can only be inferred from circumstantial internal evidence, such as mentions of Cypriot products and people, or slave women from Asia Minor at Pylos. Some Hittite tablets concern the Ahhiyawa, probably Mycenaean Greeks who colonized Miletus and plied the seas perhaps as far as northern Syria (Cline 1991). In the end, however, there are no actual ship remains from a Mycenaean vessel; the famous Late Bronze Age wrecks at Cape Gelidonya and Uluburun are almost certainly Levantine in origin (Pulak 1998), and we do not know if the distribution of Mycenaean artifacts means that they actually traveled to all those places, for example voyaging all the way to Egypt rather than doing business through Cypriot or Levantine middlemen.

All of these vestiges of cross-cultural maritime interaction, and the interpretive problems they present, are well documented. What has been missing is any systematic consideration of maritime networks at the local scale. The missing local scale exposes a serious imbalance, since I feel confident in asserting that in the Late Bronze Age, the vast majority of coastal dwellers rarely, if ever, ventured more than a few tens of kilometers from their communities. Long-distance travel would have been rare by contrast, dwarfed by the density of nodes and connections active at the local scale. These local networks composed vibrant worlds buzzing with activity and connectivity. The lifeline for these communities lay in small-scale networks for subsistence and trade, intermarriage and other social ties. Because of these strong ties, local networks are hypothetically more stable and enduring than very large maritime structures, such as empires and thalassocracies, which tend to be artificially configured and susceptible to rupture with changing political fortunes. By contrast, local networks are easier to maintain from a practical point of view, since distances and environmental obstacles are less inhibitive, and they are often founded on long-established and deeply embedded social ties. On this point it is possible to speak of a locally embedded economy in which economic and social transactions are closely intertwined. It is no surprise that these links can persist even during periods of external domination, and revert to familiar patterns once released from external control (see case studies in Horden and Purcell 2000; Kramer 2016). It is at the local scale that we must look for the true fabric of Mycenaean life, and in view of the coastal topography of the Aegean, with its extraordinarily long coastline and innumerable islands, we particularly need a better understanding of maritime connectivity at this scale. A worthy objective is to write diachronic maritime histories in which the local context is central, while larger political entities with their larger-scale maritime networks move into and out of the picture. Accordingly, my aim was to create and

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systematize a set of concepts to theorize these networks and methods to recover them archaeologically.

A MULTI-SCALAR FRAMEWORK

The multi-scalar framework I propose shifts emphasis to the local and micro-regional scale of "definite places" (Horden and Purcell 2000), which I call "Mycenaean coastal worlds." I begin with the discovery and investigation of coastal archaeological sites, draw partly upon network theory to model webs of maritime interaction at multiple scales, and seek textual and ethnographic evidence to shed light on the people and their lives. Because the data are so fragmentary, it is an exercise not so much in network analysis as in network reconstruction or "synthesis" (Sindbæk 2013). The outlines of the problem can be seen as methodological—how can we use archaeology, geomorphology, and other research tools to reconstruct parts and characteristics of networks?—and conceptual—how were networks configured and how did they work?

Methodological Problem: Where Were the Mycenaean Anchorages and Harbors?

We have little secure knowledge about where the Mycenaean harbors and other landing sites were, partly due to lack of attention to the local scale. Equally important, however, is that the harbors of the Mycenaean period have been rendered virtually invisible on the Greek coastal landscape of today, erased by millennia of geomorphological change and doomed to obscurity by the practices of the Mycenaeans themselves. There is little evidence that the Mycenaeans built durable harbor infrastructure, like quays, jetties, or breakwaters, which seem to be a post-Bronze Age phenomenon in the Aegean. Instead, like the Homeric heroes of the *Odyssey*, they relied on natural anchorages where smallish boats with minimal draft could be pulled up onto sandy shores, or anchored or moored just offshore in locations protected naturally from winds and waves. Many would have been used only episodically or opportunistically as safe havens, leaving few or no material traces. Altogether, these places have very low archaeological visibility.

This problem is exacerbated by long-term coastal change. Coastal zones are among the most dynamic settings on Earth, constantly reworked by long-term, natural processes of erosion, deposition, and tectonics. Over time, coastal features change, appear, and disappear, and these changes can affect the relationship of humans to the sea in profound ways. Although global sea level change since the Bronze Age has not been a major factor in the Aegean, progradational (advancing seaward) or recessive (eroding landward) shorelines can alter coastal configuration dramatically. A prominent example is the massive sedimentation of the great rivers of the Aegean's eastern coast, silting

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in the once great natural harbors at Troy, Ephesus, and Miletus. The processes of plate tectonics are even more insidious because their effects can be so variable and localized. The Aegean sits directly over a subduction zone where the African tectonic plate is moving northward and grinding underneath the Eurasian plate. This results in volcanoes, frequent earthquakes, mountain building, and a complex set of faults underlying the Greek landmass and seabed, creating variable tectonic effects on regional and local scales. A good example at the regional scale is the Corinthia, which is generally tilting downward from west to east: the Corinthian Gulf coast being uplifted while the Saronic Gulf coast is subsiding. Hence, in antiquity the Corinthian Gulf port of Lechaion was apparently put out of commission by co-seismic uplift, while the Saronic port at Kenchreai subsided in a series of earthquakes and was submerged (Noller et al. 1997; Wells 2001). But tectonic effects are also quite localized, because coastal configuration is often controlled by local fault systems. As a result, regional or pan-Mediterranean models of coastal evolution may be invalid for any particular local setting, and experience has shown that locations even a few kilometers apart may have different tectonic histories (Nixon, Reinhardt, and Rothaus 2009).

In the search for potential Mycenaean harbors, there is no getting around a proper geomorphological analysis, which would include some or all of the following (Marriner and Morhange 2007): examination of coastal landforms for features like fossil barrier reefs, lakes, lagoons, sandy coastal plains, dunes, or tombolos; geophysical survey to profile the marine basin and detect anomalies potentially associated with harbor activity; underwater dive surveys to investigate anomalies and discover submerged features; and programs of coring for samples of sediment across modern wetlands or alluvial plains. These cores contain microfauna that are sensitive to salinity and temperature, allowing experts to track changing coastal environments, such as marine embayment, lagoon, marsh, or freshwater lake. Sediment grain size and sorting can also give clues to the depositional environment and can indicate human interference in the form of artificial harbor works. Organic material suitable for radiocarbon dating is usually present, from which chronologies for the changes seen in sediment and microfaunal species can be derived.

These studies should be closely co-ordinated with archaeological survey and excavation. Survey offers the opportunity to explore coastlines on a large scale, and may lead to the discovery of coastal sites and activity areas to populate coastal worlds. Modern and known historical harbors can be investigated for their histories, and settings of certain kinds, such as natural embayments, deltas, and coastal wetlands, should be targeted.

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Conceptual Problem: Building Networks

The process of finding evidence for coastal activity and working back to paleocoastal environments is only the first step in reconstructing maritime networks for the Mycenaean period. SNA can provide useful tools for building network models, but as Knappett (2013, 7–8) has pointed out, social network models originated in conditions where all of the actors were known and the problem was simply to analyze nodes and links that could be recovered empirically, and, by representing them in mathematical or graphical form, to come to a better understanding of the structure and operation of the networks. The problem for archaeology, of course, is that the actors are long dead and the material evidence that we use as proxy for their interactions is fragmentary even in the best scenarios, and can be highly ambiguous since their specific actions, motivations, and intentions are mostly lost to us.

Modeling maritime networks for prehistoric periods, in the absence or virtual absence of texts, is especially challenging. Nonetheless, the attempts by Broodbank (2000) and Knappett and colleagues (Knappett, Evans, and Rivers 2008; 2011) to do just that for the Bronze Age Aegean have been significant advances in network modeling. Broodbank's pioneering network model applied a simple proximal-point analysis (PPA) to simulate interaction networks in the Early Bronze Age (EBA) Cycladic islands given certain assumptions about the number and location of interacting nodes (in this case, settlements) and certain rules about how they connect. PPA predicts patterns of connections between points distributed in space, conventionally by connecting each point with the three closest to it. The webs formed by these connections generate network clusters, as some points accumulate more links by virtue of their proximity to a larger number of other points. The denser clusters hypothetically mark out interaction "centers" where communication ought to flow most easily. Broodbank addressed the problem of fragmentary site date by placing known sites on the map and then adding points to simulate the growth of population over time. He created four different network models (PPA 1–4) by adding a point for every 150, 100, 75, and 50 square kilometers, and matched the results with the apparent settlement patterns of the Neolithic to EBA Cyclades. The limitations of this PPA were recognized by Broodbank and have been well characterized elsewhere (e.g., Knappett, Evans, and Rivers 2008; 2011). In the model, communities form links with their nearest neighbors because longer voyages are risky and time-consuming with the available propulsion technologies of paddling and rowing. Thus geographic proximity is the structuring principle of network formation. Sites are taken to be of roughly equal size and distributed evenly in space among the islands. The links between them are similarly undifferentiated and non-preferential: one node can connect with any other directly or through a series of short hops.

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Sea travel is uniform in all directions. While this set of rules and assumptions obviously oversimplifies and distorts the reality of these networks, Broodbank's PPA was successful because it was designed for the limited geographical world of the Cyclades at a time when boats were propelled by human power alone. Although the fit between the model and the archaeological record is not perfect, Broodbank's analysis did demonstrate that location and network centrality can be closely correlated under conditions of relatively limited mobility. PPA is unlikely, however, to simulate well eras with large travel ranges, or to translate easily to greater geographical scales.

Knappett, Evans, and Rivers (2008) sought to devise a more sophisticated network model with wider geographic and historical applicability. Their model of "imperfect optimization" uses a complex mathematical equation to express the notion that participants in a network tend to strike a reasonable, though never perfectly optimal, balance between the costs and benefits of maintaining maritime connections. To assess the likelihood of connection between two sites, or the connective potential of any single site in a network, each site is coded with several variables, including an estimate of importance based on site size, population, and available resources. These values lead to a set of equations to calculate in quantitative terms the energy balance between the costs of supporting the local population versus maintaining distant links, and the benefits of exploiting local resources versus acquiring distant resources. The connectivity between any two sites is measured by the energy required to maintain contacts, derived as a combination of the physical distance between them and the fraction of effort each devotes to the interaction. To each variable a constant can be attached to assign its relative weight in decisions about connectivity; these constants can be varied to test the implications of different strategies. This "imperfect optimization" is more flexible because it incorporates more of the variables that influence connectivity and allows the weight of each variable to be modified, either experimentally or to reflect current understandings of the archaeological record. Thus the model admirably serves as a tool to explore alternative interpretations of the archaeological data.

Some aspects of the model articulate powerfully with emerging concepts in network theory. A central assumption is the network centrality of large sites, like Knossos, which are better connected than smaller sites and attract new connections preferentially because of their greater ability to acquire and control the resources needed to sustain and benefit from overseas contacts. Network theorists Albert-László Barabási and Réka Albert (1999) describe two common properties of networks: continuous growth by the addition of new nodes, and preferential attachment by which new nodes attach disproportionately to sites that are already well connected. A node that acquires more connections than others will accumulate them at an increasing rate, causing the difference in connectivity between the two to multiply as the network grows (Barabási and

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Albert 1999, 511). Further, large communities tend to target each other, creating longer-distance connections and network hierarchies. This "gravitational pull" can aid in linking distant settlements and holding large-scale networks together. The constant addition of new nodes and the creation of shortcuts between well-connected nodes links local clusters into "small worlds" (Watts and Strogatz 1998) and further into large-scale networks in which powerful centers can connect directly over long distances; and certain sites such as emporia that are well positioned in network terms may attract links from the entire sailing universe. These dynamics may help explain the meteoric emergence of Mycenae as a central place during the Shaft Grave era, or the rise of Knossos to an unparalleled position on Crete. (It would also be interesting to synthesize the enormous network connectivity of a true emporium, such as Bronze Age Ugarit in northern Syria.) With advances in seafaring technology and the emergence of large centers in Protopalatial Crete, conditions were set for Aegean-scale networks to grow, requiring a model of greater scope and variability than Broodbank's PPA. Knappett and colleagues applied the model of "imperfect optimization" to the Middle Bronze Age (MBA) Aegean by adjusting the constants to simulate an incremental increase in the benefits of trade (Knappett, Evans, and Rivers 2008, 1015–1016, Figure 4). At each increment, the links between geographically distant areas of the Aegean—the mainland, Cycladic islands, Crete, the Dodecanese and Asia Minor—strengthened, and particularly well-positioned sites such as Akrotiri on Thera became crucial "intermediate" nodes in holding the larger network together, in spite of their modest size. Removing these nodes, as when Thera was destroyed in a volcanic cataclysm in the middle of the 2nd millennium BC, can (and did) cause major disruptions in the broader network (Knappett, Evans, and Rivers 2011).

Knappett's model of "imperfect optimization" can be manipulated to simulate admirably enough the kinds of network that plausibly existed in the MBA Aegean, but it carries its own assumptions and simplifications. Most problematic is the challenge of quantifying human behavior and representing it by means of mathematical formulas and graphical output, in view of the fragmentary archaeological record and our limited knowledge of human motivations and actions in the distant past. The model accommodates flexibility in its mathematical variables and constants, but what is the procedure for establishing numerical values for abstract concepts? For example, what is the basis for quantifying the "fraction of effort" that one site puts into its relationship with another? The values of the constants and variables can be changed to simulate different allocations of resources, but is this based on a clear rationale grounded in behavior or are they merely being tweaked until they seem to fit a known historical scenario? If the mathematical outcome of a test run looks rather like what we see in the archaeological record, does that mean that we have

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explained something about the past? In other words, can we validate the choices we make in each step of model building, or does it begin to look like a house of cards, piling assumption on assumption?

Ambiguities arise and confidence varies as an inescapable result of the fragmentary nature of the archaeological record. One need only read the "technical appendix" (Knappett, Evans, and Rivers 2011, 1022–1023) to appreciate the difficult range of variables for which values must be derived to run the "imperfect optimization" model: population size and density, site size, carrying capacity, "costs" and "benefits," etc. Often these are simply not available for most settlements in a region under study, at least not without wide margins of error. The problem is acute for Mycenaean archaeology, because the settlement and cemetery data tend to be inferior to those available for the Cyclades and Crete, the areas analyzed by Broodbank and Knappett. Even geographic distance by sea, fundamental to the calculation and among the more quantifiable variables, uses normative figures for daily travel ranges and features an untextured sea. In the absence of reliable quantitative data for these and other categories, calculations of site importance or cost–benefit for local and long-distance interaction are open to challenge. The double quandary of acquiring robust numerical values for structural features and then translating them through mathematical equations into social behavior has led many historians and archaeologists to adopt a cautious attitude (e.g., Malkin, Constantakopoulou, and Panagopoulou 2007, 6). It is not only refining the models that we use, but also addressing critically the quality of our empirical data, that must draw our attention. Concerted effort on both fronts will help to move network analysis into the mainstream of archaeological practice.

A MULTI-SCALAR NETWORK MODEL

The network model I devised to address Mycenaean maritime networks is multi-scalar and qualitative. I envisioned networks forming at multiple, nested geographical scales from local to international. Although it is possible heuristically to consider each scale independently, it is crucial to bear in mind the following characteristics: (1) the boundaries are fuzzy, never hard and fast; (2) the shapes and frontiers of the scales are not static, but dynamic, susceptible to change over time; (3) the larger scales intrude upon the smaller, not only as long-distance travelers penetrate local worlds, but also because life at the local and microregional scales responds to, and often is transformed by, events and currents unfolding at larger geographical scales. This dynamism, and the inseparability of local history from larger processes, are well documented in Broodbank's Cycladic island networks, and by the many case studies in Horden and Purcell's *A Corrupting Sea* (2000). The nested geographical scales, from small to large, are the *coastscape*, the *maritime small world*, the *regional/intra-cultural*

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maritime interaction sphere, and the *interregional/inter-cultural maritime interaction sphere* (Figure 4.2). These are summarized briefly here; for detailed discussion, see Tartaron 2013, 188–203.

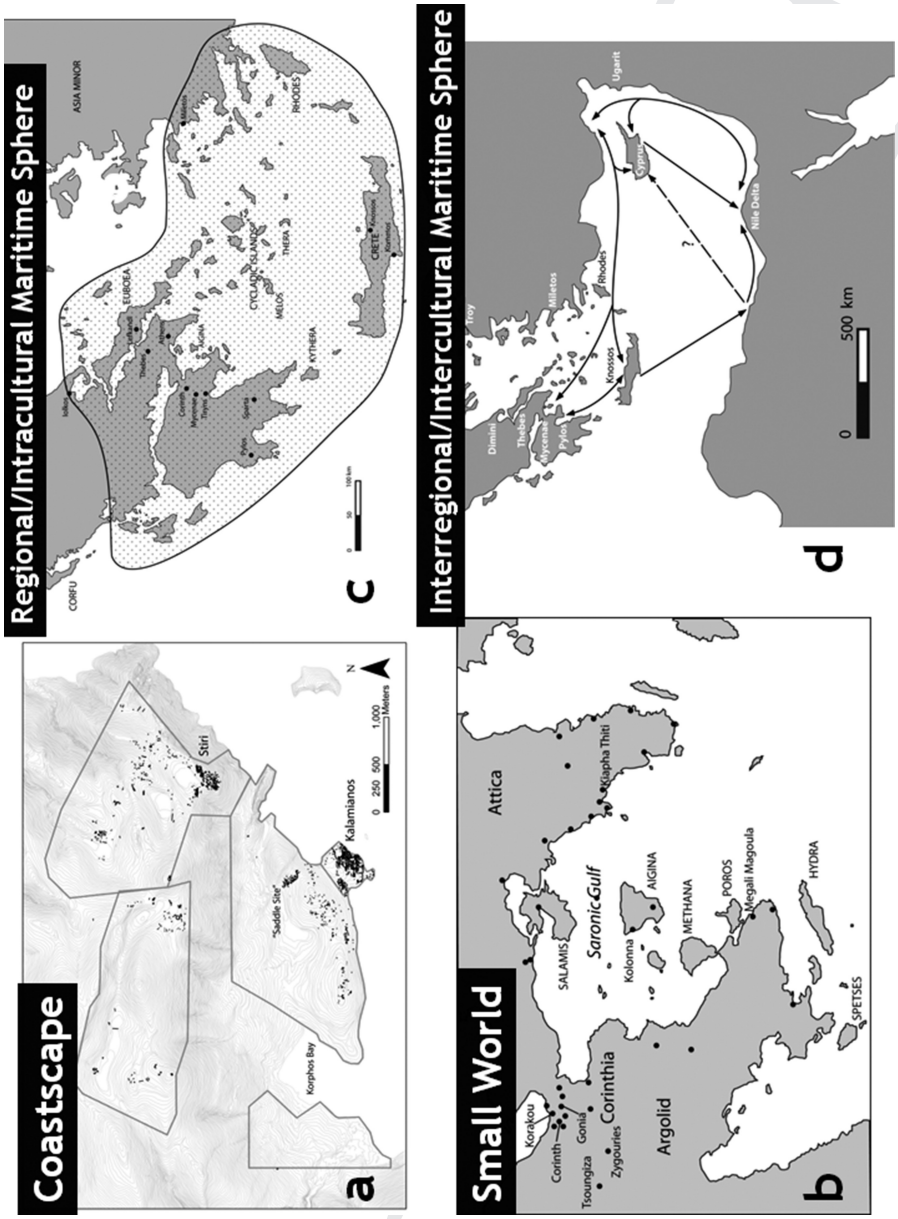
Coastscape

The local scale is represented by the coastscape, the coastal zone defined by habitation, interaction, practice, and perception (Figure 4.2a). The coastscape is both *liminal* and *central*. Where land meets sea, coastal dwellers occupy a liminal transition between contrasting ecological zones and their productive resources. But it is also central and connective, the meeting place for land and sea dwellers. The coastscape includes the following components: (1) the shoreline, the settlement, and the adjacent coastal lowland inhabited and exploited by a maritime community; (2) the connective routes and openings into the interior, following natural paths connecting coast and hinterland—the landward limit is often defined by ridges or mountains, but can also be a cultural barrier; (3) the inshore waters utilized on a daily basis for economic and social purposes; and (4) the visual seascape, the everyday field of view that defines the cognitive horizon in the seaward direction. Ideally, coastscapes are defined by a combination of topography, archaeological survey, and phenomenology of place.

Maritime Small World

Maritime small worlds are microregional interaction spheres that form as aggregates of many neighboring coastscapes (Figure 4.2b). They are constituted by habitual face-to-face interaction and cohesion based on shared origin, cultural traditions, language, economic ties, social networks, mutual protection arrangements, and so forth. The relationships among these communities may be hierarchical, orbiting around a powerful polity, but will often be nonhierarchical or heterarchical. Proximity, intervisibility, and ease of travel enhance the cohesion of small worlds. The small world is the scale that dominates maritime interaction. The Saronic Gulf, as described below, is an ideal Bronze Age maritime small world of intensely interacting coastscapes orbiting around Kolonna on the island of Aigina. But if we trace the long-term history of this small world, we see it oscillating between cohesion and fragmentation, affected by internal as well as external forces.

The term "small world" is now used regularly to describe networks of interaction, but it currently indicates two distinct and contradictory streams of meaning, so there is a need to clarify what it means and why. In social network theory, small worlds address not geographic distance, but "interaction distance," measured by the ease and frequency of interactions.



4.2. Maps representing four nested geographical scales of maritime networks in the Aegean and eastern Mediterranean.

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Small worlds form when the addition of a few key nodes links smaller networks and causes them to grow into larger networks, thus decreasing the barriers to interaction among nodes that were previously "distant" in interaction terms. As the number of intermediate nodes it takes to link two nodes together decreases, interaction distance decreases, creating well-connected "small worlds" that may be spatially expansive. Some archaeologists have followed this notion to construct small worlds of impressive geographic size. In Andrew and Susan Sherratt's article entitled "Small worlds: interaction and identity in the ancient Mediterranean" (Sherratt and Sherratt 1998), the term "small worlds" does not appear in the article itself, but the authors are clearly concerned with long-distance trade networks stretching across the entire Mediterranean. Similarly, in a recent book, Irad Malkin (2011, 5) envisions Greek colonization of the 8th to 6th centuries BC as "turning the vast Mediterranean and the Black Sea into a 'small world'."

On the other hand, "small worlds" grounded in real-world geography and a more literal interpretation of "small" are also established in Aegean Bronze Age archaeology. Cyprian Broodbank (2000) used the term to describe closely spaced, intensely interacting island communities in the Early Bronze Age Cyclades. The fact that he also referred to them as "local worlds" and "local interaction networks" confirms his commitment to geographical scale. For my purposes, the term fits logically in a nested geographic scheme, and I was directly inspired by Broodbank's scale of analysis, which I find entirely appropriate for the Aegean Bronze Age. I emphasize geographical scale because it matters in the Bronze Age Mediterranean, so it ought to be a real-world measure rather than an abstraction.

Regional/Intra-cultural Maritime Interaction Sphere

Voyaging beyond the small world, a crucial transition occurred. Moving beyond "the safe and familiar," maritime travel was relatively infrequent and was in the hands of specialist sailors and merchants plying the seas in seagoing vessels. They possessed knowledge of sea routes, navigation in a range of conditions, open-sea and coastwise sailing, winds, currents, storms, landing sites en route and at the final destination, and personal relationships with people along the way. This transition finds support in ethnographic examples of recent seafaring in the South Pacific: most young men learn to navigate in local waters for fishing and visiting, but only a few achieve the navigational skill required for long-distance, open-sea voyaging (Feinberg 1988, 88–91).

We also see this difference in the locally seagoing farmers of Hesiod's *Works and Days* versus the hardened sea captains in the *Odyssey*, two roughly contemporary written works. As part of Hesiod's rant against his lazy brother Perses

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(*Works and Days* 645–665), he offers advice about taking to the sea, engaging properly in maritime trade, and storing a boat over the winter. Ultimately, however, he admits that he has actually been on the sea only once when he crossed the narrow gulf to Euboea to compete in funeral games. Hesiod's knowledge of the sea is no more than conventional folk wisdom and he is familiar only with local-scale maritime activity. In Homer's *Odyssey*, on the other hand, we meet captains, helmsmen, sailors, and rowers possessing intimate knowledge of seafaring. Odysseus was a hardened sea captain who voyaged far and wide over the sea. He understood stellar navigation, as we learn when he departs from Calypso's island and, with her instructions, navigates by the Pleiades, Arctophylax, Ursa Major, and Orion to reach the island of the Phaeacians in eighteen days (*Odyssey* 5, 270–281). We can mark out a rough "Mycenaean maritime culture region" of the 13th century BC (Figure 4.2c). It was crisscrossed by innumerable sea-lanes, but not by fixed boundaries. At different times, a maritime voyage from Mycenae to Dimini or to Knossos might be an intra-cultural or a cross-cultural journey.

Interregional/Inter-cultural Maritime Interaction Sphere

The interregional/inter-cultural maritime interaction sphere involves interactions and networks that extend beyond the Mycenaean maritime culture area (Figure 4.2d). Sporadic visits of Mycenaeans to far-flung lands outside the Aegean seem assured for Cyprus and the northern Levantine coast in the East, as well as for the shores of southern Italy and Sicily in the West. Activity in this sphere is best represented by the non-Mycenaean Uluburun and Cape Gelidonya shipwrecks.

FROM THEORY TO PRACTICE: A SARONIC GULF MARITIME SMALL WORLD

With many coastal and island settlements, the Saronic Gulf is an ideal maritime small world because it is well bounded by the enclosing landmasses of the Argolid, Corinthia, and Attica (Figure 4.3). Sea voyaging in the relatively calm gulf waters is considered easy, and a high level of intervisibility promotes intensive interactions in local-scale social and economic networks. The analysis that follows focuses on two Bronze Age sites: Kolonna on the island of Aigina, the largest and most prominent settlement of the Bronze Age Saronic region, and Kalamianos, a small, peripheral coastal settlement located on a rugged segment of the gulf's western shore. Kolonna dominated this small world for a millennium from about 2500 to 1400 BC, but during that time the small world oscillated between cohesion and fragmentation, primarily because small worlds are

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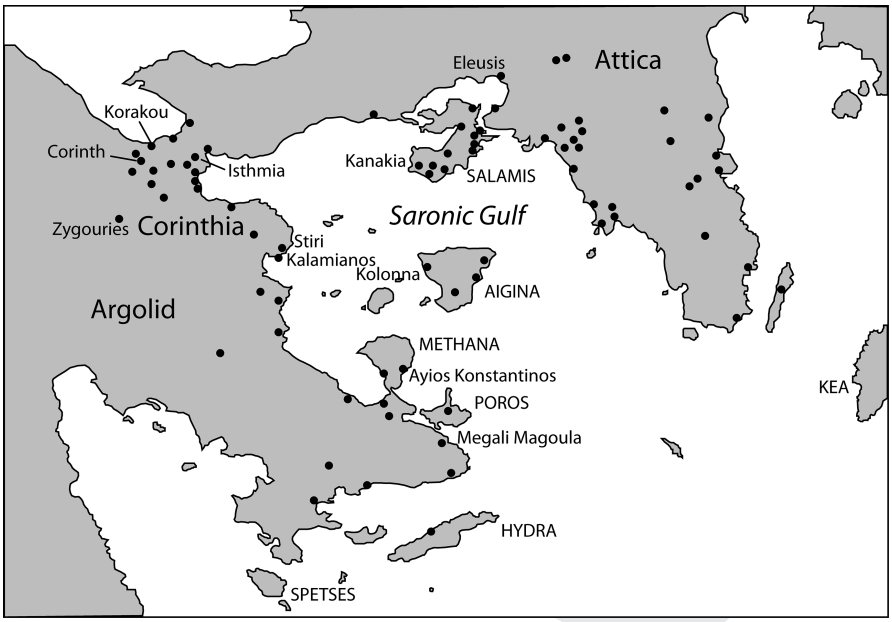

4.3. Map of the Saronic Gulf and surrounding land masses; the black circles represent known sites of the Mycenaean palatial period of the 14th and 13th centuries BC.

enmeshed in, and respond to, larger networks and historical processes unfolding at larger geographical scales. Beginning in the Early Bronze Age, relations of small coastal settlements such as Kalamianos with Aigina waxed and waned as the attention of Kolonna's inhabitants shifted into and away from the gulf.

Kolonna

Kolonna is a highly complex fortified site, with nine separate urban phases in the Bronze Age, and a center without peer in the mainland region until the political expansion of Mycenae incorporated the gulf into its own larger sphere of influence (Felten 2007). During the Early Bronze Age phases Early Helladic (EH) II (*c.*2700–2200 BC) and EH III (*c.*2200–2000 BC), Kolonna grew from a modest settlement of mud-brick houses to one of the most significant urban centers of the Aegean: a densely populated, heavily fortified town with monumental stone buildings and sophisticated town planning (Figure 4.4). Evidence of economic specialization includes the production of pottery and textiles, storage of agricultural surplus, and smelting of copper. The so-called Weißes Haus was a monumental building of the "corridor house" type, like those found at contemporary mainland sites, which possibly played a central administrative role in the community.

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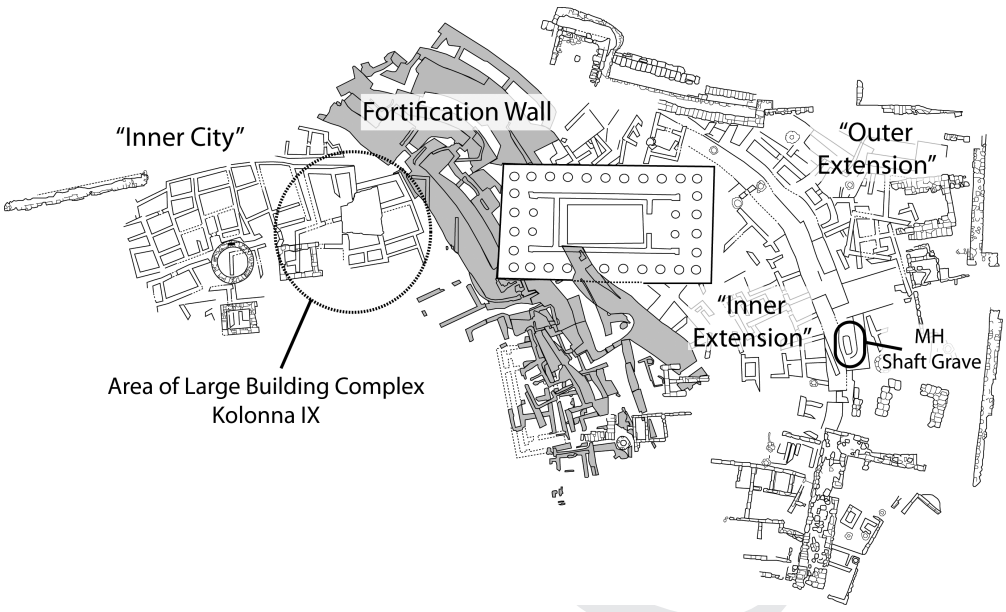

4.4. Plan of a portion of Bronze Age architecture at Kolonna on Aigina, showing different phases of the fortification walls as well as other features. (After Gauß and Smetana 2007, 58, Figure A)

During EH II, Kolonna was one of many peer sites participating in a time of increasing complexity around the Aegean and an "international spirit" characterized by high maritime connectivity (Renfrew 1972, 451–455). Exotic items with presumably high social value, including bronze daggers and tools, metal jewelry, fine drinking and pouring vessels of metal and ceramic, and marble vessels and figurines, circulated among the coasts and islands of the Aegean Sea. Competition and some level of maritime threat are implied in the appearance of fortifications at many coastal sites.

EH III witnessed dramatic changes. Settlements dispersed or disappeared all over the southern Greek mainland and islands. In some areas settlement did not recover until late in the Middle Helladic (MH) period, the so-called Middle Helladic hiatus of up to 500 years. By contrast, Kolonna emerged as the singular, dominant power in the Saronic in the late 3rd millennium. Beginning in EH III, the Aiginetans imported pottery from the Peloponnese, central Greece, and the Cycladic islands. By the beginning of the Middle Bronze Age, these same areas had begun to import Aiginetan table ware, storage vessels, and cooking pots. Ties with Minoan Crete were also strong: alongside Minoan imports a local industry of imitation Minoan ceramics emerged, perhaps operated by resident Cretan craftsmen. This evidence suggests that the Aiginetans shifted their focus to more distant trading partners partially in response to the demographic crash on the Greek mainland.

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The Aiginetans maintained their focus on this extra-Saronic network until developments of the Shaft Grave period, most prominently the rise of Mycenae and the recolonization of the interior of the Greek mainland, revived intensive interaction with the Saronic and northeastern Peloponnese starting in MH III and peaking in Late Helladic (LH) I–II. This was the time of greatest cohesion of the Kolonna-centered Saronic world, as indicated by the abundance of imported Aiginetan pottery at most sites in this orbit. There are also signs of emerging competition between Kolonna and Mycenae. The rarity of early Mycenaean painted pottery at Kolonna and in the circum-Saronic region despite easy trade routes may indicate a deliberate exclusionary strategy on the part of the Aiginetans.

In the 15th century (LH II in pottery terms), Mycenaean-style pottery spread for the first time into the Saronic region. Still, Kolonna's pottery export industry declined only after 1400 BC, coinciding with the construction of the first palace at Mycenae itself in LH IIIA. By this time, it appears that Mycenae had begun to expand politically as well as economically, poised to replace Kolonna as the dominant power in the Saronic Gulf. The construction of the palace at Mycenae ushered in the palatial period, and the number of sites in the Saronic almost doubled. These new foundations show strong influence from Mycenae. By LH IIIB1, *c.*1300 BC, the Saronic region, including Aigina, was fully incorporated politically and culturally into the Mycenaean state. Mycenae had broken apart the old Saronic world and incorporated the region into its own sphere of land and sea connections.

Kalamianos

Let us now insert Kalamianos into this narrative. Kalamianos was discovered in 2001 and is the focus of the Saronic Harbors Archaeological Research Project (SHARP). Strikingly, the Bronze Age harbor was situated at the currently exposed location at Kalamianos, and not at the well-sheltered modern harbor of Korphos, an excellent illustration of dramatic change in coastal configuration over millennia, in this case caused by local tectonics (Figure 4.5). A program of paleocoastal reconstruction established the likelihood of a harbor basin with sheltered anchorages to the east and west of the promontory on which the site was built (Figure 4.6; Dao 2011; Tartaron et al. 2011, 570–575). The settlement itself is preserved as a large architectural complex of the 13th century BC (i.e., the later palatial period), with more than fifty buildings, many of them monumental, exposed on the surface as foundations and walls spread over eight hectares. A plan of the architectural complexes reveals two main foci of construction and two phases of enclosure wall. Coastal subsidence has submerged part of the site (Figure 4.7).

Whereas Kalamianos reached its acme in the 13th century, the Korphos area has a longer history as a Saronic coastscape. In EH II, Kalamianos was a small

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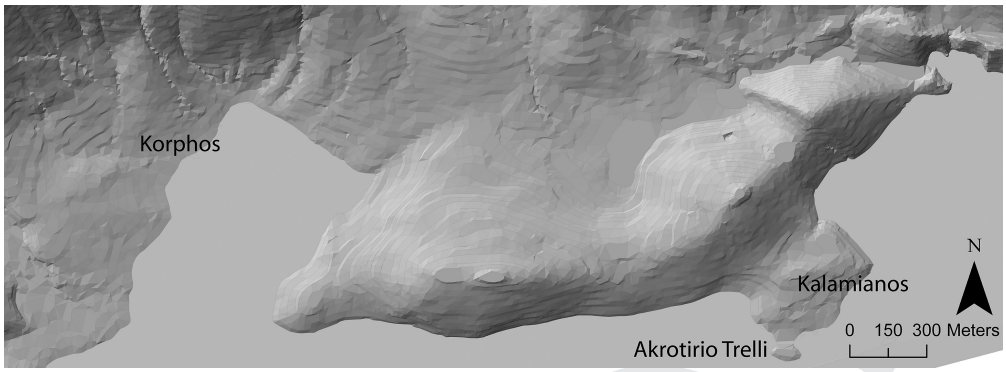
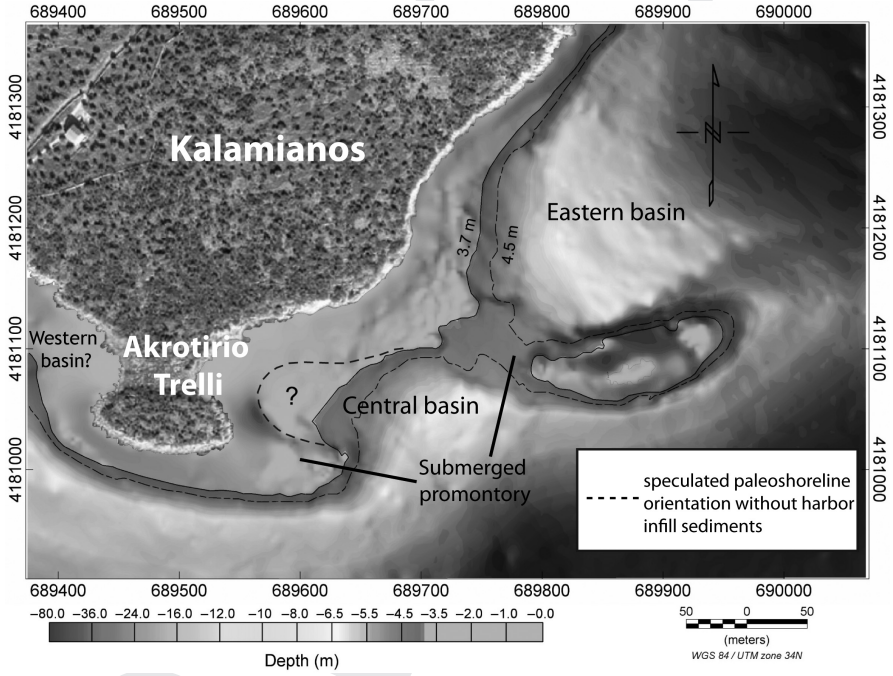


4.5. The modern coastline at Korphos, showing the location of the unlikely harbor at Kalamianos. (Satellite image © 2010 Google Earth.)



4.6. The reconstructed Late Bronze Age harbor basin at Kalamianos. (Courtesy Joseph I. Boyce and the archives of the Saronic Harbors Archaeological Research Project.)

but significant harbor tied into a nascent Saronic "small world" centered at Kolonna. Two major settlements, one at Kalamianos and an even larger one at Stiri high on a coastal cliff, were founded. Obsidian from the island of Melos, 170 kilometers away, was imported as raw nodules and processed at Kalamianos, as was andesite from Aigina, found both as raw nodules and as finished ground-stone implements. In the hinterland, surface survey discovered

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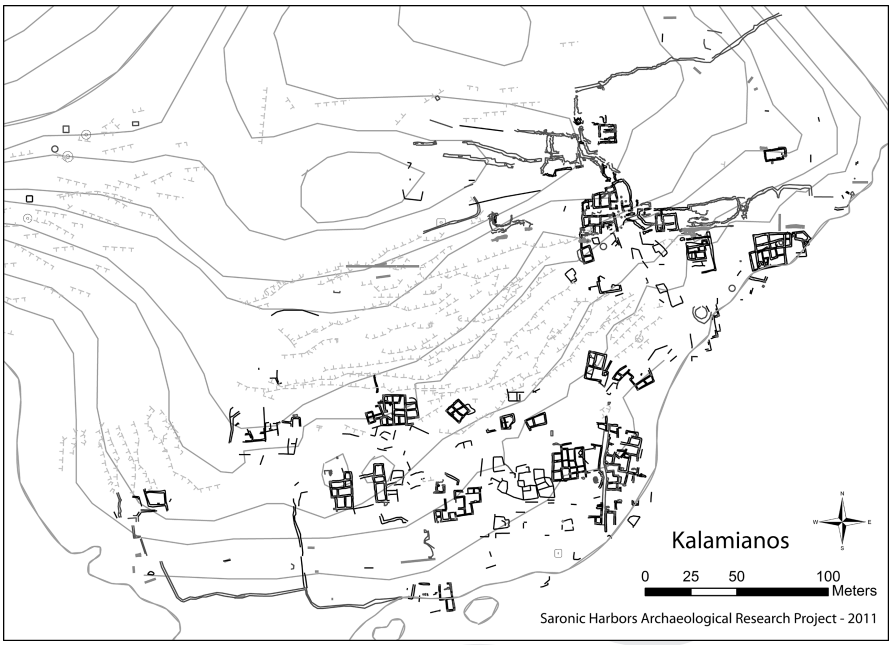

4.7. Plan of architecture exposed on the surface of the Mycenaean site at Kalamianos.

Early Bronze Age stone cairns and enclosures, evidence of a highly humanized and exploited landscape.

Beginning in EH III and lasting for more than 500 years, Kalamianos becomes almost invisible archaeologically, like so many other small settlements in southern Greece. Only a few sherds with standard Aiginetan potmarks give evidence of sparse human presence during a time that corresponds to the period in which Kolonna's attention lay outside the Saronic. Subsequently, in the transitional time (LH II–IIIA) when Kolonna and Mycenae vied for hegemony in the Saronic, Kalamianos was part of a contested periphery, set almost exactly halfway between them. But it was only at the end of that period that we see the first signs, in architecture and pottery later in LH IIIA (later 14th century), that Kalamianos was re-established and interacting with the outside world. By that time, it seems that Mycenae's economic and political influence had extended to envelop the Saronic Gulf.

Sometime around 1300 BC, during the mature stages of the Mycenaean palace period, the urban port was founded and built at Kalamianos, most likely by Mycenae. The port may have served two objectives: as a foothold for maritime economic and military activity in the Saronic, and as a definitive statement of Mycenae's hegemonic position in the Gulf. This meaning is encoded in the monumentality of the architecture, marking Kalamianos as a second-order center and probably Mycenae's principal Saronic harbor.

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During the 13th century BC, the Mycenaeans developed the economic potential of both lowland and upland zones by building a second settlement at Stiri, with expansive views overlooking the Saronic Gulf and fertile basins and hills that could have been used for growing grain and tree crops, and for grazing livestock, just as they are today. From there, a natural pass through the mountains leads to the west, to the interior of the Corinthia and the Argolid, and to Mycenae itself. On the slopes, the Mycenaeans erected an extensive system of agricultural terrace walls to maximize productive capacity (Kvapil 2012).

The role of Kalamianos as a harbor can be established by the evidence of imported materials, as well as recent underwater work, mentioned above, which clarified the evolution of the Bronze Age harbor basin by identifying several episodes of tectonic subsidence and the changing configuration of the shoreline. Kalamianos was not a long-lived harbor town, however. We have not found even a sherd of LH IIIC, meaning that, shortly after 1200 BC, the settlement and indeed the region were abandoned. The fate of the harbor seems closely tied to the demise of the Mycenaean palatial system early in the 12th century, as it was to the vibrant maritime life of that system.

Korphos–Kalamianos exhibits the hallmarks of a coastscape, with the development of the local zone for habitation, exploitation of the sea, connecting routes to the interior, and a visual seascape opening to the Saronic maritime small world. With mountains inhibiting views to the interior, the daily frame of visual reference for Kalamianotes was the Saronic Gulf. This view incorporates the inshore waters where people of Kalamianos fished and traveled, as well as the visual seascape: not of boundless sea, but of many islands and coastlines, each with their own coastscapes. Kolonna looms in the center of the Gulf. The visual connection and the relative ease of maritime travel to these nearby places bound these communities in a maritime small world.

Conclusion

This brief example shows that the Saronic was susceptible to the emergence of a "maritime small world" because visual contact, ease of movement by sea, and moderate distances facilitated connectivity and the experiential sense of a coherent world. Interweaving the stories of Kolonna and Kalamianos over time allows us to move beyond static maps to access the dynamism of a small world oscillating between cohesion and fragmentation over time, responding to internal forces as well as shifting centers of power and demographic trends played out beyond the Saronic. This scale of analysis is important because most Mycenaeans lived and died within these small-scale settings, yet Kalamianos became prominent only in periods of strong interregional connectivity: EH II with its nucleation of population and strong maritime orientation, and LH III

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with the incorporation of large territories by the Mycenaean palaces. In each case, the harbor at Kalamianos and its hinterland were developed to articulate with economic and political systems of greater scope than the Saronic. Adding in the stories of other Bronze Age coastscapes in the Saronic, such as Kanakia on Salamis, or Megali Magoula on the mainland across from Poros, would allow for an increasingly nuanced narrative of the diachronic network patterns in a maritime small world from multiple points of reference.

ETHNOARCHAEOLOGY OF THE MARITIME COASTAL COMMUNITY

I turn finally to the last element of the framework, using anthropological techniques to draw out the coastal community and its people, about whom Linear B and even archaeology are almost silent. Ethnoarchaeology studies living traditional societies and technologies as a way to provide analogies and insights on societies of the distant past, including insight into patterns of the archaeological record. Analogy is fundamental to all archaeological research, but a cross-cultural study that attempts to build a bridge between the present and the past carries certain explicit assumptions. We must demonstrate that patterns of material culture and behavior observed in a contemporary society have some analogues in past societies, and we must clarify both similarities and differences: what coastal communities share across the world and what makes each one unique. The ethnoarchaeological component is based on an ongoing program of oral history interviews in Greece and India. Between 2007 and 2009, my colleague Lita Tzortzopoulou-Gregory conducted oral history interviews with elder fishermen and -women from Korphos village as part of SHARP.[1] In 2014, I collected similar interviews with Greek colleagues on the Aegean coast of Thrace in the villages of Porto Lagos, Maroneia, and Imeros,[2] and with Indian colleagues in the southwestern Indian state of Kerala.[3] In each case, we sought out older fishermen and -women who lived and worked in the years before mechanization, federal government intervention, and globalization; in practice before the end of World War II. What follows is merely a sketch of some preliminary results.

Assumptions and Hypotheses

The theoretical foundation for my use of cross-cultural analogy is based on three key assumptions: (1) there are certain aspects of engagement with the sea and life in a maritime community that are universal or at least widespread across the world and through time, a kind of "structuring logic" to coastal life; (2) in many places, the lives of people in maritime communities in the period before World War II were more similar to those of the ancient past than to 21st-century maritime life; (3) oral histories and other observations of behavior and

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material culture can provide enlightening ways of thinking about and interpreting the archaeological record of coastal communities, particularly where textual sources are lacking. Tempering these assumptions must be a careful consideration of the inevitable differences among examples drawn from disparate times and places. These differences may include geographical or environmental setting; social, political, and economic organization; and so forth. In some cases the differences may be sufficiently decisive that comparison is rendered difficult or impossible.

Based on the world ethnographic literature and the oral interviews in Greece and India, I have developed a series of hypothetical characteristics that seek to bridge ancient and modern "traditional" coastal life in the context of a nested geographic network model. Here I mention and discuss just three of these: (1) there exists an esoteric body of maritime knowledge transmitted from generation to generation in the form of practical instruction and maritime "lore"—that is, a maritime *habitus*; (2) the coastscape is often a physical space of segregation from the broader society where the attributes of *liminality* and *centrality* play out; and (3) coastal dwellers often bear a peripheral status relative to inland centers whose power is based on agriculture, herding, and the acquisition of exotic goods in long-distance trade, with the result that the coastscape becomes a locus for the formation of a distinct *identity*.

Maritime Habitus

In both Greece and India, the systematic transmission of knowledge across generations has played a fundamental role in the survival of the community, its conservatism, and its identity, an excellent example of habitus in Bourdieu's terms (Bourdieu 1977; 1990). The many aspects of fishing—knowing where and how to fish, navigational skills, maintenance of equipment, marketing catch—are not easy to learn and master. Prior to World War II, around 90% of the male population of Korphos was engaged in fishing or merchant activities on the Saronic Gulf. Young boys learned by doing, accompanying their fathers and grandfathers on the sea at an early age. The fishermen worked in local waters and preferred the rich fishing ground near Kalamianos. Fishing communities in Kerala (India) exhibit a particularly strong maritime habitus. As in Korphos, they learn their trade from their fathers or other male relatives, sometimes with formal instruction but mainly by observation and participation. As one fisherman observed,

> They learned exactly the same way from their parents. He has learned from his father. It was handed down exactly from father to son. What your father has done you will learn and will teach your next generation. During

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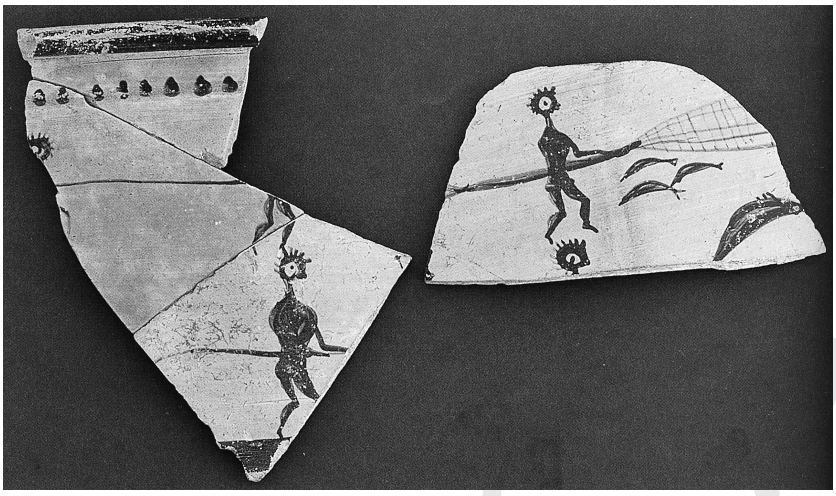

4.8. Sherd of the 12th century BC from Kynos, showing net fishing strikingly similar to modern net fishing techniques in Greece (*gripos*) and India (*karamadi*). (After Dakaronia 2002, 100, Plate 6.)

> my time you will learn from me what I have shown you; thus it goes on . . .

Because fishermen depended on the catch for their meager subsistence, deviation from taught practice typically brought correction or even a strong rebuke. In Kerala a typical response went like this: "If something goes wrong the father or someone who is an expert will correct them and instruct them how to do it." Virtually all respondents spoke of learning basic stellar navigation since they routinely went to fish at night, and at the time there were few, if any, lights on the shore to guide them. They spoke of specific stars. One fisherman from Thrace commented, "You had to learn them even if you didn't want to."

These factors explain why the fishing life tends to be conservative, with limited scope for experimentation and innovation. So it should not surprise us too much to encounter fascinating parallels such as net fishing, in Kerala called *karamadi* and in Greece *gripos*, in which a net secured to extremely long ropes is taken offshore by a small boat, and then slowly dragged back in to shore, represented also in depictions of communal net fishing on painted pottery of the 12th century BC in Greece (Figure 4.8).

The division of labor is not uniform, even across Greece or Kerala, for example, but there is a high occurrence of women marketing the fish while the men focus on the equipment and their work at sea. At Korphos and in Kerala, women transported the fish to market by foot, often long distances. In Kerala, women often walked a dozen kilometers or more to market with a heavy basket of fish on their head. At Korphos, one very old woman remembered walking over rugged terrain to bring fish to the inland village of

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Sophiko, a few hours by foot. In all cases, women did not normally go to sea, but helped with cleaning and mending the nets and other shore-based tasks.

Liminality and Centrality

The coastscape as a place both liminal and central is perhaps best illustrated by Korphos. The smaller group of sea-traders in the village lived a more varied life with better economic prospects than the fishermen. In the early 20th century, Korphos was a major port in a vibrant Saronic maritime small world with nodes on coasts and islands and innumerable links connecting them. The sea-traders purchased fish and local agricultural and forest products and exported them to Saronic markets. There was not a single dominant port in the Saronic, but instead a handful of large, bustling nodes of maritime connectivity. Several interviewees recalled bringing wood, charcoal, resin, and manure to markets at Piraeus, Eleusis, Salamis, Aigina, Poros, Nea Epidauros, and elsewhere. In exchange, the Korphiotes sought food and staples. From Aigina they imported flour and water jugs (still in modern times tempered with the volcanic inclusions that enhanced their performance and made them desirable in the Bronze Age), fruits and vegetables from Nea Epidauros, and foodstuffs and water from Piraeus, among many other items. Upon returning to Korphos, the merchants brought their wares inland, where local buyers acquired them and distributed them further on.

The people of Korphos had strong ties of kinship and intermarriage with the inland village of Sophiko, but when prompted about the orientation of the community, the elders were unanimous that the Korphiotes have always thought of themselves as an island people: they looked to the sea for their livelihood, wore island dress, listened to island music and danced island dances, and created networks of interaction with coastal and island people in the Saronic Gulf. They found spouses on Aigina and Salamis, and many emigrated to those islands after marriage. They contrasted their outlook with that of the Sophikites, whom they considered inland, "mountain" people. That they nevertheless maintained close social and economic ties with Sophiko indicates the dual orientation of a maritime coastal community, and exemplifies the inland/coastal symbiosis that is an important feature of the dynamism of coastal life. The Sophiko–Korphos–Saronic system in the early modern period bears the stamp of a microregion in Horden and Purcell's terms, and Korphos emerges as a coastscape and a maritime coastal community. The people of Korphos forged the link between the terrestrial and maritime worlds.

The small-world scale of the Korphiotes is echoed in Thrace and in Kerala. The best fishing near Korphos was only a couple of kilometers from the harbor. At Thracian Porto Lagos, one fisherman mentioned occasionally sailing along the coast as far as Molyvoti, about twenty kilometers distant, to reach good

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fishing grounds. In Kerala, fishing is measured in distances out to the open ocean from shore, and the traditional range was up to about twenty-five kilometers. When queried about storied seafarers of the past, informants emphasized not those who could navigate best or sail farthest, but those who could fish in all weather conditions and bring in the largest catches. These are the people of Hesiod's world, not Homer's.

Peripheral Status and Identity Formation

The maritime orientation of the Korphiotes marks out a distinct identity in contrast to the inland people of Sophiko. In Kerala, this distinction is even more pronounced and it strongly affects the social networks the communities form. In recent centuries, the fishing folk of Kerala have been marginalized by inland centers of power because of their low status in the caste system and their predominantly Christian religion. They were excluded from power, and ignored in historical and archival texts, save for narrow interests such as taxation or conscription. When we examine the record of long-distance traders who came to Kerala, including Romans, Jews, Arabs, Dutch, British, and Indians, we see them operating in an entirely separate, parallel maritime system, feeding the demands of foreign or inland centers and bypassing fishing villages, in part because their landing sites were too shallow for large cargo ships.

This history helps us to understand the different ways that village coastscapes cohere to form maritime small worlds. The early 20th-century Saronic Gulf, with its calm waters, short distances, extreme intervisibility, and lack of a strong political hierarchy, was an ideal incubator for a heterarchical maritime small world with dense nodes and omnidirectional links. The Bronze Age Saronic small world had similar natural properties, but experienced different network configurations due to the strong gravitational effects first of Kolonna and later of Mycenae. The southern coast of Kerala presents a very different configuration, similarly circumscribed but arrayed in a long, linear series of communities sharing common caste, occupation, and religion. Interaction was particularly intense because the villages are cheek by jowl. People visited one another along the coast and intermarried, often finding spouses many villages up or down the coast. Thus the coastal villages were tied inextricably through kinship; their small world was shaped by social networks that were more binding even than economic ones.

In spite of their distinct identities and orientations, coastal and inland people came together regularly to do business. Any "traditional society" with a reasonable level of resource differentiation and transportation by foot or animal-drawn cart should have a proliferation of local marketplaces, both formal and informal. Kerala offers an opportunity to observe market dynamics of the recent past. In Kerala there were many markets. Usually a small market

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within a kilometer or two from the beach stocked basic essentials. But the women typically had to walk to larger roadside or village markets in the range of five to twelve kilometers to sell fish and obtain necessities such as rice, meat, fruit, and vegetables from inland producers. Hindus, Muslims, and Christians came together peacefully at these markets. We can understand these as neutral, liminal spaces where people of different social groups interacted and exchanged complementary resources. Part of the current research in India is to plot the locations of markets of all descriptions in southern Kerala as a way to identify the spatial attributes of a partly self-organizing system that developed organically to serve the needs of diverse producers and consumers. Bearing in mind the obvious differences, Kerala does at least provide one model that can be tested against the cultural and environmental landscapes of Bronze Age Greece; for example, the geography of Messenia derived from the Linear B tablets combined with intensive surveys already accomplished there.

MARITIME COMMUNITIES IN THE AEGEAN BRONZE AGE

We might imagine a similar situation in the Mycenaean palatial period, with small coastal villages and palace centers engaged in networks at quite distinct, but geographically overlapping and sometimes interacting, scales. While we should not overstate the idea of discrete and independent spheres in the Mycenaean economy, note that unlike sheep, goats, cattle, wheat, or flax, fish and marine products were both highly perishable and too widely available to be easily monopolized or converted to profit by a palace. There is scant testimony of coastal activity in the Linear B tablets at Pylos except for references to shipbuilding and conscription of crews presumably for naval ships. Like the agents from the inland cities of Xanthi and Komotini who came to the Thracian coast to buy fish, the palaces may have sent representatives to procure products directly. This may have been part of their responsibilities to collect taxes, recruit rowers, and monitor the movement of exotic goods from palace to shore. After all, we have never explained how exactly the palaces managed to control the safe passage of these goods and to restrict them from wide dissemination. Though apparently not recorded in the Linear B archives, salt may have been a key commodity harvested by coastal people and coveted by the palaces. The coastal regions of western India are locations where salt flats yield prodigious amounts of the resource. Salt is an essential part of the Indian diet, and was of such value that the British monopolized the harvesting and trade of salt, and forbade Indians to engage in them. Salt as a symbol of oppression was so powerful that Gandhi chose disobedience of this law as the focus of nonviolent protest against British rule in 1930, the famous Salt March. The western coast of Greece's Peloponnese, with many coastal wetlands demonstrated for the Bronze Age, was a potential salt producer. Despite the apparent absence of

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salt as a commodity in the Linear B archives, it is worth investigating in light of the proximity of the palace at Pylos to those coastal wetlands.

The coastal–inland symbiosis characteristic of Korphos and Sophiko in modern times may be analogous to the relationship between coastal Kalamianos and upland Stiri in the Mycenaean period. Kalamianos was integrated into a Saronic maritime small world, but at the same time the intervisible site at Stiri provided a link to the interior, including paths west to Mycenae.

As the research continues, intriguing similarities and differences are emerging among coastal communities separated by time and space. With these few preliminary observations I hope to have suggested what might be learned from a cross-cultural ethnoarchaeological approach. I would like to stress that this is just one complementary component alongside archaeological and geoarchaeological fieldwork, and study of texts and artifacts, one that aims to address different questions for which our usual approaches fall short. It helps me to think about how coastal people in any setting negotiate their status as simultaneously peripheral, liminal, and central. They form the link between land and sea and the people, products, and ideas that pass between. Observing life among so-called traditional people, who can tell us in their own words about their experiences, opens up new ways of interpreting what we find in the coastal archaeological record, or projecting where we might find features like marketplaces. I return to the basic assumption that these elders lived in worlds more like antiquity than the 21st century, and this is a valuable, but of course not infallible, link. A final point is that we are almost out of time to do this kind of research. These people, along with the memory of their ways of life, will very soon vanish.

CONCLUSIONS

Network analysis offers new and enlightening ways to explore the components of ancient maritime networks and the variables that condition their diachronic trajectories. The models and the various iterations run on them may lead to convincing reconstructions of network inception, growth, decline, collapse, and so forth, but some caution is warranted regarding this work in progress. The case of the Aegean Bronze Age, where visionary work has been done, illustrates some of the challenges that lie ahead.

I shall make just a few summary points. First, the quality of the empirical data is the limiting factor to the robustness of the inputs to a model, and ultimately therefore to the model's outputs. Assessment of the data inputs should be an area of the greatest concern and effort. Second, there has not been sufficient attention to multi-scalar approaches that synthesize maritime networks holistically from local to international scales. In particular, the local scale, represented in the model presented here by the coastscape and the maritime small

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world, has not been adequately explored. Understanding Bronze Age maritime networks in terms of nested geographical scales is one way to isolate patterns of interaction that are different while also characterizing how the different scales interpenetrate and influence one another diachronically. Third, for prehistory and other cases where texts are unavailable, or wherever there are large lacunae in basic behavioral information, ethnographic and ethnoarchaeological approaches can help to fill the gaps with plausible proxy characteristics. These must be used judiciously with careful attention to environmental and social context, but, as I have suggested, it may be possible to identify certain structuring principles of coastal life that transcend time and space to offer testable scenarios such as market location or fishing catchments.

The model I have proposed is a qualitative one, because I am not confident that it is possible to derive sufficiently robust variables and constants for a quantitative model with the Mycenaean data available to me. My hope is that further refinement of the data, coupled with the oral history interviews, might one day make that a possibility. Our colleagues in this volume have done the hard and necessary work of modifying off-the-shelf approaches from sociology and physics for the very different questions and problems of archaeology, and we can expect this work to yield fascinating new insights into the ways that ancient maritime networks operated.

NOTES

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