Intramuros: Investigating Relations between Cross-Industry Practices and Networks through Sixth Century A.D. Sagalassos

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Modern conventions in archaeological practice have defined and reinforced single-industry analyses. This is in part due to the sometimes overwhelming range and quantity of material culture unearthed by excavation, the analysis of which comes to be managed through divisions of labor according to materially defined artifact categories; for example, most projects have a ceramologist, alongside other specialists studying glass, metals, and bone. In the case of materials with large and highly diverse functional classes (such as ceramics), a project might have an even more refined set of specializations – specialists in building materials, amphorae, and table wares. To some extent, this is a highly practical approach, as materials have particular properties that affect how they are made, used, and valued. Additionally, professional expertise on the part of the archaeologists is time-consuming to develop, and the ever-growing bodies of literature appearing on these material classes requires and encourages a substantial degree of specialization within the discipline.

Yet these material-based artifact specializations reflect and promote a system of parochialization that privileges objects, materials, and technologies over archaeological and social context. Disconnected from the full assemblage of materials, these artifacts are only subsequently interpreted as collective corpora derived from archaeological contexts. While these methodological specializations are entirely pragmatic, it is vital to stress that such artificial subdivision does not fully represent how professional lives in the ancient world were experienced. The potential limitations of materially-defined research programs become apparent when we attempt to reconstruct the economic activities of a site, and this situation is exacerbated in the case of ancient cities. In such urban contexts, supporting specialized occupations and diverse economic activities, it is clear that artisans of all sorts were often part of the same local community; they in some cases inhabited shared neighborhoods and could be interconnected in myriad ways. This chapter investigates and traces those connections in an attempt to move us away from the partitioning of material culture studies to more context-led approaches.

I. Cross-Industry Studies and Network Thinking

One means of moving past narrow definitions of industry and focusing too specifically on single material classes is to consider issues of what has been called cross-craft, cross-industry, or multicraft approaches. These approaches delineate connections between different industries through the material record. While infrequently framed in explicitly ‘network’ terms, such modes of thinking about cross-craft relations are conceptually compatible with network-oriented approaches, and where these analytical frameworks have been combined they have proven to represent powerful interrogative tools with regard to craft contexts¹. Network studies, however, encompass a wide range of perspectives and methodologies (Purcell, *this volume*). Perspectives range from the highly

¹ Brysbaert and Vetters (2010), for instance, successfully applied such an approach for Bronze Age Mycenaean palatial workshops. See also, Rebay-Salisbury, *et al.* 2014.

analytical and quantitative to the largely metaphorical and conceptual, and the type of social study presented here lends itself to the latter. Given the incomplete nature of the archaeological record, variable preservation of the remains of different industries, and imprecise chronological schemas, quantitative and computationally analytic approaches (more familiar from network science) would here be largely inappropriate (for successful applications to more robust bodies of data, see e.g., Collar *et al.* 2015; Knappett 2011, 2013). The economic sociologist, M. Davern (1997) instead has outlined the intrinsic utility of the network metaphor as a means of explaining socio-economic behavior by focusing on four characteristics of the network: the structure of the network; the distribution of resources within the network; the norms and rules of behavior within the network; and the changing and dynamic nature of networks. Here, we follow Davern's approach, taking a qualitative approach that employs the metaphor of the social network in order to understand more comprehensively the structure of different types of socio-economic interaction at a local level. We do this through considering network topologies, directionality of resources, and historical trajectories of economic development.

Archaeologically Reconstructing Cross Industry Ties

Within this social network framework, evidence is used to reconstruct relationships between different archaeological contexts of manufacturing. Defining the 'nodes' and 'links' of these networks, however, presents a range of complications and challenges given the nature and limitations of archaeological data – challenges that warrant some elaboration. While the actions and social presence of individuals would offer a more refined 'node' of analysis, these are however very difficult to identify archaeologically. Consequently, the production sites, as the smallest archaeological contexts of analysis, are utilized as nodes and as material proxies for the associated workgroups. In considering the links between worksites, there are different ways of reconstructing these network connections from the archaeological record, and they (for the purposes of this discussion) might be distinguished by the direct or indirect nature of the evidence.

Indirect Evidence for Cross-Industry Ties

Some of the evidence for interaction among artisans working in different media might be considered 'indirect', in the sense that similarities in appearance are seen as reflecting a transmission of ideas between industries (McGovern 1989; Rebay-Salisbury, *et al.* 2014). This could be argued in instances of skeuomorphism, wherein objects are made in reference to or representation of products more commonly manufactured in another material (Knappett 2002; Blitz 2015). Such skeuomorphism has long been supposed between pottery vessels and metal plate by archaeologists working in the classical Mediterranean world; Vickers and Gill (Vickers 1994; Vickers and Gill 1994) have, for example, demonstrated morphological and stylistic parallels between ceramic table wares and silver and gold vessels, and Stern (1997) has demonstrated parallels between rock crystal and clear glass. Other such indirect evidence includes technological transfers based on design features observed in technologies of different industries (McGovern 1989). In these cases of indirect evidence, parallels are observed in the material record, but the socio-economic nature and intensity of that connection and transmission can typically only be inferred. The materially ephemeral nature of cross-industry encounters and the fact that information on products and technologies can be conveyed in ways that do not require direct social interaction make interpreting the dynamics of such connections challenging.

Direct Evidence for Cross-Industry Ties

There are also instances of more 'direct' material evidence for the relations between industries. 'Composite' objects, manufactured using multiple media, might be considered in these terms, but such direct material links can also be archaeologically observed, in some contexts, through instances of sharing or pooling, either by shared spaces, infrastructure, supply networks, raw materials, or tools. In these instances, which Shimada (2007) would refer to as 'multicrafting', direct material links

can be observed archaeologically and can be used to reconstruct relationships and scenarios wherein different parties and materials come together through the production process (for archaeologically identified case studies see Shimada 2007; Brysbaert 2014; Brysbaert and Vettters 2010).

Returning to the network metaphor, different types of archaeologically identifiable cross-industry interactions, based on either direct or indirect evidence, present different types of links between the workgroup nodes. Implied in the reconstruction of these links is inherent variability in the strength of connection and directionality of idea or material flow between workgroups. Using this network metaphor within a defined dataset, this paper attempts to investigate the material traces of cross-industry relationships in the ancient city of Sagalassos in order to reconstruct the extent and intensity of contemporary cross-industry relations during a period of significant urban economic transition – the sixth century AD.

II. Sixth Century Sagalassos (Asia Minor)

The ancient city of Sagalassos is situated in the western Taurus Mountains near the town of Ağlasun (Burdur Province, Turkey). Constructed atop a series of large terraces at an elevation of 1400 to 1600 meters a.s.l., the site's main occupation has been dated from the Late Achaemenid to the Middle Byzantine periods. The Roman imperial era city had elaborately decorated upper and lower agoras, equipped with *nymphaea*, a large public bath complex, a theater and stadium, several temples, and at least two pedestrian colonnaded streets. Such monuments embody much of the urban 'armature' typical of a large Roman city in the region (Parrish 2001). By the mid sixth century, however, the city had undergone some major changes in its organization. The area of the *bouleuterion* (located on the Upper Agora) had been converted into the forecourt of a large church (Talloon and Poblome 2016); the political character of the upper and lower *agorai* by this time had already taken on more commercial functions (Lavan 2006); the colonnaded street had received a sixth century renovation (Jacobs and Stirling 2017); and the *frigidarium* of the imperial bath complex was repurposed for communal dining activities (Rens and Waelkens 2011, 2012).

Alongside these monumental buildings, ample evidence has been collected with which to reconstruct the economic history of the city, particularly as concerns the notable presence of industry. This is most conspicuously concentrated for much of the city's history in its Eastern Suburbium, located to the east of the city's theater and along the only known cart road into the city. This suburban zone hosted a potters' quarter, active for nearly seven centuries, and most notably producing a red slipped table ware that has come to be called "Sagalassos Red Slip Ware" (SRSW), which was manufactured into the seventh century (for overview of typology and chronology, see Poblome 1999).²

In many respects, the urban developments witnessed at Sagalassos are in keeping with wider trends across Asia Minor. Late Antiquity, and especially the sixth century AD, has traditionally been viewed as a time of economic reorganization in the region, with urban development undergoing transformations related to population movements (Haldon 2006: 615), redefinitions of public and private spaces (Saradi 2006), shifting social expectations regarding urban zoning (Saliou 1994), and a marked increase in the use of 'spoliated' materials (Alchermes 1994). Industry has been interpreted as playing a critical role in these characterizations, with some industries moving into the central zones of the city, public streets and porticos encroached upon by workshop activities, and with monumental public buildings repurposed for industrial use (Zanini 2006; for regional overview of these trends see Murphy and Uytterhoeven forthcoming). While these patterns have been observed at cities across the region and can certainly be seen as beginning by the early fourth century, few

² Several other industries have also been presumed active in this suburban zone, including glass-making, stone-working and metal production, yet associated workshop contexts have not yet been found.

highly detailed analyses of the economic impact of these processes at the local urban scale have been conducted (for a good example of such a local study for Anemourion, see Russell 2002). Yet, by identifying and tracking ties between contemporary industries during this critical period in the reorganization of the Classical city, new perspectives on the nature, significance, and co-reliance of different types of industries within local economic development at this time can be proposed, yielding a more nuanced picture of urban innovation and economic resilience.

Indirect Material Evidence of Interactive Practices in Late Antique Asia Minor

Some of the evidence for the relationship between industries can be reconstructed from textual sources from the region. For instance, the fifth to seventh centuries funerary landscape of the city of Korykos (Cilicia) is perhaps best documented in this regard, recording a wide range of local trade titles (Trombley 1987). These craft occupations were typically defined according to service provided or product manufactured, with the latter also often further specifying the product function or material. Trombley (1987) used the diversity of trades at Korykos to highlight the specialized nature of the local work force, yet the range of titles also includes occupations that almost certainly manufactured so-called 'composite' products (i.e., objects made from multiple, different materials). Indeed, at Korykos, cutlers, glaziers, gem-engravers, goldsmiths, and fine woodworkers are all attested in the funerary record (Trombley 1987: 20-22), and all manufactured finished products either that would have required skill in working multiple media or that brought together multiple specialists in its making. Cutlers would have combined their blades with worked bone or wooden handles; carpenters often incorporated different types of inlay into the decoration of fine furniture; and gemstones were often set into items of metal jewelry. Such objects embody cross-industry production processes and highlight the organizational diversity of production activities in ways that sometimes frustrate archaeologically-defined, *etic* constructs of 'industries' based on narrow material categories.

Composite objects (e.g., knives with wooden and worked bone handles, enameled metal objects, stone sculpture with inlay) have been found at Sagalassos. Other types of 'indirect' evidence from the city also have been interpreted as representing an exchange of ideas between industries, based on similarity of style and imagery on products. Talloen and Poblome (2005), for example, have suggested that the inspiration of depictions on relief-molded sixth century pottery types derived from known examples of Sassanian metal plate. While these associations between objects suggest an exchange of ideas and imagery between materials manufactured in different media, the exact nature of the interaction between artisans, particularly those within the city, remains problematic. Consequently, the remaining discussion will focus on the material evidence of direct cross-industry relations.

Industry as Consumers

In contrast to 'indirect' visual references and stylistic influences in the skeuomorphic relationship between pottery and metal plate at Sagalassos (described previously), the link between industries can occasionally be directly observed in the material culture of workplaces. A study of tools found in the ceramic workshops of the city have highlighted the use of instruments made in a range of materials, including worked bone, metals, ceramics (Murphy and Poblome 2012). In many cases, these appear to be objects appropriated from the wider urban environment and employed in unconventional ways in the pottery workshops. For instance, hairpins and styluses appear to have been used as 'point tools', while iron knives were used as 'fettling knives' to cut slabs of clay (Murphy and Poblome 2012). The appropriation of widely available consumer goods for use in ceramic production appears to have been prevalent, and in most cases, these hand tools were objects that required minimal or no alteration to be employed for pottery making.

Occasionally, however, objects have also been found in the workshops that seem to represent a different type of consumer behavior. Such an argument might be made for a copper-alloy roulette wheel, found in the East Slope pottery workshop. This tool and its multiple parts seems to be specially designed for rouletting. At Sagalassos such specially designed tools may not have been restricted to pottery workshops. For instance, a small, hollow ceramic rod with a sheathing of glass wrapped around it, has been interpreted by Lauwers *et al.* (2007a) as a *mandril*, a rod used to manufacture glass rings and beads. The *mandril* itself was formed using Çanaklı clay, the same clay used in SRSW production at the site, and had been high-fired before the sheathing of heat-softened glass was applied. While no physical structures for glass production have yet been found at the city, it has long been argued that Sagalassos hosted a local glassworking industry from the Roman imperial to Early Byzantine periods, based on a combination of archaeometric evidence and identification of secondary production waste (Lauwers *et al.* 2007b). This *mandril*, however, offers direct evidence for relations between industries, either through the shared supply of raw clay or by the ceramic industry's supply of highly specialized tools for a glass maker. In the case of the latter, and considering the specialized nature of the tool, its manufacture undoubtedly would have required direct communication among artisans.

The appearance of other types of objects might offer different perspectives on consumer practices within production contexts. For instance, used cooking pots (with sooting) have been found in many of the workshop contexts (ceramic production, lime burning, smithing). As most of these workshops spaces lack clear domestic spaces, the presence of cooking implements offers insight into the rhythms of workshop life and the commensal nature of its work crews. Although the manufacturing sites of such cooking wares have not been identified archaeologically, the clays are provenanced to the central part of the Ağlasun Valley (Neyt *et al.* 2012). These used cooking pots have even been found within the table ware and molded ware workshops of the city (which lacked any other evidence of domestic dwelling), highlighting distribution and consumption patterns between differently specialized local ceramicists. In the case of one fine ware pottery workshop complex, a small hearth installation was also uncovered in a corner space, likely for food preparation. Other daily-life objects also appear in work contexts, including a locally manufactured molded lamp and an *oinophoros*, which were found in the floor-fill near an early seventh century limekiln in a former urban mansion (Uytterhoeven *et al.* 2014; Uytterhoeven 2009).

Considering these objects collectively, the connections they represent between industries raise some thoughts on dichotomies of work versus dwelling spaces and production versus consumption activities. The material links between these industries highlight different types of interaction that were embedded the day-to-day work practices were in wider society. Moreover, the role of these specialized crafts people as consumers of both special commissioned goods and everyday market goods highlights their contribution to wider consumer patterns within the Late Antique city.

Overview of the Worksite 'Network'

Numerous worksites have been uncovered at Sagalassos dated from the fourth to the early seventh centuries AD (Figs. 1 and 2). As regards direct evidence of cross industry relations throughout the city, the best-preserved and most conspicuous evidence for industry in this regard is found in contexts dated to these centuries, and particularly those dated to the sixth century AD. This is in part due to it being the final, extensive occupation at the site, which thereby privileges its preservation. For the sixth to early seventh centuries, we have a large corpus of workplace evidence across the ancient city for various types of metalworking, lime burning, ceramic production, commercial food production, and antler and bone working. While the physical evidence for these industries is sometimes patchy and variable, the contemporaneity of so many industries makes this a particularly useful corpus with which to investigate 'direct' cross-industry ties with which to consider the importance of those networks in relation to the changing sixth century urban environments.

Moreover, the early sixth to the early seventh centuries AD also brackets a period that is seen to be an important transition in the organization of Sagalassos' urban life, as reflected in the increased reliance of industry on recycled materials, the abandonment of public buildings of the earlier city, and in the closing of several fine ware ceramic workshops.

In assessing these remains, industrial activities appear across the city – in the baths, *agorai*, and in a large domestic mansion, and already by the late fourth century, ceramic production is observed both in the Eastern Suburbium and (for the first time in over four centuries) to the west of the Theater in the area east of the 'Neon' Library (Poblome *et al.* 2015). In general, then, industrial activities lack clear industry-specific patterning in their spatial distribution (Fig. 2). For instance, recycling industries of copper alloy and lead, as well as lime burning, appear in the eastern rooms of the public bath complex, while a smithy and possible bakery were uncovered just off the Upper Agora (Uytterhoeven *et al.* 2011; Poblome 2012). A deposit of worked bone waste was found in a room of the Macellum, suggesting a possible workplace in the vicinity sometime in the mid fifth to late sixth century (Richard and Kiremitçi 2006) and a large oven was found in another room of the building. Sixth century limekilns were found in a variety of locales, including in front of and within the North-East Building of the Upper Agora (Uleners and Altay 2009), and lime burning was documented in some of the pottery kilns in the Eastern Suburbium (Murphy and Poblome 2016). An early seventh century limekiln was also found in an atrium of what had been a large elite mansion (nearby sections of which had already been renovated for use as a hostel) (Uytterhoeven 2009: 442; Uytterhoeven *et al.* 2014: 376).

Looking at the distribution of these contexts, there is an impression of a rather messy dataset, based (in some cases) more on variability than on continuity within a materially-defined industry. Figure 3 offers a composite network view on the relationships between different (materially defined) industries and between the individual contexts of production; the links are based on all forms of material evidence (technologies, raw materials, artifacts found in the workplaces, spatial organization of workspaces). In outlining these connections as a heuristic exercise, some relevant observations nonetheless can be made. First, utilizing industry categories based on very general material classes provides only a very schematic outline of cross-industry links (Fig. 3, top). Yet, by employing more refined definitions of industries based on subtype of material being worked (e.g., fine versus cooking ceramic wares, copper-alloy *versus* iron *versus* lead metalworking), a more complex network topology emerges that demonstrates patterns in the nature of interaction and the directionality in the movement of goods and transfers of spaces (Fig. 3, bottom). This network therefore offers a more useful starting point from which to explore the qualitative features of these connections and the work practices that support them at Sagalassos. The interconnectedness among such different industries, which supplied different economic sectors, highlights the multifaceted nature of cross-industry work practices throughout the ancient city.

Moving In: From pottery to lime kilns

Some sets of relations between industries are also seen in chronological and spatial terms; for example, in consecutive occupation of workspace. This is most apparent in a ceramic workshop complex located in the Eastern Suburbium of the city (Murphy and Poblome 2016). This complex was composed of at least four architecturally independent workshop units operating into the sixth century. Shortly after the potters abandoned the complex (by the mid-sixth century), the workshops and their kilns were repurposed for lime burning. In this transfer, the kilns were renovated; the perforated floors used to separate the combustion and firing chambers of the simple updraft pottery kilns were removed, creating a single vertical shaft with a slight ledge upon which lime and fuel might be stacked. The lower stokehole of the kilns was filled and the lower tile floors were partially dug-out to create a small pit where ash might fall and be separated from the burned lime. The repurposing of the kilns appears to have been completed across the entire complex. Eight kilns were

found containing a thick lens of powdery lime across the interior (for example, see Fig. 4); in the inner rooms of the workshop, rubblestone from the nearby mountain screes were piled onto the workshop floor. Inside one of the kilns, a locally manufactured amphora and some complete SRSW vessels were discovered, likely used by the workshop to hold charcoal or loose lime, and discarded with the abandonment of the complex by the lime burners.

In this scenario of sequential occupation, workshop spaces appear to have been transferred as a single property between workgroups. The workspaces seem to have been little altered by the workers burning lime, and indeed the smashed (yet reconstructable) vessels on the floor and associated with the pottery phase of occupation suggest that many of the remains abandoned by the potters were simply trodden over by the latter group. Indeed, the occupational activity seems to have focused on the use of the kilns, themselves.

From a cross-industry perspective, this repurposing of kilns demonstrates a detailed knowledge of pyrotechnologies (recognizing the continued utility of these kilns in sustaining the long, slow firing necessary for slaked lime), and a laborious yet technologically strategic overhaul of the workshop kilns soon after the potters moved out. The conversion of furnaces has also been found in the pottery workshops east of the Library where two pottery kilns showed similar evidence of lime burning in their final, early sixth century, phase of use (Poblome *et al.* 2015, 230-1). The repetitive occurrence of these renovations at different workshop sites at Sagalassos suggests that this infrastructural repurposing fits into a pattern of reuse (from pottery to lime firing) and maintenance of technological knowledge in the early to mid sixth century city.

Organized Multicrafting: Shared Spaces

In the network of sixth century industry at Sagalassos, another type of cross-industry connection is observed in the tight cluster of spatial links among the worksites found in the Roman Baths complex. In this once large public building complex, we can trace instances in which multiple industries were working alongside one another; that is, the concurrent operations of multiple crafts by different individuals or groups within the same or adjacent spaces or what Shimada (2007) would describe as 'multicrafting'.

In the eastern *frigidarium* of the baths, which had already been renovated in the early sixth century for communal dining, the remains of two furnaces with lenses of lime were found in the center of the eastern wing of the room (over an in-filled pool). The two limekilns were preserved at the lower courses and floor, and were encircled by several copper-alloy (likely bronze) working furnaces situated in the surrounding niches (Fig. 5). Both the lime and metal melting furnaces were constructed of reused building tile and display similar (circular) vertical shaft designs. The copper-alloy areas also included fragments of *tuyères* fashioned from waterpipes and pieces of clay molds used to cast the melted metal. Chunks of charcoal were found affixed to thin pieces of partially melted metal. The baths building would have provisioned abundant materials that could be heat-treated to recover metal and lime. Architectural decorations, such as flooring or (white marble) wall revetments with bronze fixtures and plaques, were readily available in such a baths complex, as were perhaps also the colossal imperial statuary that were found in the same room (Waelkens *et al.* 2010: 269). These statues were originally composite objects themselves – constructed of marble heads and limbs, with gilded bronze plated torsos – a mixed-media object perhaps befitting a multicraft organization in its recycling.

The appearance of such industry within a monumental public structure offers a stark juxtaposition of grand architecture and smoky deconstruction work, and similar late occupational contexts at other cities in Asia Minor have been cast as 'squatter' activities (Yegül 1986: 10). Yet the highly interconnected nature of this multicraft arrangement warrants further attention, as these

workspaces in the baths of Sagalassos represent a highly organized, and likely a *centrally organized*, operation involving numerous workers handling different types of material. The multiple limekilns of similar design and size suggest a high capacity of output; as one kiln was being charged, another could be cooled down. Multiple contemporaneous metal melting furnaces likewise suggest an intense effort with numerous groups working simultaneously within a shared space. This multicraft environment represents a particularly dense and entangled web of network connections that are expressed in the organization of space, materials, and likely labor. Indeed, it is conceivable that these groups could provide complementary work support for one another, particularly in the less specialized tasks in production (breaking apart of materials, stoking of the fires). What draws these crafts together is a common reliance on mining the building for materials, and the similar subsidiary resource needs of pyrotechnological industries that rely on charcoal fuel to feed their furnaces. Moreover, the physical process of deconstruction (whereby metal fixtures needed to be removed from the stone and *vice versa*) created a symbiotic relationship in which the waste of one industry was the complementary raw material of another.

The concentration of lead cuttings (Fig. 6, left) found in another room of the baths may, in this respect, represent a slightly different relationship with the other two industries located in the complex. Situated nearby in a narrow service room originally intended to stoke the fires of the hypocaust furnaces of the central *caldarium*, dozens of pieces of cut lead were discovered in 2009 (Claeys *et al.* 2009). While it is possible that these fragments represent the remains of some sort of construction activity or a collection of used lead pieces (for instance collected from window panes), considering the activities documented in the nearby rooms, these might also be seen as recycling operations, perhaps of lead fixtures and pipes removed from the water heating system. Lacking any sort of drippings (associated with soldering) and using the classification of tool cut marks on lead developed by Duvauchelle and Monteix (2013) in their study of lead working at Pompeii, it is possible that this space was dedicated to melting and recasting lead – perhaps even in the shape of lead ingots of the sort found on the North-South Colonnaded Street of the city in a sixth century deposit (Fig. 6, right).

The baths industries were reliant on recycled stone and metals, and reused brick and waterpipes (likely also retrieved from the disused building) were used to construct their furnaces when most of the shell of the building was still intact. Yet many of the other, expendable raw materials were acquired in traditional ways that utilized supply networks sustained by long-running industries, such as ceramic manufacturing. This is most clear in the use of clay in the casting of copper alloy in the bath workshops. The fragments of gray clay have been identified as deriving from the Çanaklı Valley, and they match the clay source employed by the SRSW industry (i.e., these clays were used to manufacture the city's table ware throughout its seven centuries of production) (Degryse and Poblome 2008; Degryse *et al.* 2008). This copper-alloy casting site was accordingly being supplied its clay through the same networks as the pottery workshops operating in the city. What is perhaps most remarkable about this sharing of supply chains is that this particular clay fabric was transported to the city from a valley situated over eight kilometers from Sagalassos and several hundred meters below the city (in the lower valley systems of Sagalassos' ancient territory). The copper-alloy recycling industry was employing these particular clays despite the presence of several nearby clay sources, even located in the city itself (Degryse *et al.* 2008). As regards fuel sources, paleoethnobotanical analyses of the fuel from these contexts are less refined than those of clay sourcing. Yet the current state of analysis of the charcoal also suggests that industries across the city at this time were commonly reliant on the same ratios of cedar, pine, and oak that had long been supplying the city, while palynological results suggest some changes to the wooded slopes around Sagalassos in the fourth century (Vermeere *et al.* 2003). Together, these data support a view that these demolition works and recycling industries, while reliant on recycled materials, were likewise connected to and helping to maintain regional supply networks.

While the scale of these industry activities is striking, the presence of so many recycling industries involved in the simultaneous mining of materials from the former public baths may be interpreted by some as an unrestricted, opportunistic economic extraction. Yet, considering the intensity of these interactions, their organization is unusual for the city at the time and suggests that it may have been coordinated. Moreover, recycling of copper-alloy (and possibly lead) is likely indicative of the lack of regional availability of these ore sources in the territory of Sagalassos and, as a practice, their recycling had had a long history at the city (as evidenced by isotopic analyses of such materials). In fact, in the case of architectural lead, isotopic compositions from all periods of occupation at Sagalassos (even the Hellenistic and high imperial periods) suggest a high degree of mixing of materials from multiple sources (i.e., an indirect indication of recycling) (Degryse *et al.* 2009). A similar scenario can be suggested in the case of glass working at the site. The vast majority of glass throughout the Roman and Late Antique periods was manufactured from raw materials acquired from Egyptian and Syro-Palestinian sources (Degryse *et al.* 2009). In this respect, recycling of bulky, non-local raw materials derived from sources well beyond the territory of Sagalassos, has a deeper history at the site. Yet, while recycling of raw materials (metal, stone, etc.) as an economic practice can hardly be said to uniquely characterize the sixth century, the scale of the recycling works in the former baths complex at this time highlights the unique character of this multicraft work organization.

Cross-Industry Relations: Networks and Economic Development in the Sixth Century

The Late Antique phases of many cities across Asia Minor have come to be characterized by changes in urban organization, and industry has prominently featured in this discussion, both in terms of the rise of recycling activities and in terms of its appearance in what in earlier times would have been unexpected public places (monumental buildings, public porticoes). While often couched in narratives of economic ‘decline’ or technological ‘stagnation’, this network approach by contrast takes a more nuanced and highly localized view on these large-scale processes of urban economic development through the local craft people of sixth century Sagalassos. This raises the question: what do these observations regarding networked industries have to offer to our understanding of the Late Antique urban economy at Sagalassos that might otherwise be missed by single industry studies?

First, this network approach highlights how widespread industry was throughout the city at this time, and how interconnected these craftspeople were through multiple ways (exchange of products and materials, as well as sharing of infrastructure and spaces). Using the structure of the network and strength of these connections as entry points to explore these relationships brings to life the types of daily work practices in the city at the time that reinforced these connections. The archaeological reconstruction of these practices also highlights the role of local producers, being not only engaged in recycling activities and reusing materials (activities often characterized as being derivative), but also as being actively involved in exchange as consumers of both specially commissioned and general market goods, as well as regionally traded raw materials. This engagement suggests continued economic activity that was embedded in local and regional socio-economic networks and established work practices.

Second, the spatial clustering of these inter-industry links also calls attention to the rather unusual nature of the operations found in the Roman Baths complex. Not only are these connections defined spatially (in their concentration and arrangement), but the material record of the work practices that took place in those areas suggests an intense interaction. These were targeted operations that accumulated materials, such as copper alloy (and possibly lead), that had been imported from beyond the city’s hinterland for many centuries. The unusual strength of these connections conceivably reflects a high degree of organization in bringing together work crews trained in working

different materials. Various scenarios might be proposed for such an arrangement, including the rent or sale of buildings by imperial or civic authorities to private individuals, guilds, or civic decurions (Saradi 2006, 186-210), although based on the current evidence, it is difficult to speculate on the specific institutions or actors involved at Sagalassos.

Third, by employing the network metaphor to the datasets of this period, attention is drawn to certain patterns and intensities in industry entanglements. There are two industries in particular that stand out in this regard: lime burning and fine ware ceramic production. Both demonstrate a high degree of connectedness with other industries that is expressed in a wide range of material expressions (spatial, material, infrastructural) (Fig. 3, bottom). Each therefore warrants further discussion.

Lime burning was widespread across the city. The number of lime burning kilns dated to the sixth century is notable, and the growth of this industry is certainly tied to the building activities of the city and the architectural styles of the sixth century, which involved setting building tile and reused stone in a heavily applied lime mortar. This is not to say that lime burning was unique to this period; in fact, Roman imperial period lime burning has been observed in the Eastern Suburbium and in the late fourth century in the workshops located near the Library. Many of the limekilns dated to the sixth century, however, likely sustained early to mid sixth century building projects. New building projects included the church on the Upper Agora, a section of the fortification walls, as well as major renovations of existing structures, including domestic quarters in a (former) Urban Mansion complex. While the increased demand for lime may help to explain its prevalence in the dataset, the interconnected nature of its activities demonstrates their embeddedness in the local craft network. Such network entanglement may have encouraged the high degree of technological innovation and diversity of context observed with this industry. In general, lime burning appears in a wide range of contexts – from disused workshops to construction sites, demolition sites, and domestic contexts, and the kilns themselves are technologically diverse, with variation in the size, design, and construction materials of furnaces as well as with differential levels of infrastructural investment. This network approach offers new perspectives on some of the unusual features of this industry's organization.

The significance of the connections of the fine ware ceramic industry appears to present a different story. The continued presence of table wares, figurines, and other fine ware ceramics in contents associated with consumption and use (including the worksites described previously) demonstrates that Sagalassos continued to provide a local consumer base for the fine ware industry throughout Late Antiquity. Yet, in addition to the number and diversity of connections, what is particularly noteworthy in its cross-industry network is the directionality of those diverse connections, which tend to move goods and transfer spaces and infrastructure to other industries. The wider significance of the connections between the ceramic industry and others in the city may be evidenced in the case of regional supply networks that were still being maintained into the sixth century, particularly the eight-kilometer-long clay transport from Çanaklı, which (even in the most prosperous of Sagalassos' times) was beyond typical limits of catchment areas. In some sense, the degree of connectivity and directionality of resources perhaps reflect the role of this long-standing, archaeologically conspicuous, and thereby (presumably) economically significant table ware industry, which when studied in isolation in the mid sixth century appears to have been downsizing, yet still demonstrated a high degree of product specialization and continuity in ceramic forms and technical execution. Thus, the ceramic industry at the site seems to have provided an economic 'anchor' for other industries of the city during this time of transition. This was perhaps not so much due to its scale of production (which by the late sixth century appears to have begun to dwindle), but rather due to its socio-economic relationships that were founded on more than seven centuries

of craft tradition, sustained through regional transport and supply networks, technological knowledge and investment, and an established local consumer base.

Conclusion

This chapter has used the case of Sagalassos as a means of interrogating the utility of the network metaphor for the study of local cross-craft relations. Production studies in the last decade have begun to expand the ways in which they approach the study of craft production and how they socially frame these types of economic activities. Drawing together two current bodies of scholarship – network thinking and cross-industry studies – this exercise gives pause regarding our *etic* archaeological categories in archaeological analyses of economic organization. It is clear in tracing the connections between work contexts that there were numerous ways in which industries interacted with one another in the past and variable material expressions of that interaction. Moving between the pragmatic divisions of study reinforced by specialized archaeological practitioners and approaches that emphasize the interconnectivity of production activities within a local community, this study has brought to life work practices and the roles of different industries within the city's economic organization that might otherwise have been overlooked in single industry studies. By exploring the topologies of these networks and the types of connections therein, rather than offering a new economic history of Late Antique Sagalassos, this study instead serves as a means of socially reframing the data for the period in new ways that provide a fresh lines of research.

Figures

Figure 1. Listing and chronology of Late Antique industry worksites

Figure 2. Map of Sagalassos indicating location of worksites

Figure 3. Schematics of the sixth century inter-industry connections observed archaeologically at the worksites of Sagalassos: general classification of industries (upper image) and a more specific classification of industries and types of connection (bottom image)

Figure 4. Pottery kiln converted for lime burning

Figure 5. Bath complex plan (left image) and aerial photograph of lime burning and copper-alloy work areas (right image)

Figure 6. Remains of lead cuttings from service rooms of bath complex (left image) and a lead ingot from a sixth century context on the Colonnaded Street (right image)

All images are provided by the Sagalassos Archaeological Research Project.

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