Micromorphological Analysis of Activity Areas Sealed by Vesuvius' Avellino Eruption: The Early Bronze Age Village of Afragola in Southern Italy

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Dedicated to my husband,

the memory of my mother Ines Zampicinini

and the memory of Professor Robert Dewar, my first mentor

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Chapter 1
Introduction

This study investigates site occupation intensity, human activities, and site function at Afragola, an Early Bronze Age village in southern Italy (Fig. 1.1). The identification of activity areas and site occupation intensity through the microscopic analysis of intact archaeological deposits processed in petrographic thin sections (e.g., soil micromorphology) will assist in the reconstruction of past household economic and social organization in early Bronze Age communities. Soil micromorphology allows the high-resolution analysis of microscopic properties, such as the composition and mutual physical arrangement of artifactual and bio-archaeological constituents of undisturbed archaeological deposits. The soil micromorphology analysis of floors and occupation deposits allows the high resolution description of the interaction of cultural and natural depositional and post-depositional processes and ultimately the recognition of past human activities (Courty et al., 1989).

Afragola is remarkable for its preservation that is matched by only a few archaeological sites in Europe. This site has been called the "New Pompeii," as it was protected by almost 1m of volcanic ash deposited during the eruption of Mount Vesuvius in 3945+10cal BP, 1995+10cal BCE (Fig. 1.2). Afragola boasts a large number of well-preserved structures, built features, material culture, and organic materials. The archaeological record at the site places Afragola in the Early Bronze Age (ca. 4,200–3,760 B.P.), a dynamic period marked in many parts of Europe by momentous socio-cultural change including increased agricultural production leading to a constant growth in population, crafts, manufacturing, and trade (Harding, 2000, Heyd, 2013, Earle and Kristian, 2010). These economic achievements and innovations led to a more complex social organization (Harding, 2000, Earle and Kristian, 2010). Because of the superb quality of its remains, Afragola provides an excellent opportunity

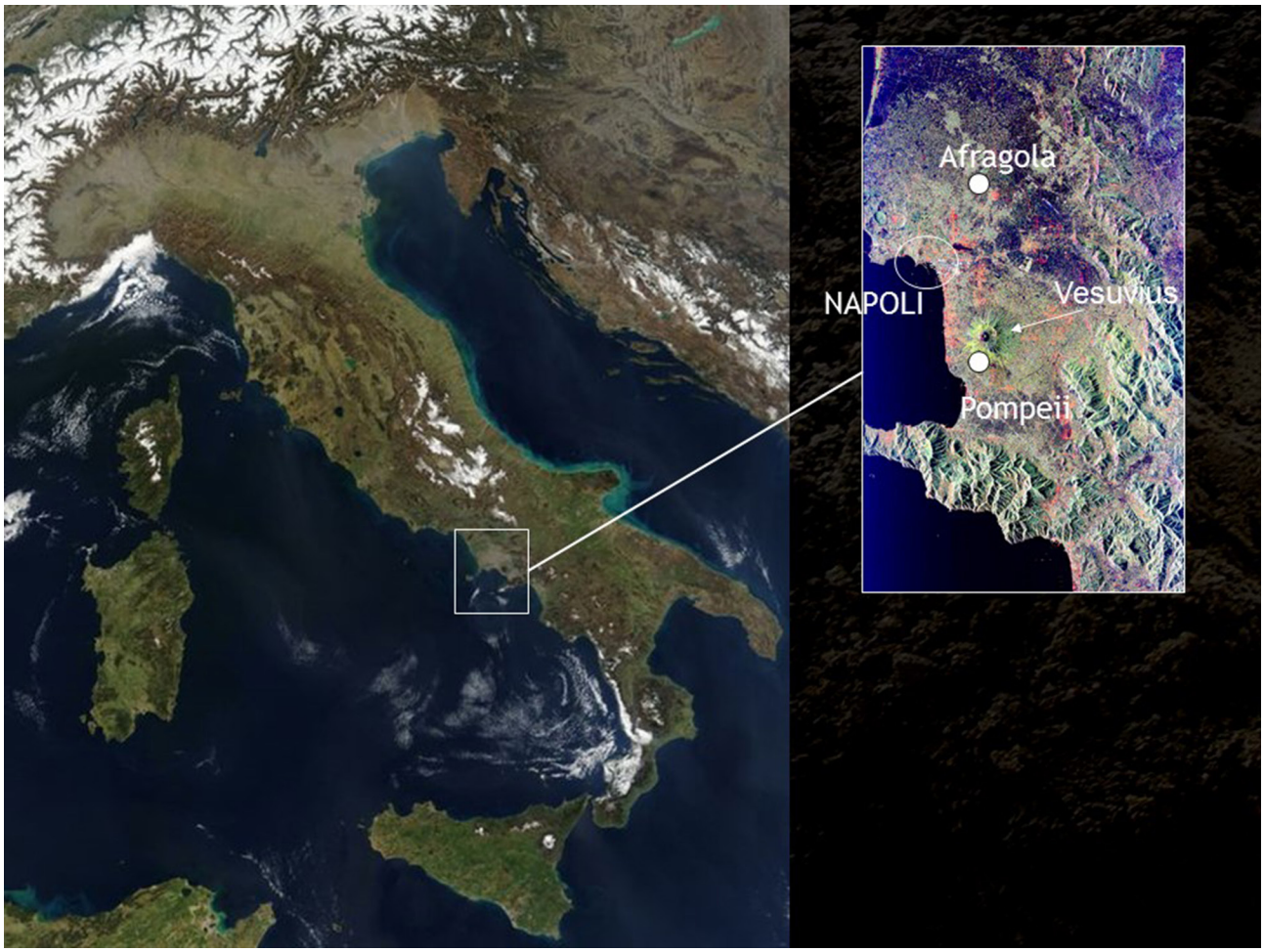
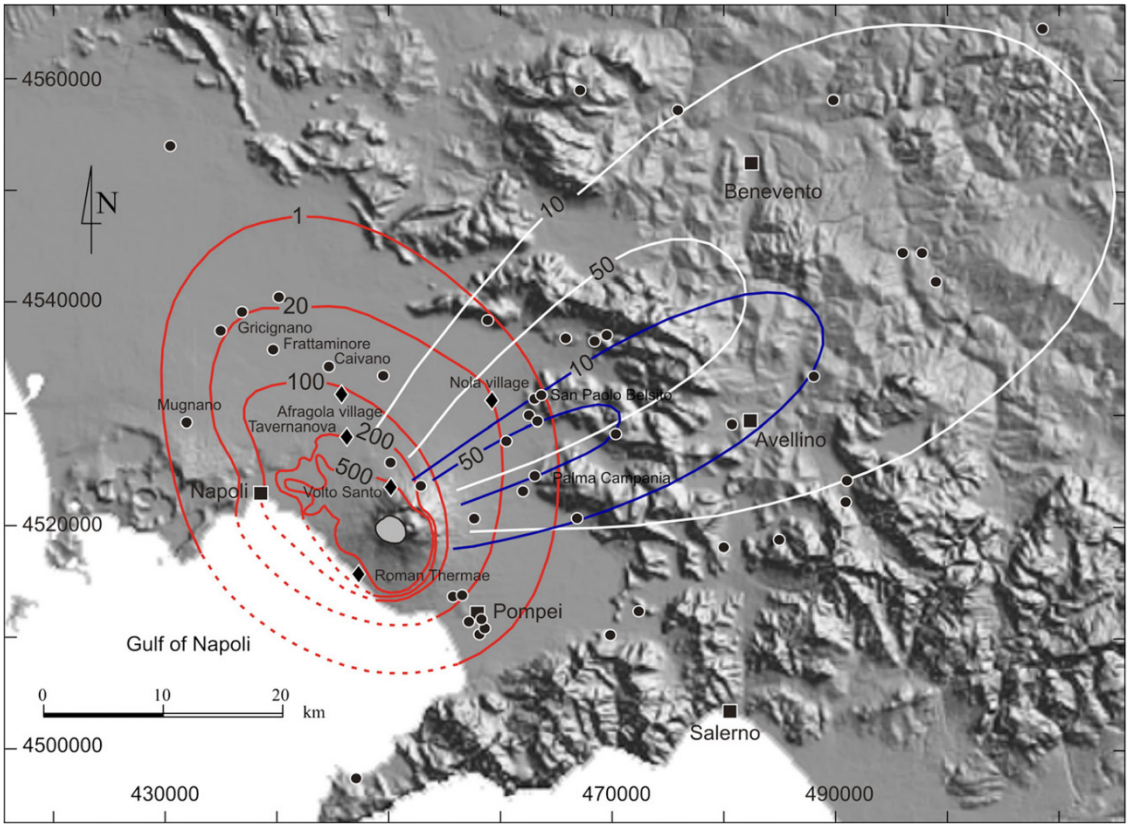


Figure 1.1. Afragola is located on the Campania Plain in southern Italy.

a.



b.

Britain	Start	End
Beakers	2450	1700
Early Copper (MA I–II)	2400	2150
Migdale (MA III)	2200	1950
Food Vessels, Collared Urns (MA IV–V)	2100	1500
Acton Park, Taunton	1770–1350	1380–1210
Penard	1380–1210	1220–1080
Wilburton	1220–1080	1100–960
Blackmoor	1100–960	1000–860
Ewart Park	1000–860	880–750
Llyn Fawr	880–750	
France		
Early Bronze Age	2300/2200	1600/1500
Middle Bronze Age	?1800/1700	1500/1400
Bronze final I–II	1400	1200
Bronze final III	1300	800/700
North and central Italy		
Beakers	2550	1800
Polada	2400	1400
Apennine	1690	660
Late Bronze Age	1500	1140
Protovillanovan	1430	660
Spain		
Argaric Bronze Age, motillas	2300/2250	1600/1500
Middle–Late Bronze Age	1600/1500	1300
Bronce Final I	1250	1100
Bronce Final II	1100	940
Bronce Final III	940	750
Iron Age (Hierro)	800	
Central Europe		
Bell Beaker/Corded Ware		2000
Singen (Br A1)	2200	2000/1950
Bodman/Schachen, Zürich-Mozartstrasse (Br A2)	2000/1950	1600/1500
Tumulus Bronze Age (Br B–C)	1500	1300
Br D	1400	1200
Ha A1–A2	1250	1050
Ha B1	1100	1000
Ha B2/3	1050	750
Ha C	750	
Scandinavia		
Late Neolithic II	1920	1730
Period I	1730	1510
Period II	1500	1250
Period III	1440	1040
Period V	850	760

FIGURE 1.2. (A) RELIEF MAP OF THE CAMPANIA REGION AND DISTRIBUTION OF THE POMICI DI AVELLINO DEPOSITS. ISOPACHS IN CM: BLUE=EU2; WHITE=EU3, RED=EU5. LIGHT-COLOR GREY AREA=INFERRED VENT. SYMBOLS: DIAMOND=SAMPLING SITE; DOT=ARCHAEOLOGICAL SITE (BRONZE AGE) (MODIFIED AFTER DIVITO ET AL., 2009); (B) RADIOCARBON CHRONOLOGY FOR BRONZE AGE EUROPE; (from Harding 2000).

to investigate the socioeconomic organization of a small village during the Early Bronze Age period in the Campania region. Through the identification of the spatial distribution of archaeological and micro-archaeological remains, it is possible to understand the organization of every-day life for the inhabitants at the village with a high degree of temporal and spatial resolution.

Background to research

Mediterranean bronze age

During the third and second millennia BCE state societies existed in western Asia and Egypt, while state-level palace civilizations emerged in Crete and mainland Greece during the second millennium BCE (Harding 2000; Knapp 1993; Kristiansen and Larsson 2006). In southern and central Greece the growth in population is seen in the building and enlargement of the new urban centers and the fortification of smaller centers often close to the coast. In western Europe, the Early Bronze Age is characterized by increased social complexity, the movement of human settlements to more fertile agricultural areas,

the beginning of labor specialization, and arguably, an increasingly stratified social system (Harding 2000) (Fig. 1.2). It is generally accepted that highly complex and dynamic systems of communication and exchange appear around the Aegean between 2,500 and 2,200 BCE. This is accompanied by emergent social hierarchies, the rise of an elite class, a division of labor, a system of redistribution, social storage, the manufacture of prestige goods. In the Aegean these changes are associated with the Early Bronze Age (EBA) (Heyd, 2013). However, in other areas of the Mediterranean basin, including southern Italy, the Bronze Age did not begin until the final centuries of the third millennium. Southern Italy, the Balkans and the south central Mediterranean (especially Sicily, Malta and Apulia) did have an exchange relationship with the Early Bronze Age Aegean network, but otherwise, much of the Italian peninsula was comprised of largely self-sufficient Neolithic-Chalcolithic villages in which social differentiation and wealth accumulation were minimal and evidence of metallurgical production was found only on a small-scale or household level (Mathers and Stoddart, 1994).

Unlike the Balkans where prestige goods emerged during the EBA, fewer prestige goods have been found on the Italian peninsula. Precious metals are rare, and thus, there is no direct evidence for local elites. In the central and southern Italian peninsula most individuals were buried in communal graves in natural and artificial caves, grave goods are absent or utilitarian in nature and dating is difficult (Maran, 2007). The current consensus on the social development of the Italian Peninsula is a continuous development from south to north and east to west, with a culturally regionalized background. The influence of the Aegean EBA culture is apparent in Sicily (Castelluccio culture) by 2,500 BCE, and occurs slightly later along the Adriatic coast of Italy (2,400 BCE), northern Italy (2,300 BCE) and the western part of the Italian Peninsula (2,200 BCE) (Heyd, 2013).

Early Bronze Age in the Campanian Plain (Facies of Palma Campania)

The *Palma Campania* culture emerges at the end of the third millennium and is representative of the Early Bronze Age in the ancient Campania region of southern Italy. The Palma Campania *facies* can be recognized by its distinctive pottery which appears on the Campanian Plain from approximately 4,000 to 3,110 cal BP (Albore Livadie, 1999). Several Palma Campanian sites are located within a 25 km radius of Vesuvius and all were completely buried by the Avellino eruption in 3945+10cal BP, 1995+10cal BCE (Fig 1.2)(Albore Livadie, 1996, Giardino and Guida, 2006, Albore Livadie, 1999, Albore Livadie, 2008, LaForgia, 2011).

The volcanic ashes of the Avellino eruption buried villages like the archaeological site of Pompeii, and fossilized entire landscapes, including cultivated fields, fences, pathways, footprints and wagon tracks. In recent years, new excavations have revealed several new villages from the Palma Campania culture. Several villages are found in the area of the modern city of Nola and in the Sarno River valley on the outskirts of Mount Vesuvius, including Afragola, the subject of this study (Fig. 1.3).

When compared to other parts of the Mediterranean region, the EBA of the Campania region appears more closely related to late Neolithic cultures than EBA cultures elsewhere. The shift to a more complex socio-economic system may not occur until later in this region, perhaps during the Middle Bronze Age after Campanian villages were reconstructed following their destruction by the Avellino eruptions (Barfield 1994; Earle and Kristian 2010; Harding 2000; Peroni 1989).

The Facies of Palma Campania is an archaeological culture of the EBA in the Campania region characterized by pottery style and decoration. Continuity in pottery styles have lead some scholars (Albore Livadie 1999; Fedele 2007) to argue that the *Facies of Palma Campania* originated locally from a version of the preceding Eneolithic cultures, especially the Laterza culture.

The *Facies of Palma Campania* culture owes its name to the locality in which it was first discovered. The first Bronze Age settlement, Palma Campania, was discovered in 1972 during the construction of the Caserta-Salerno motorway. The excavations exposed the remains of a building containing a large number of ceramic vessels (n~130). The vessels were in remarkable condition. They exhibited smooth external surfaces, some of which were polished and a variety of decorations (i.e., double rows of angular incisions, digital impressions). Over the course of the excavation, more than 80 cups of various sizes and shapes, jugs, mugs, bowls, and large containers were found (Albore Livadie, 2008). The single building excavated at the site of Palma Campania likely represented a storage area for pottery vessels rather than a domestic building (Albore Livadie and Vecchio, 2005). The ceramics of the *Facies of Palma Campania* culture are made of local clay mixed with volcanic materials (*pyroclastite*) as tempering agents (Albore Livadie, 1999). Several pottery forms are typical of *Facies of Palma Campania* including cups (*tazze emisferiche and carenate*), bowls, some with large handles (*scodelle troncoconica and olle biconiche)* and vases, some in the shape of an hourglass with a base (*sostegno a clessidra*). Some vases were used to boil food and equipped with lids. This form first appears in the EBA and continues in use into the Middle Bronze Age (Albore Livadie, 1996). Ceramics comprise a ubiquitous part of the material assemblages of the Campanian villages. At Nola almost 100 vases were found in only two structures. Some of the forms are unique and there is significant variation in decoration and composition (Albore Livadie and Vecchio, 2005) .

The emergence of the *Facies of Palma Campania* culture coincided with one of the most pronounced arid phases on the Holocene (4,000 BP)(Combourieu-Nebout et al.,

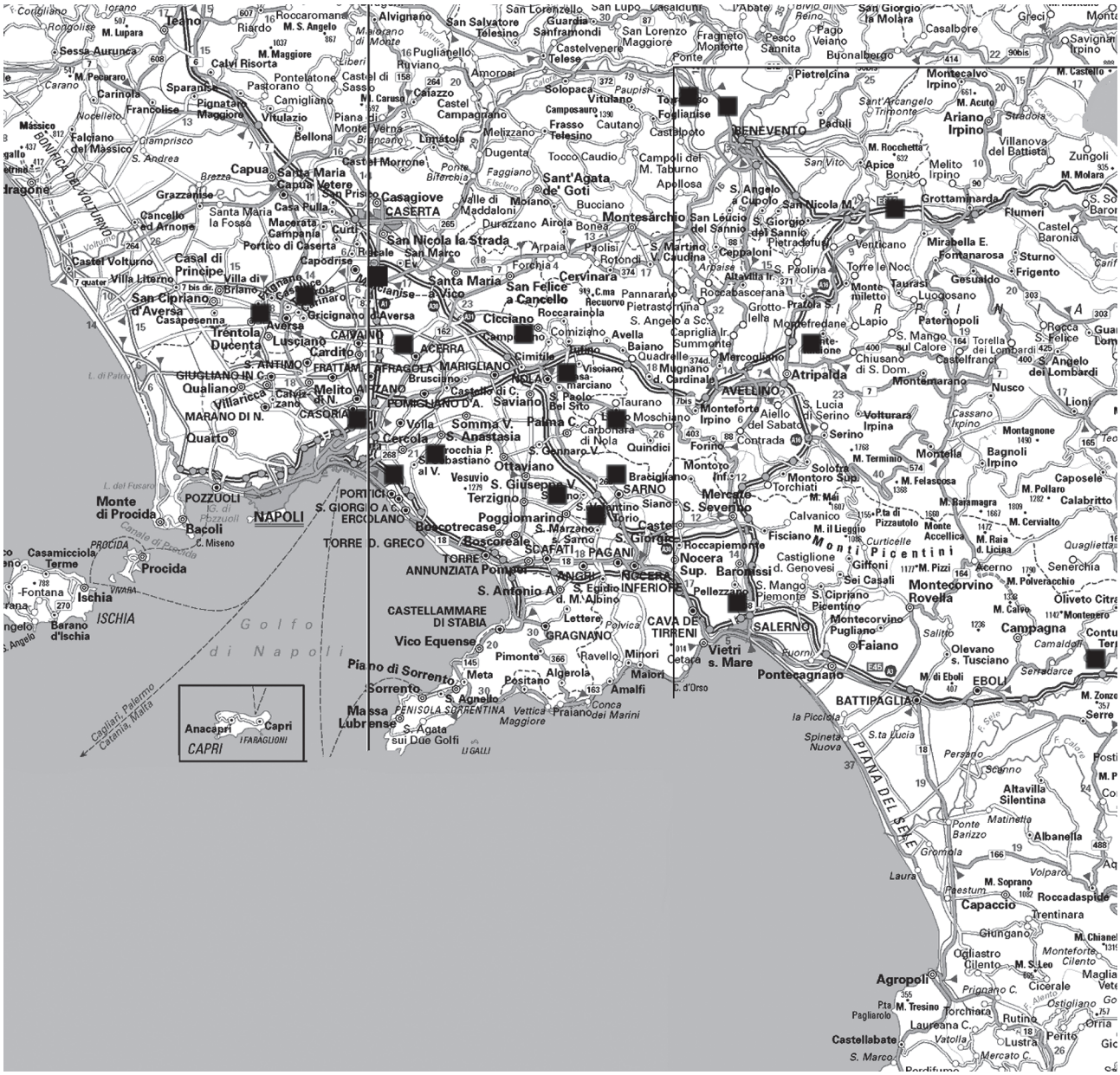


Figure 1.3. Selected Early Bronze Age sites in the Campanian region. Palma Campania – Gricignano di Aversa – Grotta dello Zachito (Caggiano) – Nocera; Ercolano – Paestum; Anfiteatrol – Vinchiaturo - Avella: località Fusaro – S. Paolino; Bosco del Castello – Ponte Medioevale – Sant'Anastasia – Ottaviano: località Zabatta – Montoro Inferiore: località Figlioli – Avellino: località Cava dell'Arciprete – San Pietro – Torre d'Elia (Mirabella Eclano) – Casamarciano: località Oreale – San Paolo Belsito – Livardi, Liveri – Nola – Saviano – Taurano - Frattaminore, Aversa – Foglianise: località Santa Maria a' Peccerella – Afragola (after Albore Livadie 1996).

2013). Compared to today's environment, the temperatures were colder in the winter, cooler in the spring, hotter in the summer and warmer in the fall (Albore Livadie et al., 2005, Albore Livadie, 1996). During the EBA, the humid lowlands of the Campanian Plain would have been covered by meadows and pastures, and surrounded by wooded slopes of alder, beech, and oak and highlands of pine and birch. The plain was well suited for agricultural activity as evidenced by domesticated fruit and nut trees such as hazelnut, fig, almond, and abundant cereal crops (Albore Livadie, 2008, Albore Livadie, 1996).

Archaeological evidence from the Campanian Plain suggests that the region was occupied by scattered small sedentary villages during the Early Bronze Age. Most domestic structures are shaped like horseshoes with a curved area called the apse and a flat side where the only entrance was located. The orientation of the structures is most often NW/SE related to the predominant direction of the winds in the Campania Plain. The walls are made of intertwined wood and reeds supported by small and large poles (about 25cm in diameter); the former are located mostly along the sides of the structures and supported the walls (LaForgia, 2011). Floors were not constructed, and the interior walls of structures were plastered in only a few settlements (e.g., Nola)(Albore Livadie and Vecchio, 2005). A detailed study of the imprints of the thatched roof and walls on the volcanic tuff suggest that thatched roofs extended all the way to the floor like a tent (Albore Livadie et al., 2005, Divito et al., 2009). The domestic

Figure 1.4. Chronology of Copper and Bronze Age Cultural phases of Italy (After Malone et al., 1994, Harding, 2000).

Period	**Cultural Groups**						**Dates BCE approx.**
	Northern Italy	**Central Italy**	**South Italy**	**Lipari**	**Sicily**	**Malta**	
Copper Age			Gaudo		Serrafelicchio	Zebbug	3,500-2,500
			Piano Conte	Piano Conte	San Cono	Ggantija	
					Piano Notaro	Saflieni	
						Conca d'Oro	
	Beakers	Beakers	Gaudo	Piano Quatara	Malpasso	Tarxien	2,500-2,000
		Laterza Rinalsone	Laterza		Sant'Ipolito		
			Proto-Apennine A		Moarda		
					Beaker		
Early Bronze Age	Beakers	Beakers	Palma Campania	Capo Graziano	Castelluccio	Tarxien	2,000-1,400
	Polada	Laterza Rinalsone	Proto-Apennine B		Rodi-Tindari-Vallelunga	Cemetery	
	Fiave'				Morda		
					Monteaperto etc.		
Middle Bronze Age	Terramare	Proto-Apennine	Apennine	Milazzase	Thapsos	Borg in-Nadur	1,400-1,300
		Apennine					
Late Bronze Age	Peschiera	Sub-apennine	Sub-apennine	Ausonian I	Thapsos	Borg in-Nadur	1,300-1,200
Final Bronze Age	Protogolasecca	Protovillanovan	Protovillanovan	Ausonian II	Pantalica	Bahrija	1,200-900
			Calabrian Fossa graves		Cassibile		

structures found at Afragola, Nola, Frattaminore, and Palma Campania vary in size from 4 to 15m long and from 9 to 3m wide (Albore Livadie and Vecchio, 2005, Albore Livadie et al., 2005, Rossenberg, 2005 , Vecchio et al., 2010). At Gricignano located 15km north of Naples and about 30 km north of Mt. Vesuvius several structures are primarily rectangular in shape with curved apsidal ends (Sulpizio et al., 2010). They are quite large up to 28m long and 7m wide and were surrounded by smaller oval-shaped buildings. Smaller rectangular buildings are situated around the village (Divito et al., 2009).

None of the EBA villages structures found in the Campania Plain shows sign of fortification. Instead, the structures occur in clusters. Postholes indicate that fences were used, but only to divide internal spaces (Albore Livadie and Vecchio, 2005).

During the EBA mixed farming communities are dispersed across the Campanian region. Barker (1985) has suggested a mobile-sedentary economy, consisting of permanent villages dependent on a cereal economy in the lowlands and combined with seasonal transhumant caprine husbandry in

the mountains. Most EBA settlements are located at low altitudes, close to ancient or modern watercourses, likely because of a low water table and warm temperatures. The more isolated structures found at higher elevations were likely used only during the summer months to take the animals to greener and cooler pastures (Guzzo and Peroni, 1998). These upland hamlets likely represent seasonally splintered groups of the same community. The herds were likely moved to the mountain pastures during the summer and autumn when plants in the lowlands dried up from the heat and lack of water.

Most faunal assemblages from the EBA were dominated by caprines. Based on mortality data, animals in this period were raised for mixed use; cattle were used for meat, milk, and traction, while sheep were used for meat, cheese, whey and wool. Only pigs were bred purely for meat (Malone et al., 1994).

Evidence of cereal cultivation is found at the villages of Nola, Afragola, and Palma Campania. The Avellino eruption allowed for outstanding preservation of plant seeds,which were found embedded in the volcanic tephra. Wheat (*Triticum dicoccum, Triticum monococcum)* barley *(Hordeum vulgare)*, grapes and almonds were found at Nola (Albore Livadie and Vecchio, 2005). Although it is less common millet was also present at Nola (Albore Livadie et al., 2005).

In the Campania region, the EBA agrarian landscape is remarkably preserved due to the protection of the Avellino eruption. At Gricignano excavations revealed ploughed fields that included about 60 ha of organized fields cross-cut by a cart track. This is the largest field surface identified in Central and Southern Italy, and the oldest comprehensive agrarian system so far reconstructed in the country. The arrangement of fields differs from more recent systems documented in Northern Italy (Balista et al., 1998). Fields were generally elongated strips delimited by shallow gullies. The strips were grouped in lots defined by low banks and could exceed 600m in length. The size and orientation of the agricultural fields, as well as the direction of the cart tracks, changes from site to site, showing local adaptations of the general pattern (Saccoccio et al., 2013).

Studies conducted in Croce del Papa in Nola, "Fuggiaschi" di San Paolo Belsito, Gricignano, and several sites in the area around Nola, show that the *Facies of Palma Campania* villages were connected to each other by dirt tracks along which wagons travelled (Figs 1.1, 1.2, and 1.3). Some studies have suggested that the layout of the settlements indicates that some centers exercised control over others and that there was a hierarchy of sites (Fedele and Petrone, 2000). The settlements identified so far exhibit no evidence for defense, suggesting that if any hierarchy did exist it was free from tension or conflict. Increasingly detailed evidence from excavated sites in the region reveal evidence for homogenous everyday activities at these sites, and thus far have not presented clear evidence for site hierarchy.

The southern Italian peninsula lacks metal ore deposits, with the possible exception of the Calabria region and northeast Sicily. Therefore, any metal artifacts or raw materials would have to have been imported to the Campania region. The closest sources were in Tuscany, though they may have also had access to Alpine sources via the Adriatic route (Malone et al., 1994). Evidence for metal working and metal objects is rare in the Early and Middle Bronze Age across the Italian peninsula which limits our current understanding of the role of metallurgy and metallurgists (Guidi and Piperno, 1992). Toward the end of the Early Bronze Age metal objects were sometimes deposited in underground hidden caches (*ripostigli*). The *ripostigli* contained metal objects ranging from swords to adornments. They are most often found outside of inhabited areas and along commercial routes. The deposition of metal objects in these caches may explain why metal objects are rarely found in the Early and Middle Bronze Age villages of the region (Laforgia et al., 2007). In southern Italy the rare metal objects that are found often derive from individual tombs. The special depositional contexts and careful curation of metal objects in this region attests to their value in Early Bronze Age society.

Despite this, there is some evidence that metallurgy was occasionally practiced on the Campania Plain in the EBA. Recently, a non-domestic structure with a platform hosting five circular ovens was found at Nola Villaggio 2 about 300m from the main domestic structures. Slags and small bronze fragments indicate that it was a production locale (Albore Livadie et al., 2005). Also, some production structures including ovens and firing platforms were found at the site at Afragola TAV V/1 located one km SSE of the Afragola TAV V/17. No habitation structures have been excavated at the site, but it is possible that they exist (Nava et al., 2007). This could be a specialized processing site associated with a nearby habitation site.

No fibers have been preserved at the Campanian EBA sites. Wool is assumed to have been important based on the presence of senescent sheep at several sites (Albore Livadie et al., 2005). Imprints in the volcanic ash provide evidence for the manufacture of cordage, thread and baskets, but organic preservation is rare.

Recent finds at the sites of San Paolo Belsito, Gricignano and Aversa have enriched our knowledge of EBA burial practices in this region (Albore Livadie et al., 2007). Human burials were usually interred in extended or semi-flexed positions. At San Paolo Belsito large stones were used to mark grave locations. Offerings of domestic animals (i.e., fragments of ovicaprine and dog bones) and ceramic sherds were also commonly interred in graves at the site of San Paolo Belsito (Albore Livadie et al., 2007). One burial from Gricignano, stands apart from others in the region. A large grave was found with the remains of a child and a bronze dagger (Albore Livadie and Vecchio, 2005, Albore Livadie et al., 2005). This grave may indicate that some individuals with inherited social status during

the EBA; however stratigraphic and chronological issues suggest that the burial may actually derive from the Middle Bronze Age.

Some argue that the Bronze Age communities of southern Italy were not subject to sufficient pressure or stimulus to transform their society (Malone, et al. 1994). Evidence for settlement hierarchy and social differentiation from burial practices and material culture does not begin until the Middle of the Bronze Age in the Campania region (Cocchi Genick 1996; Kristiansen and Larsson 2006; Malone, et al. 1994; Mathers and Stoddart 1994; Vecchio, et al. 2010).

Research goals and expectations

This research seeks to identify the type and range of human activities undertaken at Afragola including the function of features and buildings and the intensity of site occupation. The ultimate goal is to situate these results within the broader socioeconomic framework of the Early Bronze Age of the Campanian Plain. This study also seeks to make a broader methodological contribution to micromorphological research by investigating a site with minimal post-depositional disturbance. The *aims* of this project can be divided into five primary objectives:

(a) The micromorphological study of exceptionally preserved occupation deposits/surfaces

The micromorphological study at Afragola aims to shed new light on the formation of EBA occupation surfaces in the Campanian region. Because the site was buried quickly by the Pomici of Avellino volcanic eruption and its surface was sealed by 1.5m of volcanic tuff, the occupation deposits and surfaces are preserved as they were moments before the eruption. Afragola thus provides a unique opportunity to apply micromorphological methods to comparatively analyze pristine occupation surfaces at a high degree of temporal resolution, and it provides an opportunity to compare these results to sites that were more impacted by post-depositional processes regardless of time or place.

A wide range of research in soil science, geoarchaeology, experimental archaeology, and ethnoarchaeology has provided crucial sedimentary correlates of the depositional and post-depositional factors that contribute to the formation of occupation deposits and surfaces (Gé et al., 1993, Shiffer, 1987); Macphail, et al. 1997; Macphail, et al. 2004; Macphail and Crowther 2004). A growing body of research has produced detailed guidelines for detecting floor deposits and occupation surfaces in the archaeological record (Allison, 2002, Boivin, 2000, LaMotta and Schiffer, 2002, Macphail et al., 2004a, Reddy, 1997, Stahl and Zeidler, 1990, Gé et al., 1993, Goldberg, 2009, Matthews, 1995a, Matthews et al., 1997b, Rowena et al., in press, Karkanas and Efstratiou, 2009). Ethnoarchaeological studies have contributed to the body of knowledge on sedimentary accumulation in different rooms and areas of human settlements (Horne, 1994). These studies illustrate how a range of depositional contexts and socio-cultural factors influence the creation of occupation surfaces such as the natural and built environment, human social structure, demography, subsistence strategies, on-site activities, maintenance and discard practices (Ge' et al., 1993, Middleton and Price, 1996). They also document the effect of post-depositional alteration on the material accumulated on these surfaces. The reduction of sediment volume produces variation in the thickness of the strata in different parts of the archaeological deposit. One of the most common post depositional processes affecting occupation floors is bioturbation by living organisms such as plant roots, earthworms, mites, insects, and small vertebrates (Courty, Goldberg et al. 1989).

Stratigraphic sequences of occupation deposits and surfaces are an often-overlooked form of material culture. The bulk analysis of occupation deposits and surfaces averages the microlayers often contained within the occupation deposits and surfaces and thus destroys the information hidden in each microlayer. Microlayers vary from 200µm to 1mm and include residues such as burned soil, ashes, and charred wood waste. Soil micromorphology is thus the best method for examining occupation surfaces because it enables the detection and observation of variability in the microlayers that reflect the life history of the occupation deposits and surfaces. The abundance and thickness of the occupations surfaces and deposits can be influenced by factors such as their distance from a nearby oven or the amount of traffic in and out of a structure (Goldberg and Whitbread 1993; Matthews, et al. 1996; Goldberg and Macphail 2006).

There are two phases in the life of an occupation surface; the creation and occupation of the surface characterized by the sedimentary and pedogenic signature of both natural and human processes, and a non-occupational phase that includes the sedimentary signatures of non-anthropogenic processes (Gé et al., 1993). The 'ideal' archaeological occupation surface is minimally affected by natural processes. "Ideal" archaeological occupation surfaces are rare since post-depositional processes such as weathering and plant growth impact these surfaces between the time of abandonment and excavation (Schiffer 1987; Horne 1994; Stein 2001). Due to the sealing action of the volcanic tephra, the artifacts, the 'living floors', and associated activity areas at Afragola are exceptionally well preserved. Furthermore, most of the artifacts are found in their original contexts.

The first step in recreating the formation history of occupation surfaces is to detect occupation deposits created by human actions inside and outside the buildings and to distinguish them from natural accumulations. Next, whether or not *in situ* human activities caused the accretion of material remains to create floor deposits must be determined. This was undertaken by examining each thin section with a petrographic microscope to distinguish microstratigraphic units. Examining the thin sections at both low and high magnification allows sediments with micromorphological features characteristic of human

occupation, trampling, and post-depositional modifications to be distinguished (*see* Chapter 3).

(B) identification of activity areas

This study aims to identify everyday activities carried out in the structures, features and open spaces at Afragola. Micromorphology will be used to investigate the microstratigraphy and the relationships between household structures, and microrefuse to determine the range of domestic, ritual and manufacturing activities conducted at the site and where they took place. In particular, this research seeks to identify domestic spaces including middens, stables, cooking, storage, food preparation areas, and manufacturing areas for pottery, metal, and textile.

Activity areas and buildings are commonly devoid of artifacts as they are active use areas and are frequently cleaned. Therefore, the best evidence for past activities is preserved at the microscale on occupation surfaces. The study of microstratigraphic sequences facilitates the identification of past activities that have accumulated throughout the life history of an occupation area (Goldberg and Macphail 2006).

Previous ethnoarchaeological and archaeological studies have established micromorphological signatures for a variety of human activities (Banerjea et al., 2013, Evans and Limbrey, 1974, Goldberg, 2006, Goldberg, 2009, Karkanas and Efstratiou, 2009, Karkanas and de Moorte, 2014, Karkanas et al., 2004b, Macphail et al., 2004a, Matthews, 1995b, Matthews et al., 1996, Rasmussen, 2007, Karkanas et al., 2004a). This body of middle-range research will be used to interpret the data obtained at Afragola to infer the type of activities that occurred there. The integration of compositional data of the deposits with their specific texture and fabric greatly improves the ability to differentiate between different activities.

The following archaeological and micro-archaeological evidence associations provide general guidelines for the identification of some of the key activity areas likely to be found at Afragola:

1. Hearth or oven areas are typically characterized by high concentrations of organic matter, phytoliths, charcoal, and calcareous wood ash. While the area next to an oven used for domestic cooking could be plastered or unplastered, and would include multiple layers of parallel micro-layers of organic-mineral material, burnt fuel, oven fragments, bones, flint/obsidian flakes, and tubers (Goldberg and Macphail, 2005, Matthews, 1995b, Matthews et al., 1997b);
2. Kiln or furnaces. Characteristics of the occupation surface will vary depending on the use of the oven (i.e., cooking, ceramic or metal production). For example, the area next to an oven used for ceramic production will be characterized by reddened clay, vitrified or melted silica and charcoal which has converted into graphite (Courty et al., 1989, Macphail et al., 2004b);
3. Cooking or food processing areas are often associated with high levels of organic matter, characterized by parallel microstratified lenses, burned and unburned bones, groundstone fragments, plant tissue pseudomorph (wood ash), and siliceous *Graminae* plant microdebris depending on what was used as fuel (Canti, 1995, Canti, 1998, Goldberg, 2006, Matthews et al., 1997b);
4. Stables or other areas where livestock are kept should lack floor preparation materials other than straw and be rich in organic matter and phytoliths. Stabling surfaces should be characterized by interbedded lenses of cracked/fractured dung material, partially decayed plant (cellulose) fibers, opaline and oxalate phytolits, calcite spherulites, animal hair, dispersed phytoliths, and phosphate nodules. The sediments should be fragmented due to frequent trampling or form a continuous "mat" composed of laminated, partially decayed and compressed plant fibers (Canti, 1998, Goldberg, 2006, Matthews et al., 1997b);
5. Transit areas are generally characterized by compacted deposits and surfaces showing planar voids or massive microstructure, and small inclusions of unusual materials fragmented by trampling (Canti, 2003, Canti, 1998, Matthews et al., 1997b, Goldberg, 2006);
6. Sleeping areas should be characterized by very small amounts of activity debris and in some cases laminated fibrous material representing bedding or a series of beds (Mathews, 1995, Tan, 1984, Miller et al., 2009);
7. Midden deposits are defined by unstratified deposits, discarded materials such as bones, shells, charred and uncharred organic material, and various classes of debris (e.g., pottery, bricks) derived from range of activities (Matthews et al., 1996);
8. Food storage areas deposits should contain organic matter, seeds, and pottery micro-debris (Macphail et al., 2004b);
9. In areas of craft specialization, floors should contain traces of specific materials such as fibers, plaster, ceramic wasters, metallurgy, slags, and lithic raw material (e.g., chert, basalt) debitage (Mathews, 1995, Matthews et al., 1997a);

This study also aims to refine or modify the associations that characterize activity areas and to identify the signatures of any new activities present at Afragola.

(c) Site occupation intensity

Site occupation intensity can be defined as the number of human hours a site was occupied per unit time. It is thus a combined function of the number of people living at a site and the amount of time the site was occupied (e.g., number of days per year). Increases in site occupation intensity (e.g., long periods of occupation or the concentration in a short period of time of certain activities) are expected to translate into increasing surface disturbance and subsurface compaction of the archaeological deposits. In micromorphological terms, an increase in occupation intensity results in differences in the porosity and

microstructure of the occupation deposits and surfaces. Increases in the occupation of an area will translate into increasing amounts of cultural remains embedded in occupation surfaces, regardless of whether they are cleaned or not (Matthews, 1995a, Matthews et al., 1997b, Courty et al., 1990, Banerjea et al., 2013). Finally, the intensity of occupation (the performing of activities for longer time or the concentration of activities in shorter time) may have a post-depositional impact on primarily deposited sediments.

At Afragola, site occupation intensity will be measured by examining the following micromorphological indicators:

1. Porosity and microstructure types as indicators of degree of compaction.
2. Number of microstratigraphic units as indicators of number of subsequent activities and/or occupation phases.
3. Micromorphological identification of materials that have been purposely introduced and mixed into the floor (e.g., plaster, clastic sediments or clay) to create stable surfaces to estimate the amount of work invested for the preparation of a specific surface.

The micromorphological indicators of site occupation intensity will be examined by comparing morphological indicators of human activities in the soil fabric at Afragola with those from ethnoarchaeological, experimental, and archaeological studies, particularly those with known occupation lengths and numbers of occupants: Bedouin Tent in the Negev Desert of Israel (Goldberg and Whitbread, 1993), Butser Ancient Farm (Hampshire, UK) (Macphail et al., 2004a), Abu Salabikh (Iraq)(Matthews, 1995b).

Together, such ethnographic, experimental, and archaeological studies suggest that in domestic structures and features like the one excavated at Afragola, accumulation of organic material remains is expected in the deposit and on occupation surfaces. These should be especially concentrated and compacted around hearth and oven areas, and form several floor microlayers.

(d) Refinement/integration of field interpretations with microscopic data

This micromorphological study seeks to increase the resolution of the study of the archaeological site of Afragola by refining understanding or revealing the use of site deposits not previously visible. Interpretations of the use of features and structures will benefit significantly from the identification of activity areas (*see* above). The use of micromorphological techniques enables new information that cannot be viewed with the naked eye to bolster local interpretations. Micromorphology thus enables the high resolution identification of stages in the life history of buildings (LaMotta and Schiffer, 2002) and associated occupation deposits. Micromorphology will be used to clarify initial interpretations of the buildings and features made by the excavators during the field season.

(e) Investigate social differentiation in Early Bronze Age villages of the Campanian Plain

This study will contribute to the ongoing debate on the development of social complexity in the Early Bronze Age (EBA) of southern Italy by investigating issues of economic specialization and social inequality. The current archaeological evidence from the EBA on the Italian Peninsula does not fit a uniform scenario of socio-economic organization. On the contrary, extensive variability has been observed in grave goods, the type of construction materials used in settlements, site organization, geographic location, artifact types, economy, and the presence of defensive walls among contemporary Early Bronze Age sites (Laforgia et al. 2007; McConnell and John 1992; Piperno et al. 2004).

Few data have been collected on the Early Bronze Age sites in the Campanian region especially on occupation surfaces. Important novel information can be gained on the organization of EBA village life since a series of EBA sites have been discovered between 2001 and 2005 in the Campanian region. Of them Afragola is the only site to have a wide range of structures. The data collected at Afragola thus has great potential to shed new light on social organization in the EBA of the Campanian Plain.

Economic production is the transformation of raw materials or components into usable items (Costin, 1991). At the household level, production is used to meet the basic needs of the members of the household including food, clothing, shelter, and the technologies used to prepare them. Specialization can be defined as "….any exclusive activity which a person or small group perform for long periods demanding economic support for their living from one or several settlements" (Kristiansen, 1998 p. 113). These activities range from textile manufacture, to pottery production, house manufacture and metal production. Household producers thus provision themselves, whereas specialists must be provisioned by others in exchange for their labor or goods. The initiation of specialized production will substantially impact the economic and social organization of a village and is often used to differentiate simple from complex societies. This research aims to determine whether production at Afragola took place on the household or specialized level. The first step is to identify where and what type of production took place by looking at the microremains of raw materials, tools, debris, and features associated with production including slag, flint, or pottery wastes. The size, location, types and concentration of these micro-remains will indicate to what extent particular tasks were performed (Costin 1991; Hendon 1996).

The degree of specialization will be evaluated by asking the following questions: 1) what crafts were produced and where (private areas or common areas); 2) where were

storage areas located and what is their relationship to other structures in the village?; and 3) is there variability in the kinds of craft and domestic activities practiced amongst households? These questions will contribute to a larger question—were the artifacts from the village manufactured there and if so were they made for internal use or external distribution. These questions will be addressed by documenting the type and amount of debris produced and the features allocated for the production.

Social Inequality. Social stratification is defined as " – … the division of society into ranked, institutionalized categories of people such as classes and castes" (Chapman, 2003 p. 73). Inequalities may have political, economic, and ideological dimensions. Inequality often emerges when individuals in a society have unequal access to or control over resources ((Price and Feinman, 1995, Wattenmaker, 1998, Chapman, 2003) . In this research differentiation of wealth will be investigated by comparing households. In particular, hut size, hut construction materials (e.g., plaster, clay), the quality and number of goods, and access to subsistence resources (grains, animals, etc.) will be considered.

Book structure

The remainder of this book comprises four chapters and an Appendix. Chapter 2 describes the site of Afragola and its setting on the Campanian Plain. It includes an overview of the geographic, geological, and pedological characteristics at the village. Current interpretations of the site according to published data and site reports are summarized. Chapter 3 provides a detailed discussion of the micromorphological methods and analytical procedures followed in this Book. It emphasizes the importance of micromorphology as a tool to investigate past human activities as well as the field and laboratory procedures applied to sampling, and sample preparation. This chapter also details the sampling strategy and lists the range of areas and features sampled at Afragola. Chapter 4 is a detailed presentation of the micromorphological results. This chapter is divided into three major sections. First, the micromorphological characteristics of a sample taken from a natural paleosol close to Afragola are described as a control for the anthropogenic thin sections. Second an overview of the general characteristics of all samples including microstructure, composition, texture and their overall distributions at the site are presented. Third, full micromorphological descriptions are provided for samples grouped by buildings and features. This enables a more comprehensive look at the degree of variation within the structure that will aid in constructing activity areas and ultimately structure function. Guidelines and terminology for the micromorphological description follow Stoops (2003). Chapter 5 presents a discussion of the micromorphological results with reference to the research objectives outlined here in Chapter 1. The first section focuses on the anthropogenic aspects of the analysis. It interprets the micromorphological results to reconstruct activity areas and the function of all buildings, features, and outdoor areas. This is followed by a broader interpretive discussion of the site, its intensity of use and the reasons for its abandonment. Finally, the site is situated in its larger socio-economic context by discussing evidence for social complexity and situating the results within the broader Early Bronze Age culture of the Campanian Plain. The Appendix provides full micromorphological descriptions of the 80 anthropogenic and control samples. Each description includes a scanned image of the thin section, a table with details about the sample's location, microstructure and voids, biogenic and inorganic coarse fraction and anthropogenic and post-depositional features.