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Models of Local Exchange in Late Bronze Age Cyprus

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During the Late Bronze Age in Cyprus, town centers and smaller sites with specialized productive and political-religious functions arose in the context of intensified copper exploitation and increasing long distance trade. This article explores the problem of how those sites were integrated in terms of settlement hierarchies and local exchange networks. Models of islandwide political hierarchy and market-based exchange are problematic. Alternative models of regional polities organized along the lines of wealth and staple finance (cf., D'Altroy and Earle 1985) are proposed, and the test implications by which those constructs may be evaluated in future archaeological research are specified.

Thirty years ago, in a major review of known archaeological sites, Catling (1962) inferred a tripartite system of settlement and economy for the Late Bronze Age in Cyprus. The system comprised rural agricultural villages, copper-mining sites in the Troodos, and prosperous coastal towns engaged in metal working and trade with other civilizations of the Mediterranean. Subsequent excavations and publications have greatly enhanced our knowledge of the metallurgical and other activities carried on in the major coastal towns: Enkomi (Dikaios 1969; 1971; Courtois 1986), Pyla-Kokkinokremos (Karageorghis and Demas 1984), Kition (Karageorghis and Demas 1985), Hala Sultan Tekke (Åström 1986), Maroni-Vournes (Cadogan 1989), Kalavassos-Ayios Dhimitrios (South 1984; 1989a; 1989b), Kourion-Bamboula (Weinberg 1983), Kouklia (Maier and von Wartburg 1985), Maa-Palaeokastro (Karageorghis and Demas 1988), and Toumba tou Skourou (Vermeule and Wolsky 1990) (fig. 1). However, very little additional information has been obtained about the agricultural or mining villages—beyond the example of Apliki-Karamallos (Taylor 1952), already known by Catling—or the ways in which those sites were integrated in broader regional exchange systems. There is also the problem of how sites such as Athienou (Dothan and Ben-Tor 1983) and Myrtou-Pighades (Taylor 1957), commonly described as “rural sanctuaries,” were linked to the coastal cen-

ters and the surrounding countryside. To date problem-oriented regional surveys have been undertaken in relatively few parts of the island, mainly along the south coast (Swiny 1981; Rupp et al. 1984; 1986; Todd 1989), making the reconstruction of settlement hierarchies and exchange networks problematic in the extreme.

Given the limitations of the data, speculations concerning modes of regional integration, and in particular the mechanisms by which copper was acquired by coastal towns located anywhere from 8–40 km or further from the Troodos mines, might initially seem futile. Although any number of models might be proposed, there is comparatively little evidence with which to test them. However, some models appear more plausible than others on the basis of existing data and broader theoretical considerations. In this article I shall evaluate the applicability of certain general constructs of political-economic organization to the case of Late Bronze Age Cyprus, suggest modifications of the more likely ones based on the peculiarities of the Cypriot case, and define the lines of evidence that will be useful in substantiating, refining, or rejecting those models.

THE ISLAND-WIDE POLITY MODEL

It is important to define at the outset the scale of the unit or units under study, or more specifically,

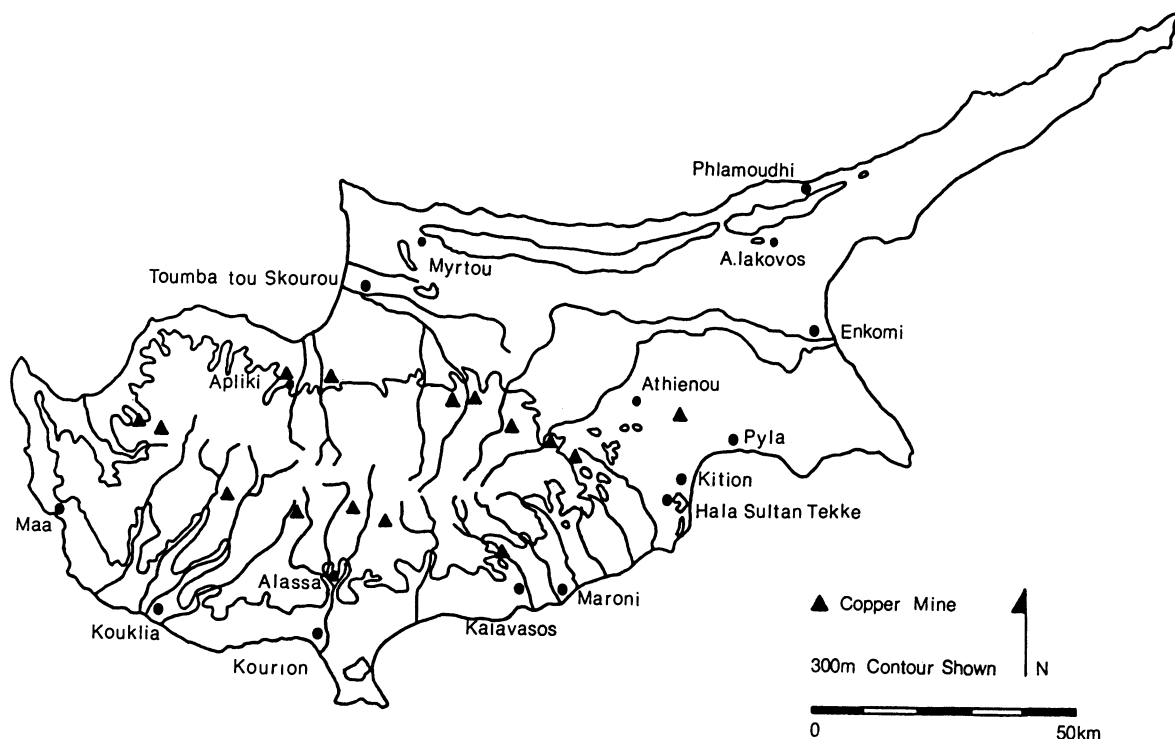


Fig. 1. Late Bronze Age sites in Cyprus.

whether we should consider the island of Cyprus as a single, integrated political-economic system or as a congeries of regional entities. There is widespread consensus that Cyprus, or at least some portion of the island, can be identified with the kingdom of Alashiya, alluded to in Syro-Babylonian and Egyptian texts of the Middle and Late Bronze Age as an important source of copper (Muhly 1972; Holmes 1971; 1975; Georgiou 1979; Knapp 1979; 1985). Some scholars (e.g., Knapp 1988: 151–52; Muhly 1989: 303) have suggested that for at least a time during the Late Bronze Age, there existed a unified, island-wide kingdom of Alashiya, perhaps founded and dominated by a paramount center at Enkomi, a site that rose to prominence early in the Late Cypriot period, well before the Late Cypriot IIC (13th century B.C.E.) florescence of most of the south coast towns. If that were the case, then it follows that the movement of copper from the mines to the coast might have been organized by the central political authority, e.g., Enkomi, with the towns of the south coast serving as subordinate administrative and processing centers. Presumably they would have received copper ore or semiprocessed ore from the sources closest to each of them and then, after undertaking further refining and metal working activities, they would have sent some

portion of the intermediate or finished products on to the paramount center as tribute.

I argue here that the balance of current settlement and mortuary evidence weighs against the island-wide polity model for the following reasons:

First, in a state with centrally-founded administrative centers, we might expect to find stylistic and functional consistencies in the public buildings of the various subordinate centers (cf., Johnson 1973; Keatinge 1974; Wright and Johnson 1975); and they in turn would share important similarities with the official architecture of the paramount center, albeit on a less grandiose scale. Yet instead we find great diversity in the major public buildings at different sites, with Near Eastern-style temples at Kition; highly variable ashlar residences and administrative buildings at Hala Sultan Tekke, Kalavassos, Maroni, and Maa; and the pillared “Sanctuary of Aphrodite” at Kouklia. Likewise, none of the buildings appear to be minireplicas of public buildings found at Enkomi. Such variability may be better accounted for in terms of independent local developments than in terms of an externally imposed administrative and ideological order.

Second, while it is apparent from the overall array of goods from ritual and mortuary contexts that

Late Cypriot town centers partook of a broadly shared complex of ideological and prestige symbolism (cf., Knapp 1986b; 1988; Keswani 1989b: 608–13), there is nowhere any iconographic evidence of subordination to a common central authority. Nor is there evidence of a coherent, replicated complex of administrative technology (seals, written records) used to maintain links between the secondary and paramount centers. It appears that the Cypro-Minoan script was seldom employed for economic accounting or correspondence; and while it is not impossible that an island-wide polity could be integrated without the extensive use of written record-keeping systems, it is surprising nonetheless, especially since such systems were widely used in neighboring states.

Third, the estimated site areas for Enkomi (11 ha.), Kition (70 ha.) and Hala Sultan Tekke (27 ha.) (Swiny 1981: 78; Åström, Bailey, and Karageorghis 1972: fig. 12) do not support the notion of a hierarchy centered on Enkomi, while the comparatively late floruit of urbanism at the other sites, along with all of the preceding arguments, makes it difficult to assert that either was the actual paramount center. Stech (1982: 113) has also suggested that the somewhat erratic spacing of Late Cypriot centers, with some, such as Hala Sultan Tekke and Kition, located within a few kilometers of one another, argues against a centrally determined settlement hierarchy.

Fourth, in comparing the elite tomb assemblages of the various coastal centers, we find a wide geographic distribution of the highest-order valuables such as gold signet rings and other very elaborate jewelry, carved "pictorial" ivories, and Mycenaean pictorial kraters (Keswani 1989a; 1989b: Tables 6.7, 6.11, fig. 6.2), rather than a hierarchical distribution of symbols of authority with the most extraordinary status goods at a single site (cf. Peebles 1971). Moreover, distinctive stylistic and iconographic features of some of those goods suggest that they were independently acquired by local elites rather than centrally distributed from a common source.

If, for the present, we reject the notion of a single, tightly integrated island-wide polity, we might choose to consider the aggregate of Late Cypriot settlements as being divided into a number of regional polities centered on the various coastal towns, with politically-organized exchange systems, or as an even more fragmented assemblage of quasi-independent settlements linked by market-oriented exchange transactions. I shall discuss the second possibility first.

THE MARKET MODEL

Allusions to "private enterprise," "entrepreneurs," the "profit motive," and market-determined "supply and demand" are pervasive in the Cypriot archaeological literature (Merrillees 1974; Muhly 1982: 252; Stech 1982; Knapp 1986a; Muhly, Maddin and Stech 1988: 288–89). The most clearly articulated statement of a market model is presented by Stech, who writes:

Miners and smelters sold their products to merchants, who were perhaps employees or members of religious organizations. The merchants brought the copper in various stages of processing to the cities, where it was sometimes processed more, refined, cast and sold. The ties between primary and secondary producers thus would have been economic, perhaps with elements of religious obligation as well. The king probably participated in the copper industry, and in other Cypriot commercial enterprises, through the collection of taxes and tribute in the form of copper (Stech 1982: 113).

Stech (1982: 113) adduces the irregular geographical distribution of the coastal "emporia" as evidence of a "free enterprise" system, as opposed to one of "political control."

I will not quarrel with the probable existence of at least partially developed "market" economies in the Near Eastern societies with which Late Cypriot towns traded (cf. Larsen 1967; 1976; Veenhof 1972), nor with the practice of entrepreneurial behavior by certain individuals, elite or nonelite, in Cypriot communities. Foreign "merchants" may well have visited and resided in the coastal towns, and foreign "market" forces may have provided significant stimulus for the development of the Cypriot copper industry. It is doubtful, however, that market mechanisms were sufficiently well-developed within Cyprus during the second millennium B.C.E. to stimulate and sustain the logistically complicated and labor intensive extraction, transport, and processing of copper ores for either local or long distance trade. Market economies are defined by more than the mere presence of "supply and demand"; they involve competition between buyers and sellers that fixes the price of goods and has a feedback relationship between price fluctuations and productive output. Their operation is dependent upon networks of transport and communication sufficiently developed to allow traders to profit from price fluctuations and to allow price fluctuations to influence production decisions. Their development further entails the commoditization

not only of goods but of labor and land, and the accumulation of capital in private hands (cf. Polanyi 1971[1957]; Humphreys 1969; Sahlins 1972). Consequently the rise of "markets" and "commercial development" tends to follow rather than to precipitate or precede the emergence of complex societies (Brumfiel and Earle 1987: 1–2).

To project the characteristics of a market economy onto the reputedly "backward," agricultural, and only incipiently hierarchical communities (cf. Swiny 1989; Knapp 1990; Keswani unpublished) that preceded the towns of the Late Bronze Age in Cyprus is highly problematic. Knapp (1986a) has argued that the expansion of the copper industry during the Late Cypriot period must have been associated with the activities of political elites, whose emergence is reasonably well documented in the mortuary record (Keswani 1989a; 1989b). Most significantly, the earliest metallurgical installations at Enkomi were located within what appears to have been an official building complex, i.e., Dikaios' Level I (Late Cypriot I) "fortress" (Dikaios 1969: 16–24). The major copper workshops of the succeeding Late Cypriot II and Late Cypriot III continue to be within or closely associated with official or religious building complexes, not only at Enkomi but at Kition and Athienou as well. On the basis of present evidence, therefore, a model or models of politically-organized exchange appear more viable than the market model.

REGIONAL POLITIES AND MODELS OF STAPLE AND WEALTH FINANCE

Assuming that there were at least eight contemporaneous or semicontemporaneous copper-producing polities, centered on the towns at Toumba tou Skourou, Enkomi, Kition, Hala Sultan Tekke, Maroni, Kalavastos, Kourion or Alassa, and Kouklia,¹ the systems by which those polities acquired their copper from the Troodos mines remain to be defined. One possibility is that copper was mobilized as tribute by coercive or ideological sanctions from communities already based in the mining regions. The use of coercion is difficult to establish; but as Knapp (1986b; 1988) has discussed, ideology and the manipulation of "culturally significant symbols," asserting the sacred associations of copper ingots, may well have played an important role in stimulating copper production and legitimizing official extractive demands. Alternatively or in addi-

tion, metal supplies may have been acquired through the official establishment of camps and permanent settlements whose main purpose was the extraction and transshipment of copper. In either case, the mining, processing, and transport of copper ores, intermediate products, and metallic copper would have been a labor intensive process, drawing farmers away from ordinary subsistence pursuits and requiring official supervision and administration. Persons engaged in such activities would have required some sort of subsistence support or other remuneration.

Two variant models of redistribution developed by D'Altroy and Earle (1985) may be relevant to Late Cypriot economic organization. The first is staple finance—in which mainly subsistence and utilitarian goods are collected as tribute, stored, and redistributed to members of the elite, officials, dependents, laborers, regional administrators, etc. The second is wealth finance—in which those personnel are remunerated instead with wealth objects or valuables that are prestigious, portable, and sometimes convertible into other goods (see Brumfiel and Earle 1987 for several examples). The use of staple finance is strongly indicated at three important but very different sites in Cyprus—a town center, a mining settlement, and a so-called "rural sanctuary."

The first example is the Late Cypriot IIC town of Kalavastos-Ayios Dhimitrios, excavated by the Brandeis University expedition under the direction of I. Todd and A. Todd. The most outstanding architectural complex found at the site is the ashlar Building X, the west side of which was devoted to a pillared storage hall 19.5 m long by 7.25 m wide, with approximately 50 massive pithoi of up to 2 m tall arranged in rows on stone blocks and in pits beneath the floor. Preliminary calculations put the total storage capacity of the pithos hall at approximately 33,500 liters (South 1989a: 321) and of Building X overall (including the recently discovered "North Pithos magazine") at approximately 50,000 liters (South 1989b). Recent gas chromatographic studies have identified the presence of multiple methyl esters associated with olive oil in 15 of 19 samples of pithoi from the pithos hall, suggesting that olive oil may have been the principal, if not the only, commodity stored there (Keswani 1992). Palaeoethnobotanical analyses of flotation samples from the pithos hall have isolated virtually no remains of cereal crops, although several olive and grape pits were found (Hansen 1989). Excavations in a building immediately west of Building X have revealed a large stone tank ca. 2 m long and 1.3 m

deep, which also contained traces of olive oil methyl esters; many carbonized olive pits were recovered from an area to the south. It appears that in addition to the metallurgical activities attested in other parts of the site (South 1984; 1989a: 320), the residents of Ayios Dhimitrios were involved to a significant degree in processing and storing olive oil.

If we were to make the conservative assumption that only half of the pithos hall storage jars actually were used for olive oil storage, their capacity would have been sufficient to meet the needs of roughly 500 adults over a two-year period of alternating good and bad harvests, allowing 15 liters of oil per person per annum.² If all of the pithos hall pithoi contained oil, then the oil requirements of over 1000 people could have been supported. Ethnographically based population estimates for an 11 ha. settlement such as Ayios Dhimitrios range between 750 and 1250 persons;³ informal calculations based on architectural density and building size by the excavator (South 1989b) yield a maximum figure of 1500. Pending completion and publication of the Vasilikos Valley survey, it is difficult to estimate the number and size of contemporaneous settlements in Ayios Dhimitrios' hinterland; but thus far Ayios Dhimitrios appears to have been the principal focus of Late Cypriot IIC occupation in the valley. It seems possible, therefore, that a very large proportion of the local population, not merely the elite, could have been provisioned with oil from the Building X storage hall, perhaps in return for labor devoted to the mining and processing of copper from the mines approximately 8 km north.

Another site with substantial storage facilities is the small (ca. 3–5 ha.) mining settlement at Apliki-Karamallos (see Taylor 1952: fig. 2), a site that may have been within the domain of Toumba tou Skourou or some other as yet unknown north coast polity. Excavations by Taylor in Area A revealed a single, well-constructed building of eight rooms arranged in an L-shaped plan, with substantial rubble and mudbrick walls 75 cm thick, and floors of hard gypsum plaster. The building yielded considerable evidence of metallurgical activity, including several tuyere and crucible fragments and a sackful of slag (see Muhly 1989). The building was also equipped with an impressive storeroom that may originally have contained up to 15 large pithoi set on limestone blocks on the floor. The six found *in situ* were estimated to measure ca. 1.5 m in height and 1.0 m in width, dimensions that, by analogy with Kalavassos pithoi, suggest a capacity of over

500 liters each. Depending on the size of the other displaced jars, this room alone may have had a storage capacity of up to 7500 liters. We have no way of knowing precisely what the jars contained, but their volume almost certainly exceeded the subsistence requirements of House A's occupants.

The three houses investigated in Area B were relatively less substantial in construction and lacked evidence for either major storage facilities or intensive metallurgical activity. They were also devoid of any valuables comparable to the gold earring, Mycenaean granary style krater, ivory cylinder, and steatite cylinder seal associated with House A (Taylor 1952: 133–43). It might be suggested, therefore, that House A represents an official residence and workplace from which the local mining and primary processing of copper were controlled, and from which subsistence commodities were redistributed to other residents. According to Helbaek (1962), the complex of plant remains recovered from the site—including hulled six-row barley, bread wheat, horsebean, lentil, grapevine, olive, and coriander—could not have been grown on the rocky slopes adjacent to the settlement. The settlement's provisions, therefore, must have been supplied from outside.

Evidence for both metallurgical activity and storage was also encountered at the very small (2500 m²) inland site of Athienou, excavated by the Hebrew University expedition (Dothan and Ben-Tor 1983). This site could have served as an intermediary between mining districts such as Troulli or Sha (located 8 and 20 km away, respectively) and one or more primary coastal centers to the east—southeast such as Enkomi, Kition, or Hala Sultan Tekke. The principal architectural complex at Athienou appears to have been a poorly preserved Late Cypriot sanctuary, from in and around which approximately 10,000 whole or fragmentary votive vessels were recovered along with a variety of valuables including a crudely carved ivory conical rhyton, cylinder seals, an Egyptian scarab, and a bronze ring inscribed with the hieroglyph of Ptah (Dothan and Ben-Tor 1983: 14–20, 118–25). Approximately a half-ton of copper ore and processed nodules were also found (Dothan and Ben-Tor 1983: 140), but no crucibles or tuyeres were identified. Maddin, Muhly, and Wheeler (1983) have thus suggested that the roasting and smelting of the ores took place at the mines. The extracted metal and roasted ore nodules retaining prills of metallic copper would then have been sent to Athienou for further processing, after which the copper would

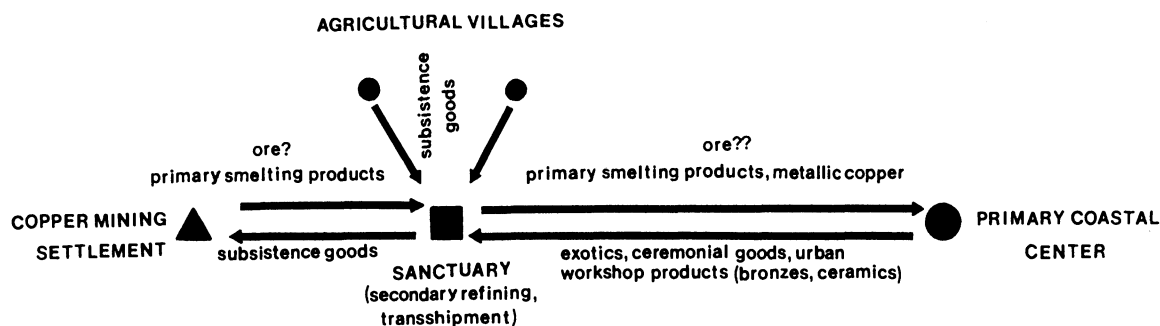


Fig. 2. Exchange in territorially extensive systems or polities in which the primary center was far from the copper source.

have been transshipped to a coastal center, with the discarded nodules accumulating at Athienou.

Remains of 11 very large smashed and severely burned pithoi thought to have contained olive oil were found on plastered platforms northeast of the sanctuary in Stratum II, dated to Late Cypriot III. Assuming that those "very large" pithoi ranged in volume between 500 and 1000 liters, the amount of olive oil (if this was, in fact, the commodity stored) would have totaled between 5500 and 11,000 liters, or enough to support 180–365 adults for two years on a generous ration of 15 liters per year. One wonders if this fairly substantial store was used to supply not only the officials and dependents of the sanctuary but also the full- or part-time miners who may have been drawn from the surrounding rural population.

In light of the evidence for supra-household level storage at the sites of Kalavassos, Apliki, and Athienou, it is somewhat surprising that no evidence for such facilities has been encountered to date at major coastal centers such as Hala Sultan Tekke, Kition, and Enkomi. At the very large sites of Tekke and Kition, the lack of evidence might be attributable to limitations of sampling to date. But at the smaller (ca. 11 ha.) site of Enkomi, which has been very extensively investigated over the past century, the absence of major storage complexes in any of the numerous buildings that may be described as elite, official, or religious, may indicate that staple finance was not an important feature of the town's internal organization.

There are a number of possible and perhaps overlapping explanations for this. One reason may have been that the court and temple institutions that developed at Enkomi were much smaller than their counterparts in the Aegean and Near Eastern

states, with significantly fewer dependents and functionaries requiring subsistence rations. Second, for all its importance, Enkomi was a fairly small town; its area was comparable to Kalavassos, with perhaps a slightly higher population. The subsistence needs of the entire community may have fallen easily within the carrying capacity of the site's catchment area, and most of the kin groups in residence at the site may have supported themselves from their own agricultural lands. Finally, elite groups based at Enkomi may have used alternative modes of "finance" to acquire their copper supplies from distant settlements and to secure the necessary labor for the local copper industry.

I propose that there existed a rather complex web of tributary and exchange relations linking coastal centers, inland centers, mining and agricultural villages during the Late Cypriot period (fig. 2). In geographically extensive systems such as those dominated by Enkomi, Toumba tou Skourou, Kition, Hala Sultan Tekke, Kourion, and possibly Kouklia, I envision a network in which lower-order exotic goods, ceremonial paraphernalia, finished metal items, and possibly other urban workshop products such as ceramics were redistributed within the primary center and passed on to inland centers. The inland centers would have been responsible for shipping various forms of semiprocessed copper (primary smelting products such as roasted ores or enriched "furnace conglomerate," extracted metallic copper in prills or other forms, possibly also some raw ores [Muhly 1989: 302–4]) to the coast. Many of those inland centers may have been focused on "sanctuaries," as appears to have been the case at Athienou, Alassa, and Myrtou-Pighades,⁴ their authorities deriving a strong measure of status and ideological legitimization through the display

of ceremonial and prestige goods from the coast. The dominant exchange principle linking the coastal and inland centers was thus that of “wealth finance” with a very prominent ideological component. Where the distances between primary and secondary centers were great, wealth finance may have been more practical than staple finance because of the lower energy expenditure required to transport such goods. Whether the inland centers were directly controlled or administered by personnel from the coast, or by local elites bound to their coastal counterparts by alliances or tributary relations, is an interesting but unresolved question. We may conceive of their relationships as hierarchical nonetheless when we consider the quantity and value of copper being shipped to the coast versus the limited quantity and value of incoming prestige goods and sacred paraphernalia at inland sites in comparison to coastal assemblages (cf. Keswani 1989b: Table 6.13, fig. 6.2).

In their own local contexts, the inland centers would have served not only as transshipment points for semiprocessed copper but also as the foci for the collection of agricultural “tribute,” some of which was used to support the resident elite and sanctuary dependents; some to support the miners who were either directly overseen by the authorities of the inland centers, or by local representatives based in complexes like House A at Apliki. Relations between the inland centers and outlying mining and agricultural villages would thus have been characterized by the principle of “staple finance,” in part from the exigencies of supporting settlements in agriculturally inhospitable mining districts, in part because of the relatively small quantity of exotic prestige goods available for further redistribution. The presence of a sanctuary at the inland center would have provided an ideological basis for the necessary mobilization of agricultural tribute and “industrial” labor.

This model requires modification in the case of polities such as Kalavassos where the primary center was in fairly close proximity to the mines (fig. 3). There the local elite may have been able to supervise the extraction and processing of copper without recourse to a tiered system of intermediaries, subsidiary administrative centers, and points of transshipment upon which other coastal centers would have depended. The concentration of population within a small area, perhaps predominantly at a single site, would have rendered the practice of staple finance logistically feasible. Similar arrangements may have prevailed at Maroni, where some-

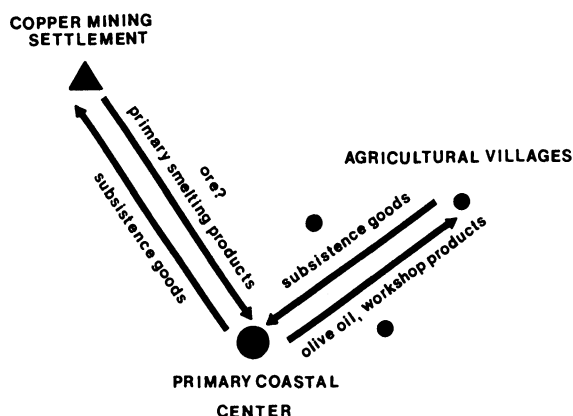


Fig. 3. Exchange in polities where the primary center was near the copper source.

what smaller scale storage facilities and evidence for olive-processing have also been discovered (Cadogan 1989).

TEST IMPLICATIONS AND DIRECTIONS FOR FUTURE RESEARCH

The constructs of exchange proposed in this article are not meant to be the final explanation of Late Cypriot politico-economic organization. Rather, they are models that may be expanded, modified, or ultimately rejected in future research, based on the extent to which their test expectations are satisfied by empirical evidence. The test implications may be summarized as follows:

- In the hinterlands of the major copper-producing centers there should be evidence for a hierarchy of sites in which the number and location of secondary centers (sanctuary sites) and other way stations is at least partly determined by movement minimization considerations with respect to the transport of copper. The location of “sanctuary” sites may also be affected by the accessibility of local agricultural resources and distances to local villages.
- The types and quantities of smelting by-products found at the secondary centers may be affected by the distance between the secondary center and the copper source (see n. 4).
- The secondary (or in some cases primary) centers located in closest proximity to the mines may have evidence for significant supra-household level storage capacity.

- Secondary centers will be characterized by the presence of evidence for ceremonial or religious activity, with ritual complexes and paraphernalia that may be similar to but would not surpass in scale or quality those found at the associated primary centers.
- The quantity and quality of exotic goods and other valuables recovered will diminish relative to a site's position in the settlement hierarchy, with the highest concentrations and most elaborate arrays found at the primary centers.
- Finished metal items such as bronze tools, weapons, bowls, etc., as well as certain types of ceramics which, by their relative concentration or direct evidence of production may be considered the output of coastal centers, may also be found in secondary centers and other dependent villages.
- Mining settlements will have some artifactual or architectural evidence for an elite/official presence and for the storage of provisions for miners, smelters, and their official supervisors.

The evaluation of these predictions will depend upon the data collected in regional surveys such as the one being undertaken by Knapp (1992) in the northern Troodos foothills and upon the excavation of sites of variable function and hierarchical position, including small village or habitation sites that some archaeologists have traditionally dismissed as insignificant. The investigation of nonurban, non-ceremonial agricultural and mining sites may prove essential to elucidating the flow of valuables, subsistence goods, and copper between settlements.

Given the significant contrasts evident even now between the systems exemplified by Kalavassos and Enkomi, it will not be surprising if we discover further organizational variability in other polities that have yet to be so extensively investigated. The value of setting up idealized models such as those discussed here lies in the framework they provide for evaluating the implications of new data as they are collected and for defining the lines of evidence we need to pursue in interpreting the organization of local and regional exchange systems in the future.

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NOTES

¹Possibly *Pyla-Kokkinokremos* and *Maa-Palaeokastro* should also be included here, but interpretations of their function vary. Karageorghis (1984: 22) has interpreted them as settlements founded by invading "Peoples of the Sea," while Muhly (1984: 51) suggests they may have been established (presumably by other centers) as outposts against such invaders. The interpretation of the as yet unpublished northern site of *Phlamoudhi-Melissa* (Karageorghis 1974: 864-65), where the Columbia University expedition discovered an ashlar building and the remains of 20 large pithoi, is also problematic; its extreme distance from the copper mines makes it seem an unlikely "copper-producing" polity.

²Gauging per capita olive oil consumption in ancient Cyprus is at best a guessing game. Ethnographic research by Forbes and Foxhall (1978) in modern Methana, Greece, indicated that local residents attempt to store 50

liters per person per year or 100 liters per person for two years; but the authors note that the villagers tend to overestimate their needs. This figure seems too high considering the more primitive processing technologies of the Bronze Age; Runnels and Hansen (1986), moreover, suggest that lower yielding wild olives may have been exploited along with domesticated olives even in the Late Bronze Age. Van Effenterre (1980) and DeWolf, Postal, and Van Effenterre (1963) use a much lower figure of 15 liters per person per year based on a 19th century ethnographic study of Crete; this seems more reasonable, perhaps even an overestimate. Gelb (1965) calculated the yearly ration of oil to semifree workers of ED IIIA-Ur III Mesopotamia at four quarts per adult.

³These estimates are based on formulas developed by Carothers and McDonald (1979) for Messenia, Greece, and by Schacht (1981) for towns in southwestern Iran.

⁴Hadjisavvas (1989) interprets Alassa-Pano Mandilaris as a probable sanctuary site; numerous terracotta bull figurines and a miniature "votive" ingot are among the finds that support his reconstruction. Evidence for some small-scale primary smelting and other secondary refining activities was found in several areas. Ashlar blocks suggesting an official building, a possible fragment of a stone altar, and sherds of large storage vessels were observed at the nearby locality of Alassa-Paliotaverna. Alassa may have functioned as an intermediary between Kourion and the copper mines at Ayios Mamas, Yerasa, and perhaps even Pefkos northeast of Limassol (Hadjisavvas 1989: 40).

The well-known sanctuary site at Myrtou-Pighades (Taylor 1957) may have served as a secondary or tertiary transshipment center between the Troodos and some un-

identified north coast center; finds of slag and lumps of fused copper were recovered from one of the rooms within the sanctuary complex and Muhly (1989: 302) notes the presence of furnace conglomerate which may have been shipped from a primary smelting center near the mines. The absence at both sites of extensive deposits of ore nodules such as those found at Athienou may reflect their positions farther "down-the-line" from the mines.

The "open-air" sanctuary at Ayios Iakovos-Dhima (Gjerstad et al. 1934: 356–61) yielded no evidence for metallurgical activity, which is not surprising considering its location on the southeastern side of the Kyrenia range, very far from the copper mines of the Troodos. That should serve as a reminder that not all Late Cypriot sites were necessarily implicated in the copper trade.

BIBLIOGRAPHY

- Åström, P.
1986 Hala Sultan Tekke—An International Harbour Town of the Late Cypriote Bronze Age. *Opuscula Atheniensa* 16: 7–17.
- Åström, P.; Bailey, D. M.; and Karageorghis, V.
1972 *Hala Sultan Tekke I. Excavations 1897–1971*. Studies in Mediterranean Archaeology 45, 1. Göteborg: Åströms.
- Brumfiel, E. M., and Earle, T. K., eds.
1987 *Specialization, Exchange, and Complex Societies*. Cambridge: Cambridge University.
- Cadogan, G.
1989 Maroni and the Monuments. Pp. 43–51 in *Early Society in Cyprus*, ed. E. J. Peltenburg. Edinburgh: Edinburgh University.
- Carothers, J., and McDonald, W. A.
1979 Size and Distribution of the Population in Late Bronze Age Messenia: Some Statistical Approaches. *Journal of Field Archaeology* 6: 433–54.
- Catling, H. W.
1962 Patterns of Settlement in Bronze Age Cyprus. *Opuscula Atheniensa* 4: 129–69.
- Courtois, J.-C.
1986 Bref Historique des Recherches Archéologiques à Enkomi. Pp. 1–50 in *Enkomi et le Bronze Récent à Chypre*, by J.-C. Courtois and J. and E. Lagarce. Nicosia: Leventis.
- D'Altroy, T., and Earle, T. K.
1985 State Finance, Wealth Finance, and Storage in the Inka Political Economy. *Current Anthropology* 26: 187–206.
- DeWolf, Y.; Postel, F.; and Van Effenterre, H.
1963 Géographie préhistorique de la région de Mallia. Pp. 28–53 in *Fouilles exécutées à*
- Mallia: Site et nécropole 2*, eds. H. Van Effenterre and M. Van Effenterre. Études crétoises 13. Paris: Geuthner.
- Dikaïos, P.
1969– *Enkomi 1948–1958*, Vols. I–IIIb. Mainz am Rhein: von Zabern.
- Dothan, T. K., and Ben-Tor, A.
1983 *Excavations at Athienou, Cyprus, 1971–1972*. Jerusalem: Hebrew University.
- Forbes, H. A., and Foxhall, L.
1978 The Queen of All Trees: Preliminary Notes on the Archaeology of the Olive. *Expedition* 21: 37–47.
- Gelb, I. J.
1965 The Ancient Mesopotamian Ration System. *Journal of Near Eastern Studies* 24: 230–43.
- Georgiou, H.
1979 Relations between Cyprus and the Near East in the Middle and Late Bronze Age. *Levant* 11: 84–100.
- Gjerstad, E.; Lindros, J.; Sjoqvist, E.; and Westholm, A.
1934 *The Swedish Cyprus Expedition. Finds and Results of the Excavations in Cyprus 1927–1931*. Vol. 1. Stockholm: Pettersons.
- Hadjisavvas, S.
1989 A Late Cypriot Community at Alassa. Pp. 32–42 in *Early Society in Cyprus*, ed. E. J. Peltenburg. Edinburgh: Edinburgh University.
- Hansen, J.
1989 Botanical Remains. Pp. 82–93 in *Vasilikos Valley Project III: Kalavassos-Ayios Dhimitrios II: Ceramics, Objects, Tombs, Specialist Studies*, eds. A. South, P. Russell, and P. Schuster Keswani. Studies in Mediterranean Archaeology 71(3). Göteborg: Åströms.

- Helbaek, H.
1962 Late Cypriote Vegetable Diet at Apliki. *Opuscula Atheniensia* 4: 171–86.
- Holmes, Y. L.
1971 The Location of Alashiya. *Journal of the American Oriental Society* 91: 426–29.
1975 The Foreign Trade of Cyprus during the Late Bronze Age. Pp. 90–110 in *The Archaeology of Cyprus. Recent Developments*, ed. N. Robertson. Park Ridge, NJ: Noyes.
- Humphreys, S. C.
1969 History, Economics, and Anthropology: The Work of Karl Polanyi. *History and Theory* 8: 165–212.
- Johnson, G. A.
1973 *Local Exchange and Early State Development in Southwestern Iran*. University of Michigan Museum of Anthropology Papers 51. Ann Arbor: University of Michigan.
- Karageorghis, V.
1974 Chronique des Fouilles et Découvertes Archéologiques à Chypre en 1973. *Bulletin de Correspondance Hellénique* 98: 821–96.
1984 New Light on Late Bronze Age Cyprus. Pp. 19–22 in *Cyprus at the Close of the Late Bronze Age*, eds. V. Karageorghis and J. D. Muhly. Nicosia: Leventis.
- Karageorghis, V. and Demas, M.
1984 *Pyla-Kokkinokremos. A Late 13th Century Fortified Settlement in Cyprus*. Nicosia: Department of Antiquities, Cyprus.
1985 *Excavations at Kition V. The Pre-Phoenician Levels. Areas I and II*. Nicosia: Department of Antiquities, Cyprus.
1988 *Excavations at Maa-Palaeokastro, 1979–1986*. Nicosia: Department of Antiquities, Cyprus.
- Keatinge, R. W.
1974 Chimu Rural Administrative Centers in the Moche Valley, Peru. *World Archaeology* 6(1): 66–82.
- Keswani, P. S.
1989a Dimensions of Social Hierarchy in Late Bronze Age Cyprus: an Analysis of the Mortuary Data from Enkomi. *Journal of Mediterranean Archaeology* 2, 1: 49–86.
1989b *Mortuary Ritual and Social Hierarchy in Bronze Age Cyprus*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Michigan. Ann Arbor: University Microfilms.
1992 Gas Chromatography Analyses of Pithoi from Kalavassos-Ayios Dhimitrios. In *Kalavassos-Ayios Dhimitrios 1991*; A. K. South et al. *Report of the Department of Antiquities of Cyprus: 1992*.
- Knapp, A. B.
1979 *A Re-Examination of the Interpretation of Cypriote Material Culture in the MC III–LC I Period in the Light of Textual Data*. Unpublished Ph.D. Dissertation, University of California at Berkeley. Ann Arbor: University Microfilms.
1985 Alashiya, Caphtor/Keftiu, and Eastern Mediterranean Trade: Recent Studies in Cypriote Archaeology and History. *Journal of Field Archaeology* 12: 231–50.
1986a Production, Exchange, and Socio-Political Complexity on Bronze Age Cyprus. *Oxford Journal of Archaeology* 5: 35–60.
1986b *Copper Production and Divine Protection: Archaeology, Ideology, and Social Complexity in Bronze Age Cyprus*. Studies in Mediterranean Archaeology Pocketbook 42. Göteborg: Åströms.
1988 Ideology, Archaeology, and Polity. *Man* (N.S.) 23: 133–63.
1990 Production, Location, and Integration in Bronze Age Cyprus. *Current Anthropology* 31, 2: 147–76.
1992 The Sydney Cyprus Survey Project 1992. A Preliminary Season of Investigation in the North Central Troodos, Cyprus. *Old World Archaeology Newsletter* 16, 1: 7–15.
- Larsen, M. T.
1967 *Old Assyrian Caravan Procedures*. Istanbul: Institut Historique et Archéologique Néerlandais à Istanbul.
1976 *The Old Assyrian State and Its Colonies*. Copenhagen: Akademisk.
- Maddin, R.; Muhly, J. D.; and Wheeler, T. S.
1983 Metal Working. Pp. 132–38 in *Excavations at Athienou, Cyprus, 1971–1972*, eds. T. K. Dothan and A. Ben-Tor. Jerusalem: Hebrew University.
- Maier, F. G., and von Wartburg, M.-L.
1985 Reconstructing History from the Earth, c. 2800 B.C.–1600 A.D. Excavating at Palaeophos, 1966–1984. Pp. 142–72 in *Archaeology in Cyprus 1960–1985*, ed. V. Karageorghis. Nicosia: Leventis.
- Merrillees, R. S.
1974 *Trade and Transcendence in the Bronze Age Levant*. Studies in Mediterranean Archaeology 39. Göteborg: Åströms.
- Muhly, J. D.
1972 The Land of Alashiya: References to Alashiya in the Texts of the Second Millennium B.C. and the History of Cyprus in the Late Bronze Age. Pp. 201–19 in *Acts of the First International Cyprological Congress*, ed. V. Karageorghis. Nicosia: Department of Antiquities, Cyprus.

- 1982 The Nature of Trade in the Late Bronze Age Eastern Mediterranean: The Organization of the Metals' Trade and the Role of Cyprus. Pp. 251–66 in *Acta of the International Archaeological Symposium: Early Metallurgy in Cyprus, 4000–500 B.C.*, eds. J. D. Muhly, R. Maddin, and V. Karageorghis. Nicosia: Pierides Foundation.
- 1984 The Role of the Sea Peoples in Cyprus during the LC III Period. Pp. 39–56 in *Cyprus at the Close of the Late Bronze Age*, eds. V. Karageorghis and J. D. Muhly. Nicosia: Leventis.
- 1989 The Organisation of the Copper Industry in Late Bronze Age Cyprus. Pp. 298–314 in *Early Society in Cyprus*, ed. E. J. Peltenburg. Edinburgh: Edinburgh University.
- Muhly, J. D.; Maddin, R.; and Stech, T.
1988 Cyprus, Crete and Sardinia: Copper Ox-hide Ingots and the Bronze Age Metals Trade. *Report of the Department of Antiquities of Cyprus*: 281–98.
- Peebles, C. S.
1972 Moundville and Surrounding Sites: Some Structural Considerations of Mortuary Practices II. Pp. 68–91 in *Approaches to the Social Dimensions of Mortuary Practices*, ed. J. A. Brown. Society for American Archaeology Memoir 25. Washington: Society for American Archaeology.
- Polanyi, K.
1971 The Economy as Instituted Process. Pp. 243–70 in *Trade and Markets in the Early Empires*, eds. K. Polanyi, C. M. Arensberg and H. W. Pearson. Chicago: Henry Regnery. Reprint of 1957 Free Press ed.
- Runnels, C. N., and Hansen, J.
1986 The Olive in the Prehistoric Aegean: The Evidence for Domestication in the Early Bronze Age. *Oxford Journal of Archaeology* 5, 3: 299–308.
- Rupp, D. W. et al.
1984 Canadian Palaipaphos (Cyprus) Survey Project: Second Preliminary Report, 1980–1982. *Journal of Field Archaeology* 4: 133–54.
1986 Canadian Palaipaphos (Cyprus) Survey Project: Third Preliminary Report, 1983–1985. *Acta Archaeologica* 57: 27–45.
- Sahlins, M. D.
1972 *Stone Age Economics*. Chicago: Aldine.
- Schacht, R. M.
1981 Estimating Past Population Trends. *Annual Review of Anthropology* 10: 119–40.
- South, A. K.
1984 Kalavassos-Ayios Dhimitrios and the Late Bronze Age of Cyprus. Pp. 11–18 in *Cyprus at the Close of the Late Bronze Age*, eds. V. Karageorghis and J. D. Muhly. Nicosia: Leventis.
- 1989a From Copper to Kingship: Aspects of Bronze Age Society Viewed from the Vasilikos Valley. Pp. 315–24 in *Early Society in Cyprus*, ed. E. J. Peltenburg. Edinburgh: Edinburgh University.
- 1989b Building X at Kalavassos-Ayios Dhimitrios: A Cypriot Palace? Paper presented at the Ninety-First Annual Meeting of the Archaeological Institute of America, 1989.
- Stech, T.
1982 Urban Metallurgy in Late Bronze Age Cyprus. Pp. 105–15 in *Acta of the International Archaeological Symposium: Early Metallurgy in Cyprus, 4000–500 B.C.*, eds. J. D. Muhly, R. Maddin, and V. Karageorghis. Nicosia: Pierides Foundation.
- Swiny, S.
1981 Bronze Age Settlement Patterns in Southwest Cyprus. *Levant* 13: 51–87.
1989 From Round House to Duplex: A Reassessment of Prehistoric Bronze Age Society. Pp. 14–31 in *Early Society in Cyprus*, ed. E. J. Peltenburg. Edinburgh: Edinburgh University Press.
- Taylor, J. D-P.
1952 A Late Bronze Age Settlement at Apliki, Cyprus. *The Antiquaries Journal* 32: 133–67.
1957 *Myrtou-Pighades. A Late Bronze Age Sanctuary in Cyprus*. London: Headley.
- Todd, I. A.
1989 The 1988 Field Survey in the Vasilikos Valley. *Report of the Department of Antiquities of Cyprus*: 41–50.
- Van Effenterre, H.
1980 *Le palais de Mallia et la cité minoenne. Etude de synthèse II*. Roma: Ateneo.
- Veenhof, K. R.
1972 *Aspects of the Old Assyrian Trade and Its Terminology*. Leiden: Brill.
- Vermeule, E. T., and Wolsky, F. Z.
1990 *Toumb tou Skourou. A Bronze Age Potter's Quarter on Morphou Bay in Cyprus*. Cambridge, MA: Harvard.
- Weinberg, S.
1983 *Bamboula at Kourion: The Architecture*. University Museum Monograph 42. Philadelphia: University of Pennsylvania.
- Wright, H. T., and Johnson, G. A.
1975 Population, Exchange, and Early State Formation in Southwestern Iran. *American Anthropologist* 77: 267–89.