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Obsidian Source Selection in the Early Bronze Age Cyclades

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by

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ABSTRACT

From excavations of burial complexes of the Early Bronze Age Cyclades (c. 3000-2200 BC) we know that obsidian was just as important and as widely consumed in burial contexts as it was in contemporaneous household contexts; Early Bronze Age Cycladic tomb assemblages are dominated by beautiful obsidian blades produced through a unique knapping technique reserved for burial contexts (Carter 2007; Dickinson 1994). The lack of sourcing studies in the area is an unfortunate pitfall in Aegean archaeology, as understanding patterns of source selection provides us with precious insight into the complex social structures and behaviors that characterized these ancient communities.

The research detailed in this thesis set out to accomplish these goals for obsidian assemblages from 11 Early Cycladic cemeteries. Structurally, these assemblages are dominated by pressure-flaked blades manufactured specifically for funerary consumption, but also include a small number of blade cores and some pieces of flaking debris. Contextually, the composition of the assemblages reflects the social significance of body modification amongst these islanders, with the blades themselves likely used for depilation, scarification, and tattooing, and the cores reemployed as pestles in the grinding of pigments, as evidenced by pigment residues located on the artifacts (Carter 1998). Two additional assemblages from settlements on Crete were analyzed, one from a Late Neolithic cave site and another from a Late Minoan settlement. These assemblages served both to provide additional regional and temporal context for the Early Cycladic findings and to advance obsidian sourcing efforts in the Aegean as a whole.

In order to characterize the chemical profiles of these artifacts for sourcing purposes, this study employed portable X-ray fluorescence spectrometry, a non-destructive archaeometric method which allows for the time- and cost-effective mass-sampling of objects on-site. The results display clearly that the Early Cycladic artifacts are overwhelmingly made from Melian obsidian, and approximately 88% derive from the Sta Nychia source. How far-reaching this procurement bias is throughout the Early Bronze Age Aegean is currently difficult to say, though contemporary data from previous studies, as well as the results obtained from the two Cretan assemblages in this study, seem to show a similar pattern. Future research integrating regional traditions of obsidian source selection with previously defined regional distinctions in pressure-blade technology is necessary in order to begin to map communities of practice across the broader Aegean.

CHAPTER ONE

INTRODUCTION

In the Early Bronze Age (c. 3000-1000 BC), the islands of the southern Aegean were home to a number of thriving settlements belonging to the Cycladic civilization (**Figure 1**). Despite a poorly preserved archaeological record and a lack of decipherable written records, the Cyclades are one of the most thoroughly researched and archaeologically productive island clusters in the world (Broodbank 2002; Dickinson 1994). These islands are well known among Aegean archaeologists for their rich maritime culture, mythological and historical significance, and the complex, extended communication and exchange networks that developed both between islands and with "outside" societies on the mainland and other island clusters.

The two islands which form the basis for this thesis – Naxos and Epano Kouphonisi – are no exception (**Figure 2**). On Naxos, the largest of the Cycladic islands, archaeological excavations have uncovered evidence of some of the most prosperous production industries and trade routes in the Cyclades, though detailed information regarding the development of its prehistoric sociopolitical and economic systems is still relatively difficult to come by. Epano Kouphonisi, one of the smaller Cycladic islands located approximately 2 miles off the southeast coast of Naxos, has produced similar types of archaeological evidence, though fewer large-scale studies have been conducted on its settlements.

At the center of many studies of these islands, and particularly of their production centers and trade routes, is obsidian, a volcanic glass formed by the rapid cooling of lava. In parts of the world where obsidian is available, it was extensively sought after in prehistoric times due to both its aesthetic and functional properties. Its first documented use in the Aegean was recorded in the Mesolithic (c. 8300-6000 BC) occupation of Franchthi cave, and its frequency of use only increases from that point (Dickinson 1994). By the Neolithic (c. 6000-3300 BC), obsidian believed to derive from Melos shows up on mainland Greece, Crete, and even in settlements in parts of Anatolia (Torrence 1986). Even with the appearance of bronze in the Aegean, obsidian's value did not decrease in many areas largely due to its abundance, low labor cost, and ability to hold an incredibly sharp edge comparable to or even greater than that of most metal implements. The demand for obsidian in the Aegean only declined once iron-working became a widespread practice – due to iron's considerable strength and ability to hold an edge – though obsidian still does not disappear from the archaeological record entirely after this point (Renfrew et al. 1965).

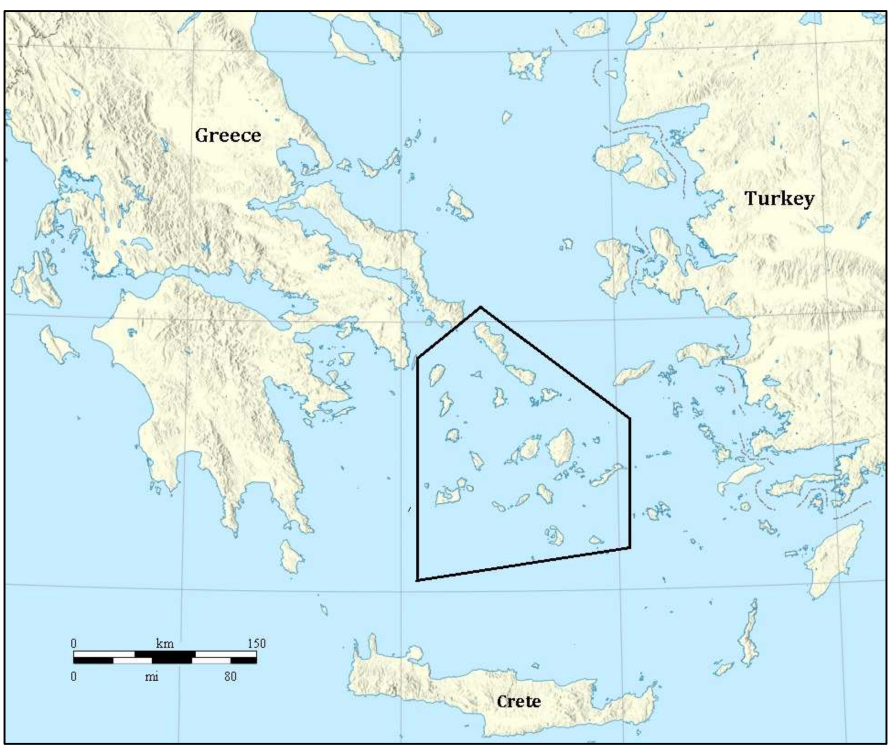

Figure 1. Map of the Aegean region, with the Cycladic islands outlined

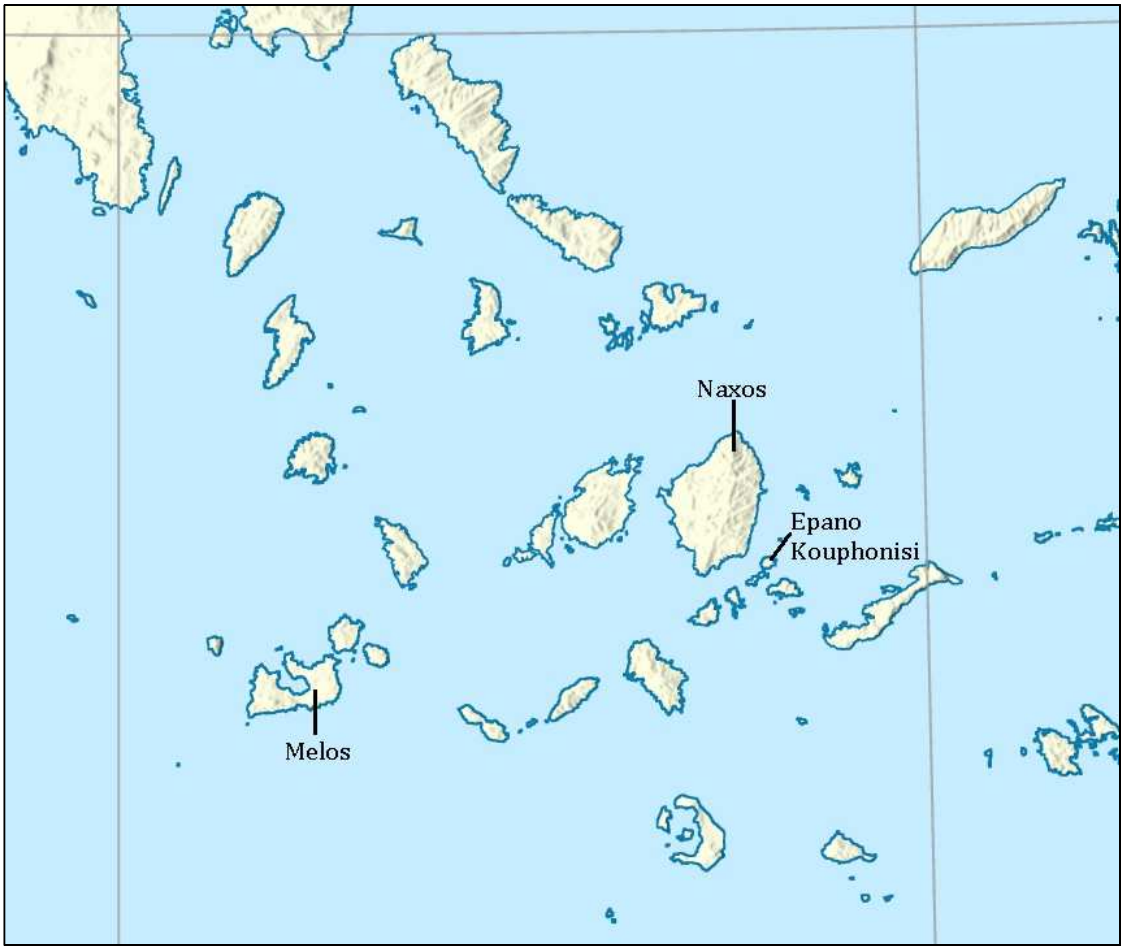

Figure 2. Map of the Cycladic Islands

Beyond the utilitarian properties of obsidian, various ideological and spiritual connotations were often attached to obsidian in prehistory, adding to its perceived social and economic value. This certainly seems to have been the case for the residents of Bronze Age Cycladic settlements, for whom obsidian existed as an important and valuable raw material used in the construction of not only tools, weapons, and bodily adornments, but in the construction and conveyance of ritual and political meanings and identities (Finley 1982; Renfrew et al. 1965). On Naxos and Epano Kouphonisi, among many of the other islands in the Cyclades, obsidian artifacts are unsurprisingly found in particular abundance in cemeteries as grave-goods accompanying the deceased (Doumas 1990a, 1990b).

In fact, the beginning of the Bronze Age in the Cyclades saw the development of an entirely new production technique specifically for obsidian in the burial arena. This technique, which involved a rather skilled, and likely very specialized, process of pressure-flaking, is applied only to artifacts in Early Cycladic (3200-2000 BC) mortuary contexts and has thus been referred to as the "necrolithic" production technique (Carter 1998, 2007). It even seems to have taken place in the cemeteries themselves, as production debris has been located in surface surveys at a number of Early Cycladic sites (Carter 2007). While these necrolithic assemblages have been studied before in other capacities (Carter 1998), remarkably few obsidian sourcing studies have been conducted in these Cycladic contexts, or even in the Aegean as a whole (Carter and Kilikoglou 2007:115; Frahm et al. 2013; Tykot 2002).

This dearth of archaeometric research stems largely from academia's longstanding acceptance of the "myth of a Melian monopoly" (Georgiadis 2008:113). This "myth" is a common belief among archaeologists working in the Aegean that obsidian excavated from Aegean sites was likely being obtained from the Cycladic island of Melos, which has two of its own obsidian sources. Though this belief is very commonly true, and in that sense is not much of a myth *per se*, it is still a problematic assumption in that once it has been made, it is likely that no further efforts will be made to trace detailed patterns of source use. This not only precludes the discovery of possible alternatives or aberrations from the assumed pattern, but it also makes it impossible for archaeologists to examine the relative usage of Melos' two geologically separate obsidian quarries, Sta Nychia and Dhemenegaki (Carter 2008; Frahm et al. 2013; Georgiadis 2008; Tykot 2002).

The ability to recognize prehistoric selection of one raw material source over another, even at such a small geographic distance as between the two Melian sources, is a valuable pursuit for archaeologists. Source selection is reflective of economic structures and decisions, and can provide a great deal of information regarding political relationships. However, it is also part of a social process (which also includes but is not limited to procurement, transport, production, and consumption of a given material). The components of this social process can be driven by individual agency, but also often reflect the mobilization and materialization of worldviews, or cultural understandings of "how things should be" which may or may not be consciously enacted (Carter 2008a:226; Dietler and Herbich 1998; Dobres and Hoffman 1994). If in this case, each step in a production process is perceived as having been carried out correctly, certain social meanings and identities can be successfully assumed and enacted in the production and consumption of that material (Carter 2007). As such, the material correlates of these processes can be used to understand better the social meanings they held (Dietler and Herbich 1998; Dobres and Hoffman 1994; Helms 1998).

Through the mass-sampling and chemical analysis of obsidian artifacts from Naxos and Epano Kouphonisi burial contexts, I hoped to be able to present high-resolution patterns of source use and obsidian consumption during the Bronze Age on these islands (Milić 2014). Using portable X-ray fluorescence spectrometry, I analyzed 714 total artifacts from 11 Early Bronze Age Cycladic cemeteries (8 on Naxos and 3 on Epano Kouphonisi). All of these artifacts are currently housed in the collections of the Naxos Archaeological Museum, and some are currently on public display. Through calibration of the elemental signatures produced by the pXRF spectrometer and subsequent comparison with signatures of geologic samples of known origin, an overall preference for obsidian from the Sta Nychia quarry on Melos was documented. This pattern fits in with previous work done in the Aegean that seems to show a temporal shift in preference from Dhemenegaki to Sta Nychia occurring alongside the transition from the Neolithic to the Bronze Age in the Aegean, though the exact reasons for this shift are still unknown (Carter 2008a).

Additional work completed by myself and Dr. Carter in August of 2014 at the Institute for Aegean Prehistory (INSTAP) East Crete Study Center provides additional regional and temporal context for the Early Cycladic sourcing results. Obsidian assemblages from two sites on Crete – Late Neolithic Pelekita (n = 67), and Middle Bronze Age Papadiokambos on (n = 92) – were analyzed with the same pXRF instrument used to analyze the Early Cycladic burial assemblages, and the results were calibrated in the same manner. The results of these analyses provide further support for the aforementioned pattern of a shift in preference for Melian sources, and together with the Early Cycladic results, will provide the basis for a great deal of future characterization work on Aegean obsidian.

CHAPTER TWO

GEOGRAPHICAL AND HISTORICAL BACKGROUND

Across Europe, the Bronze Age (c. 3200-2000 BC) was a period of social, political, economic, and cultural upheaval, and witnessed the development of numerous new technologies, practices, and civilizations. These rapid and widespread changes were largely due to the introduction of new materials, namely metals, which hastened the development of socioeconomic relationships and inequalities throughout the region (Doumas 1990a). This was certainly the case in the Aegean, where communities on both the Greek mainland and the Aegean islands were entering the largest period of growth they would see until the end of the Greek Dark Ages (Dickinson 2004). Such developments were made possible, and even perhaps expedited, in the Cycladic islands because of their geographic location, geologic properties, and the surrounding environment and climate. Within this period of growth, the islands gave rise to the Early Cycladic civilization (c. 3200 – 2000 BC), which would continue to develop and thrive throughout the Early Bronze Age (Doumas 1990a).

Environment and Geography

The landscape and environment of the Cyclades is similar to that of the mainland, particularly with regard to the climate and mountainous landscape, the latter being a result of geologic activity between the Eurasiatic and African tectonic plates in the earth's crust. These mountains impede efficient overland travel, and are largely to blame for the general lack of arable land in the region. However, this same tectonic activity led to the region's volcanic activity and potential for earthquakes, which together have produced a rich and complex distribution of raw materials. These mainly consist of workable clays, some metals (mostly copper and lead), and various stones. Limestone is the most common of the islands' lithic materials, though in areas closest to volcanic activity igneous materials are more dominant. Even after the introduction of metals in the Bronze Age, stone maintained a position among the most valuable materials in the Cyclades, particularly emery and marble from Naxos and Samos and obsidian from Melos and Giali (Dickinson 1994; Doumas 1990a). The quarries at Melos formed as a result of activity during the Late Pleistocene, while the obsidian at Giali dates to approximately 30,000 years ago (De Francesco et al. 2011:84).

Combined with a relatively arid, drought-prone climate, the geologic setting of the Cyclades does not provide an environment that is well-suited for a thriving agricultural industry. Naxos is perhaps the closest thing to an exception from this generalization; its western half is characterized by a number of highland valleys interspersed with fertile plains, and many locations present the flora necessary for stock raising (Dickinson 1994; Zapheiropoulou 1990). But even on other, less fertile islands, prehistoric settlements maintained a stable relationship with their surroundings and managed to grow a number of grains including barley, oats, and lentils, as well as fruit and nut producing trees, including fig, olive, almond, strawberry, and pear. These trees on the islands would have also served to provide much-needed timber, which would have been used to construct structures in the settlements as well as boats for travel and trade overseas (Dickinson 1994). Protein-based foods were retrieved largely from the sea, especially for the smaller islands, but animal husbandry was also a common practice for the production of meat. Livestock animals

– mostly sheep, cattle, pigs, and goats – also provided a source for byproducts such as milk and hides, as well as for labor (Dimakopoulou 1990).

The geographic configuration of the Cycladic islands is unique among the world's island clusters. The closest analogous island clusters, geographically speaking, are found in southwestern Oceania and the Caribbean, as these clusters share the Cyclades' wide variability in factors such as average island elevation, distances between neighboring islands, and particularly size – Naxos is by far the largest of the Cycladic islands (its size of 430 square kilometers is significantly larger than the next largest island, Andros, which measures at about 380 square kilometers), while Epano Kouphonisi, one of the smallest in the cluster, sizes up to about 26 square kilometers. Additionally, all three of these regions (Cycladic, Oceania, Caribbean) represent "major cradles" of island cultural, political, and economic practices (Broodbank 2002:38). However, the Cycladic island cluster remains distinct from those in other parts of the world due largely to its climatic conditions, geologic formations, and political systems.

Significantly, the Aegean Sea (and thus, the Cycladic island cluster) is essentially enclosed on all sides. Three sides (north, east and west) are bounded by mainland coast, while the southern extent is bordered by the island of Crete. The Cycladic cluster is the most central of the Aegean island groups, lying the farthest from any of these mainland coasts. In prehistoric times, this geographic arrangement served, to a certain degree, to restrict – or at least provide some measure of control over – access to the Aegean from the south, as well as movement into the southern open sea from the islands. Accordingly, the islands of the Cyclades functioned as "stepping stones" to and from other locations in the Mediterranean, which had significant impacts on these islands' sociocultural developments and interactions, both with one another and with outside societies (Broodbank 2002:41). The sea was the major doorway to external contacts and exchange for the

Cycladic people, and it was thus largely through the sea that the islands gained their cultural complexity and wealth (Doumas 1990a).

Island societies such as these are commonly seen to develop in ways which place significant, and seemingly contradictory, emphasis on both their isolation and the systems of interaction that connect them with neighboring communities. Each is understandable, particularly in the case of the Cyclades, with the isolation resulting from geographic distance and culturally imposed boundaries, and interaction (including exchange) being an essential aspect of island life, coming into play in times of adversity as well as in the daily necessities of survival (Branigan 1991:103). These concepts of isolation and interaction thus become integral parts of an island community's broader worldview and ideology, meaning that actions of mobility, both between islands and to the "outside world," are conducted in political and ideological contexts in which this movement is highly valued. This resulted in the processes of movement, of both people and goods, being invested with a certain special type of social (and economic, in the case of exchange) value (Broodbank 1993:315). The sense of isolation in particular can be seen archaeologically in the Cyclades as it affected relationships and interactions between the islands themselves; the forms and styles of material culture found in archaeological settlements on the various islands do not convey a sense of continuity, but a relatively distinct 'assemblage' of archaeological material for different islands (Vlachopoulos 1998).

Cultural and Historical Background

The Aegean archaeological record provides evidence for human activity in the region as far back as the Lower Paleolithic (see **Table 1** for a regional chronology and dates), though this evidence is limited and exists only in northern Greece (Dickinson 1994). Beginning in the Middle

Paleolithic, evidence for Aegean settlement is much more frequent and widespread. From the Middle Paleolithic through the Mesolithic, the archaeological record in the region is characterized by the temporary occupation of cave sites, rock shelters, and open coastal settlements by small hunter-gatherer groups. The islands of the Cyclades still lack any archaeological material from this time, however. Settlements are recorded only in northern Greece and the northern Peloponnese for the Middle Paleolithic, but became much more widespread by the Upper Paleolithic, with evidence appearing across the majority of the Greek mainland (Dickinson 1994; Zachos 1990). Perhaps most notable of the region's occupations during this time is the settlement at Franchthi cave, which was occupied from the Upper Paleolithic to the end of the Neolithic (Dickinson 1994).

The Mesolithic shows even greater levels of occupation throughout the region, but still lacks evidence for any sort of cohesive Aegean culture; settlements and communities are still predominantly independent at this point (Galanidou 2011). Permanent settlements and structures appear with the onset of the Neolithic, most commonly at open elevated coastal sites, though cave sites remained in use. The Neolithic also saw the development of farming communities and the first signs of a cohesive, recognizable Aegean culture, which served as the basis for the way of life that would develop in and beyond the Aegean Bronze Age (Dickinson 1994).

Beginning in the Neolithic, small-scale societies with well-developed long-distance exchange and interaction networks (including instances of colonization, particularly in the Late Neolithic) begin to appear in the Aegean archaeological record (Carter 2008b; Zachos 1990). These Late – Final Neolithic colonial expansions were responsible for the Cycladic islands' earliest recorded settlements (Broodbank 2002). The earliest of these habitations (ca. 4500 BC) is that of the Saliagos culture on the islet of Saliagos, where Melian obsidian and some obsidian from Antiparos has been chemically identified (Evans and Renfrew 1965; Zachos 1990). On Naxos, the settlements at Grotta and the Zas Cave have exhibited Neolithic pottery and metal artifacts which appear to be stylistic precursors to the Early Cycladic material (Zachos 1990). Neolithic settlement in the Cyclades overall is sparse relative to the levels of occupation seen in the Early Bronze Age (Zachos 1990).

Table 1. Summary chronological table of the prehistoric and historic Aegean

Time Period	Approximate Start Date
Lower Paleolithic	2,000,000 BC
Middle Paleolithic	150,000 BC
Upper Paleolithic	50,000 BC
Mesolithic	8300 BC
Neolithic	6000 BC
Early Bronze Age	3300 BC
Middle Bronze Age	2000 BC
Late Bronze Age	1600 BC
Dark Age in Greece	1100 BC
Founding of Rome	753 BC
Archaic Greece	700 BC
Classical Greece	480 BC
Hellenistic Greece	323 BC

The chronology for the Early Bronze Age Cyclades roughly corresponds to other, more well-known chronologies applied to other parts of the Aegean, which helps provide a bit of temporal context for the study area. The Early Cycladic (EC) occurred alongside the Early Helladic on the Greek mainland, and the Early Minoan period on the island of Crete, located farther south of the Cyclades (Dickinson 2004; Warren 1984). The Early Cycladic is broken down further into three broad periods based on changes in the material culture observed in the archaeological record throughout this time period: the ECI, ECII, and ECIII periods (Dickinson 2004; Doumas 1990a).

The Early Cycladic I period lasted from ca. 3200 – 2700 BC. This period is characterized by an almost total absence of architectural remains in the archaeological record, likely due to the fact that huts in ECI settlements were constructed from perishable materials. Most of what we know of this period (and of the Early Cycladic as a whole, but especially this period) comes from excavations and analyses of cemetery contexts, as the construction of cemeteries involved less perishable materials, mainly stone, which has survived to withstand modern investigation.

Following this period is the ECII, which lasted from ca. 2700-2300 BC. A higher concentration of architectural remains has been observed during this period when compared to the ECI, as people began constructing dwellings and other structures from stone. Despite this, settlement evidence is still relatively scattered and residences are still small, mostly two-roomed structures. The settlements observed in the ECII record are slightly larger than those seen in the ECI, but are still relatively small. Much more significant growth rates can be observed in the corresponding ECII cemeteries.

Settlement growth continued into the last period of the Early Cycladic, the ECIII (ca. 2300 – 2000 BC). A number of communities grew into urban centers where there is evidence for strong, politically-managed mercantile systems, both on land and overseas. Unsurprisingly, a similar continuation in growth can be seen in the cemeteries of the ECIII, though unfortunately, almost every tomb that dates to this period has been looted. These cemeteries, likely singled out for their size relative to other Cycladic cemeteries, were often destroyed by individuals looking for marble figurines which were commonly included in Early Cycladic burials and were highly valuable in the antiquities trade (Carter 2007; Doumas 1990a). The Middle Cycladic period (ca. 2000 – 1550

BC) followed, during which time Cycladic culture underwent a number of changes that reflected a great deal of influence from outside the Cyclades, largely from the Minoans (Doumas 1990a).

Though the Early Bronze Age was a time of great population growth across the region, the political organization of the Cyclades never developed into anything resembling a state-like civilization. The small size of each island, combined with small overall percentage of soil suitable for cultivation, prevented any sort of development of economic surpluses, while the islands' social and political separation from one another precluded the rapid development of a single centralized political system that encompassed the entire island cluster. Instead, we see the gradual development of a number of large sites that served as regional centers across the islands (Carter 2007; Doumas 1990a). The Early Bronze Age also marks the time at which the Cyclades began to send and receive a great deal of influence from a number of "outside" cultures, both as nearby as mainland Greece and as distant as central Turkey. This system of mutual influence had great impacts on the politico-economic systems that worked to shape cultural relationships and networks of Cycladic exchange (Carter 2007; Doumas 1990a).

Naxos itself holds a significant place in Cycladic prehistory, history, and even mythology. There are countless appearances of the island in Classical mythological stories, a matter doubtlessly encouraged by the island's natural beauty and fertility (Zapheiropoulou 1990). Most notably, the island is said to be the birthplace and home of the god Dionysus, and the place where he would later rescue Ariadne from Theseus' abandonment. In some myths, it is believed to be the birthplace of Apollo, and it also is home to Mt. Zas, the peak on which the cave of Zeus' upbringing is said to be located (Ring et al. 1995). While they do not directly impact archaeological considerations of political, sociocultural, and economic development on the island, these inclusions in central cultural lore certainly reflect the position of importance held by the island in the minds of the prehistoric Aegean people.

Unfortunately, the prehistory of Naxos is not very well documented archaeologically, though the historic settlements and development, particularly with regard to growth and change in the Byzantine period, are quite nicely chronicled (Cosmopoulos 1998; Crow et al. 2011). Much of what is known of Early Bronze Age Naxian culture, archaeologically speaking, comes from excavations of burial complexes on the island, which were largely undertaken in the mid- twentieth century – sometimes under questionable legal circumstances – and are therefore not accompanied with the best of documentation (Marthari 1990). We do know, however, that burials from settlements across the island are most often characterized by the presence of obsidian blades (and on occasion, cores), pictorial ceramic vessels, and jewelry, which help to provide insights into arenas of exchange, production, consumption, political systems and relationships, and sociocultural stylistic preferences (Carter 2007, 2008b; Vlachopoulos 1998).

The development pattern of these settlements on Naxos diverged from that of the other large Cycladic islands such as Keos or Melos. On these neighboring islands, a single, primary settlement visibly emerged at some point during the Early Bronze Age and functioned as a main political center for the island during the second millennium BCE. Naxian settlement development, on the other hand, followed a different pattern of various smaller, dispersed settlements arising across the island. These smaller-scale settlements are most often found situated on small interior plains, have relatively low population densities, and are generally representative of farming communities specializing in the cultivation of vines or olives (Broodbank 1993:316; Carter 2007; Ring et al. 1995). The island grew to be a key participant in trade networks within the Cyclades during the Early Bronze Age, and would eventually develop to be a major player in Minoan and

Mycenaean-driven socio-political and economic networks; numerous archaeological findings of Minoan and Mycenaean imports in Bronze Age Naxian settlements, as well as Cycladica on both Crete and the Greek mainland, attest to this (Cosmopoulos 1998).

The small Epano Kouphonisi has received less attention in academic studies and literature, though the three cemeteries from which material derived for this study – Agrilia, Skopelitou, and Tzabaris – have each been excavated and studied to some degree (Zapheiropoulou 1970, 1983, 1984). The scale and duration of occupation on this island both seem to be smaller than on many other Cycladic islands, Naxos in particular. However, the Early Cycladic cemeteries on the island still yield a considerable number of grave goods identical in character to those in the Naxian cemeteries. The inhabitants can, then, be assumed to have engaged in the same general trade networks and similar modes of production and consumption as the Naxians. This is true particularly when it came to obsidian, and especially obsidian's relation to burial contexts and practices (Broodbank 1993; Carter 2007).

Obsidian in Burial Contexts

The intentional modification and use of obsidian tools has been confirmed as far back as the Mesolithic, though evidence is not abundant. The Mesolithic levels of the Franchthi Cave occupation have produced some evidence to attest to this, as well as a small number of similar sites, such as that at the Cyclope cave on the islet of Youra in the northern Aegean. Overall, however, lithic evidence is scarce in the region before 6000 BC (Cullen 1995; Jacobsen 1969; Sampson 2008). After the start of the Neolithic, the frequency of obsidian production and consumption gradually increased throughout the Aegean, appearing in settlements on Crete, the mainland, and the Cycladic islands alike, and eventually coming to dominate lithic assemblages throughout the region (Carter and Kilikoglou 2007; Georgiadis 2008; Renfrew et al. 1965). Long-distance movement of lithic material is also a hallmark of the Neolithic, though the circulation of obsidian in most cases – and certainly of Melian obsidian – seems to have largely resulted from instances of groups and individuals accessing the sources directly (Renfrew 1972; Torrence 1986)

Despite the introduction of metal implements that came along with the start of the Bronze Age, obsidian from various sources continued to circulate widely and frequently between Aegean settlements. Obsidian from the Early Bronze Age was used at both domestic and ceremonial sites, showing up in particular abundance as a part of burial assemblages. With such a large proportion of information regarding Early Cycladic communities coming from their associated cemeteries, it should be no surprise that scholars have become aware of a deep connection between obsidian and death throughout the society. Obsidian, in various forms, is the most commonly found grave good in Early Cycladic tombs (Carter 1998; Doumas 1990a). These burial grounds consisted of single (EC1) and multiple (ECII and III) inhumations in trapezoidal cist graves with no apparent consistent orientation (Doumas 1990a).

The ECI cemeteries, like the settlements, are the smallest of the Early Cycladic. Each is characterized by small clusters of approximately 10 to 15 cist graves, with the individual interred with a select few personal belongings. Individual graves within these ECI cemeteries occasionally appear clustered in small groups, which is likely a representation of closely associated household groups (Doumas 1990a, 1990b). The burials were shallow (0.3 - 0.8 meters below surface), and were just large enough to fit the interred individual, who was positioned in the flexed position, with knees pulled up to the torso and the hands brought near the head (Doumas 1990b).

Cemeteries in the ECII are larger, as are the tombs within them, indicating larger populations and potentially larger family units and greater concentrations of wealth, as well.

Successive inhumations began taking place on top of already existing burials, reflecting the need to make space for a growing population in a restricted area. Even in tombs with multiple burials, however, individuals were still interred with their own personal grave goods in the same fashion as in the ECI. Though the earlier burials were disturbed to make room for the new inhumations, the skull of the individual buried earlier was consistently left carefully unmoved (Doumas 1990b).

Though generally speaking the population – and corresponding cemeteries – continued to grow in the ECIII, the archaeological record is lacking for this period due to extensive looting. Though the ECIII archaeological record of Naxos was subject to some of this looting, it was not very extensive in the first place with regard to frequency of graves; this time period was witness to numerous political upheavals and population shifts, with large urban centers developing on islands other than Naxos that drew residents away (Zapheiropoulou 1990). Luckily for archaeologists, a decent enough amount of material evidence remains in the archaeological record to learn from these tombs. We can tell, for instance, that ECIII tombs were overwhelmingly constructed and used for multiple burials, indicating a response to a rapidly expanding population. After the end of the ECIII, the Cycladic civilization as it had existed and dominated the Aegean up to that point ceased to exist. Obsidian, however, maintained consistent presence as a grave good throughout the Aegean (Carter 1998).

The obsidian itself could potentially source to a number of nearby quarries, though it has most commonly been assumed to come from either of the two Melian sources – Sta Nychia and Dhemenegaki – which formed as a result of geologic activity during the Late Pleistocene, and are geographically the closest sources to Naxos and Epano Kouphonisi (De Francesco et al. 2011:84). The available material at each of these sources is equivalent in quality and flaking properties, and each appears an opaque matte black or dark gray (Milić 2014) (**Figure 3**). While the evidence for prehistoric quarrying activities at the sources themselves was not initially recognized upon the 1836 discovery of the area, each source is now known to have been exploited as far back as the Upper Paleolithic, and to have gradually increased in popularity until the end of the Early Bronze Age (Torrence 1986). After the introduction of metal implements in the Early Bronze Age, the quarries continued to be used to varying degrees, even being exploited sporadically in the Classical, Hellenistic, and Roman periods for artistic and utilitarian purposes (Fiedler 1840; Mackenzie 1897; Renfrew et al. 1965; Torrence 1986).

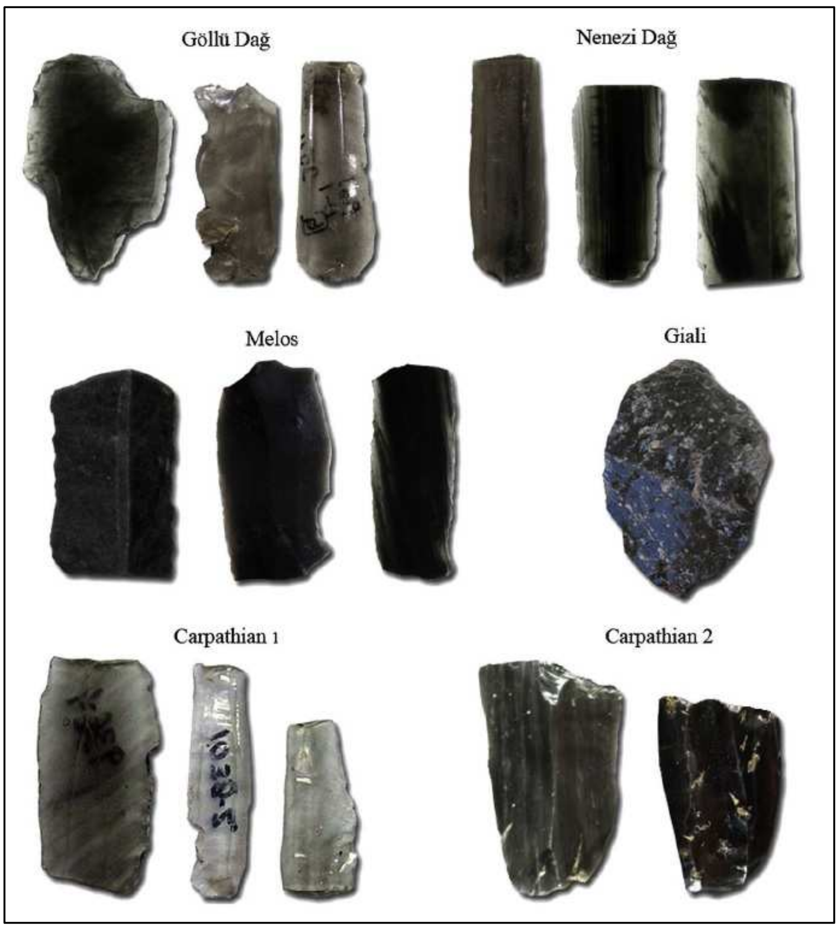

Figure 3. Visual characteristics of the major sources mentioned in the text. Milić 2014: Figure 9; used with permission (see **Appendix C**)

Also notable for their proximity to and previous appearances in Aegean communities are the obsidian sources on the Cycladic island Antiparos, the Dodecanesian island Giali, and the Central Anatolian sources of Göllü Dağ and Nenezi Dağ (**Figure 4**). Obsidian from the Antiparos source appears in only limited amounts in archaeological contexts due to the fact that it only exists in extremely small nodules (generally under 3 cm in diameter) that are not fit for most functional or artistic purposes (Carter 1998:17; Shelford et al. 1982). The sources at Göllü Dağ and Nenezi Dağ are known to have been in use at least since the Epi-Paleolithic (ca. 17,000 BC), and have been exploited by populations in Crete, the Cyclades, Cyprus, the Levant, Anatolia, and the Greek mainland (Milić 2014). The material at Göllü Dağ is very transparent, while the Nenezi Dağ material is usually only semi-transparent, but the sources produce very similar material with regard to quality (**Figure 3**).The source at Giali generally produces obsidian that is speckled with white crystalline spherulites that inhibit ideal fracture patterns, and as such was largely reserved for the production of ground or carved vessels in the Middle Bronze Age (Milić 2014) (**Figure 3**).

Figure 4. Locations of relevant obsidian sources and islands with sites tested

CHAPTER THREE

ARCHAEOLOGICAL SIGNIFICANCE

Overview of the Sites and Materials

The first archaeological work on the island of Naxos took place in the 1960s and 1970s. The archaeological data relevant to six of the Naxian sites – Akrotiri, Avdheli, Ayioi Anargyroi, Lakkoudhes, Lakkoudhes A, and Rhodinadhes – were published by Christos Doumas as part of his dissertation (1977). The material from Aplomata has received some preliminary publication, and representations of some of the finest examples of obsidian blades excavated from the site's burial contexts have been published in an exhibition catalogue (Marangou 1990). Data from Tsikniadhes, the last of the Naxian cemeteries, have also received only preliminary publication in Philaniotou (2008), though the obsidian itself is discussed more in depth by Carter (2008).

All three of Epano Kouphonisi's cemeteries that are discussed in this thesis – Agrilia (the largest of the island's Early Bronze Age cemetery sites), Skopelitou, and Tzavaris – were excavated by the Greek Archaeological service, again in the 1960s and 1970s. These cemeteries have received less attention in academic publications than the burial sites on Naxos and other Cycladic islands, though information regarding excavations at each of these sites can be found in publications by Zapheiropoulou (1970, 1983, 1984). Not every site mentioned on either Naxos or Epano Kouphonisi has been mapped in official publications, so the map used in this thesis only shows exact locations of six Naxian burial sites (**Figure 5**).

The Late Neolithic site of Pelekita has only received publication in the form of two very short site reports from the 1970s and 1980s, each written by Costis Davaras (Davaras 1979, 1982). The material from this site analyzed in my project, which has not yet received any publication itself, largely derive from a single trench (Trench E) that was excavated in 2014 by Davaras. The material from Papadiokambos, a Late Minoan harbor town on Crete, were excavated between the years of 2007 and 2010, from various excavation levels in two separate building contexts (Building A and Building B), and are also lacking publication to date. The pieces from each of these sites, once sourced, served to provide extra regional context within which we can begin to understand the source selection patterns of the Early Bronze Age Cyclades (**Figure 6**).

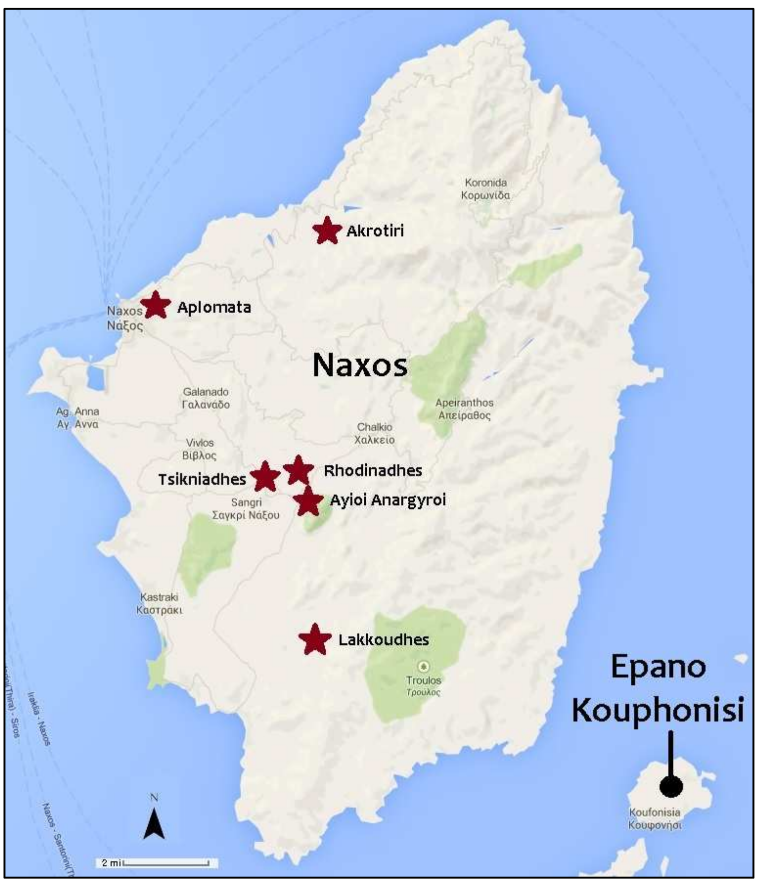

Figure 5: Map showing locations of sites studied on Naxos which have been mapped

Figure 6. Map of Crete, showing locations of sites studied

Access and Exchange

The Aegean circulation of obsidian began prior to the Bronze Age, with obsidian artifacts suspected to have originated from Melos showing up at Neolithic Knossos and other settlements on Crete, as well as Neolithic settlements in Anatolia (Torrence 1986). The widespread consumption of obsidian is unsurprising for this time before the introduction and use of metal implements, but its use did not decrease in frequency with the start of the Bronze Age as might be expected. Obsidian remained a significant component of the Aegean trade networks which would ultimately bring drastic changes to Aegean societies. These changes came largely in the form of the creation and maintenance of distinctive social classes in the Early Bronze Age, which did not definitively exist prior to this time period. The largest concentrations of traded, “exotic” goods appear at the largest, most complexly organized, and wealthy settlements. This access to and control over exotic foreign goods, as well as foreign influences and ideals, is thus suggested to have had a direct connection to an individual or group’s degree of social influence, and to have produced significant enough economic and political capital to allow for the development of large urban centers even in otherwise unproductive environments (Carter 1998).

The Early Cycladic procurement of obsidian provides an interesting case, however, because the overwhelming majority of the obsidian circulating within and between communities is believed to have been procured from either of the two sources on the Cycladic island of Melos (**Figure 7**). Due to the proximity of the Cycladic islands to one another, and to Melos itself, they are considered to exist in the same "interaction zone" for Melian obsidian, together with communities on the Greek mainland and on the island of Crete. This circulation within a single interaction zone – defined as the geographic extent wherein which sites obtained at least 30% of a given raw material from a particular source – means that obsidian does not fall into the same category as "exotic" imports (Renfrew and Dixon 1976:147; Torrence 1986). Yet, there is still an observed association between obsidian goods and social prestige in Early Cycladic communities. This gives us all the more reason to strive to understand the mechanisms of exchange that supplied the Melian obsidian to settlements throughout the interaction zone, and luckily there has been no lack of research in the area.

When archaeological research began on Melos in the nineteenth century as a result of the accidental discovery of a number of classical sculptures, the site of Phylakopi was uncovered (**Figure 7**). Due to the presence of a large obsidian workshop and the site's proximity to the sources, Phylakopi was assumed to have had significant, if not complete, control over access to the material. Following this perspective, many scholars studying Melos, Phylakopi, and obsidian exchange in the nineteenth and early twentieth centuries (and some even more recently) conceived of a commercial exchange industry, similar to modern capitalism, controlled by the elite at Phylakopi (Branigan 1970; Torrence 1986). The presumed value of obsidian, as the only heavily available siliceous material in the region (flint is available in only small quantities), was thought to have been responsible for the rapid rate at which Phylakopi developed into such a large, influential settlement. Similarly, the eventual decline of Phylakopi was seen as a direct result of a decline in the regional demand for obsidian from Melos, which was suggested to have occurred because of the appearance and popularity of metal tools (Mackenzie 1904; Torrence 1986).

More recently, however, the perspectives proposed by many scholars studying obsidian consumption in the area more closely resembles a model of direct access and reciprocal exchange. Much of the support for this perspective comes from Renfrew (1972), who recognized that due to vast differences in socio-political organization between modern society and Early Cycladic society, exchange would have likely been organized differently than is modern exchange (Renfrew 1972; Torrence 1986). Those who follow this outlook believe that the trade in obsidian may actually have not held any sort of economic significance for the communities of the Cyclades, as it was not uncommon or restricted enough economically to have been a profitable commodity. Rather, following this perspective, it was the spread and consumption of metals, not obsidian, that drove the development and growth of the large cities and civilizations in the Aegean such as Phylakopi (Renfrew 1972; Torrence 1986).

This idea certainly seems plausible for the Neolithic in particular, where it appears that anyone who wanted Melian obsidian simply traveled to the island and took it, without any apparent economic or social interaction with the Melian people. A system of direct access was almost certainly in place prior to the Late Neolithic, during which we see the earliest evidence for settlement on Melos. If no settlements existed on Melos, it follows that there would not have been a Melian-controlled commercial exchange industry (Cherry 1979; Renfrew 1972; Renfrew et al. 1965; Torrence 1986). Moving into the Early Bronze Age, the situation seems to have stayed more or less the same; no evidence for a commercial obsidian trade is to be found in the archaeological record at either Melos or any other Cycladic island. The earliest evidence for extensive foreign economic relationships – in the form of imported goods (primarily pottery) – does not appear in the material record until the Middle Bronze Age (c. 2100 BC), feasibly indicating that anything resembling a commercial exchange industry was absent prior to this time. Furthermore, by the height of Phylakopi's prosperity (also the Middle Bronze Age, as indicated by settlement size and appearance of fortification structures), the overall demand for obsidian in the region was declining, which suggests that obsidian would not have been a very important economic asset overall for Phylakopi or Melos as a whole (Renfrew 1972; Torrence 1986).

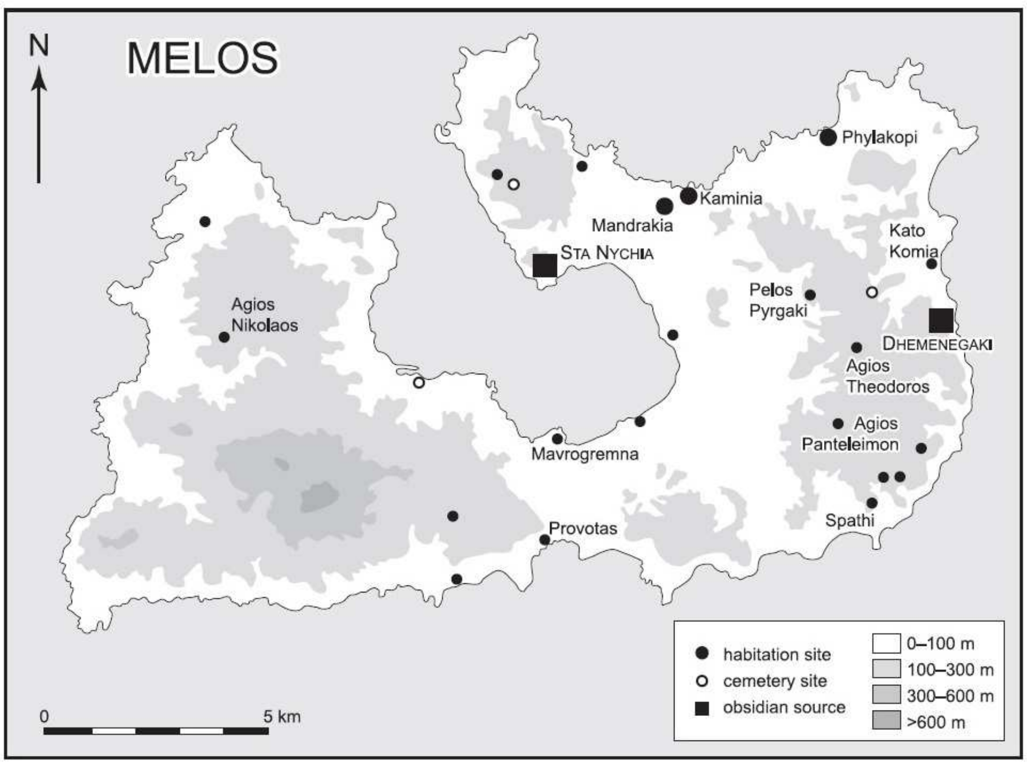

Figure 7. Map of Melos showing Phylakopi and both source areas. Carter 2008b: Figure 23.1; used with permission (see **Appendix C**)

The evidence at the quarries themselves seems to support a theory of direct access over that of an established commercial exchange system, as well. If there was in fact an obsidian industry driving the development and economy of cities like Phylakopi, we should expect to see the material remains of such an industry at the quarry sites themselves. Specifically, there should be evidence that those with ownership over the material put effort into restricting access to the quarries. However, neither Melian source show any physical evidence for having had restricted access. Archaeological excavations have revealed no evidence of walls, marked boundaries, or any other effort to restrict or delineate access to the quarries. The possibility remains that these sort of boundaries could have existed, though in the form of a perishable material like wood, but timber is very rare in the Cyclades, so the probability of this is not high (Torrence 1986). The quarries also lack evidence for any sort of systematic extraction techniques; we would expect a commercial industry to develop methodical extraction procedures and tools in order to maximize efficiency, but neither of the Melian quarries contains evidence of such methods. In contrast, the quarries display evidence for a relatively small investment of time and labor, in which material was quarried in a single location over no more than two person-days, and in a way that left considerable amounts of material behind (Torrence 1986:181) (**Figures 8-11**).

In addition to the direct access occurring at the quarries themselves, a degree of subsequent reciprocal exchange took place throughout the Aegean. Examining the fall-off curve of the movement of Melian obsidian following the removal from the island's quarries, Renfrew (1972) determined that during the Neolithic and Early Bronze Age periods in the Aegean, the movement of obsidian most closely resembles "down-the-line" exchange. In other words, the individuals accessing Melian obsidian directly would keep whatever amount was needed for themselves, their family, and/or their community, while the remnants would be traded to nearby communities for something of equivalent value. This would continue "down-the-line," until the material was entirely consumed (Carter 1998; Renfrew 1972).

Figure 8. The Sta Nychia obsidian quarry on Melos. Photo taken by R. Tykot

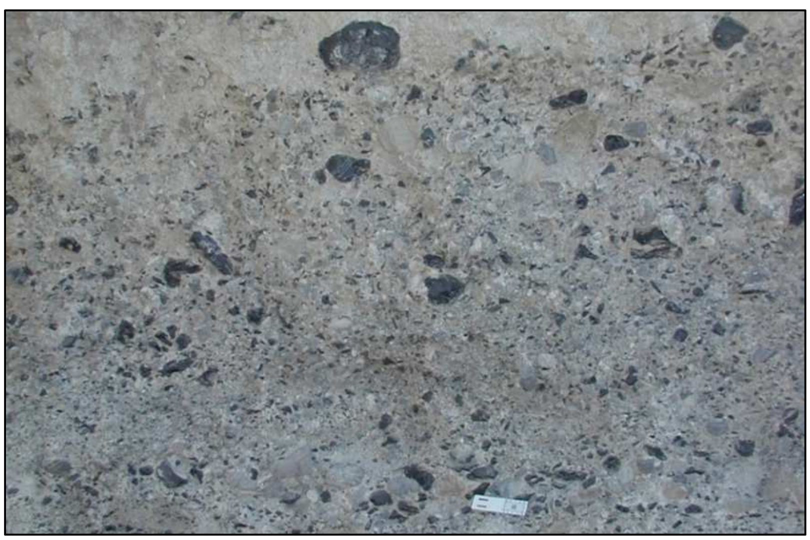

Figure 9. Close-up of the obsidian at Sta Nychia. Photo taken by R. Tykot. Scale in photo is 10 cm long in its entirety

Figure 10. The Dhemenegaki obsidian quarry on Melos. Photo taken by R. Tykot

Figure 11. Close-up of the Dhemenegaki obsidian. Photo taken by R. Tykot. Scale in photo is 10 cm long in its entirety.

Production and Specialization

There has been some disagreement in the past as to whether or not a specialized craft industry for obsidian blades existed in the Early Bronze Age Aegean. Torrence (1986), for instance, argued that the differential methods of core reduction observed throughout the region, together with what she saw as a relatively high standard deviation in the measurements of blades across the region, indicated the absence of specialization. Others have come to contradictory conclusions, such as Runnels (1985), who oddly cites the same data as Torrence with regard to blade measurements as evidence *for* standardization across the region. It should be noted, however, that even if we are to interpret the measurements the blades as standardized, such regularity of a product can be driven just as much by social expectations and preferences as it can by a specialized craft industry (Carter 1998; Runnels 1985). Despite past inconsistencies in recognizing specialization, it is now generally agreed that craft specialization of obsidian blades in the Aegean took place beginning in the Neolithic and lasted through the Early Bronze Age. The task now is to characterize the nature of this industry, considering the potential driving forces and motivations behind craft specialization beyond purely economic terms (Carter 1998).

There may be political significance involved in craft specialization, for instance, with the crafted products existing as a means for the embodiment and spread of an ideology (Clark and Parry 1990). Mary Helms (1993) makes the point that skilled crafting, as opposed to other types of production (particularly standardized, industrialized manufacturing), tends to be tied in more closely to politics and ideologies than to economics. These acts of specialized crafting tend to be more ritual in nature, and are commonly publically enacted during politically meaningful events (Helms 1993). These acts and their products are commonly conceptualized as ideologically significant transformations of the material paralleling real-world ritual transformations. Objects produced through industrialized manufacturing, on the other hand, are seen as entirely new, impersonal objects dissociated from the production process, which itself is entirely economic in its concern for efficient and uninterrupted production (Helms 1993).

This particular aspect of craft specialization is most often discussed in cases where the specialized products are regarded as "exotica," but it is just as important to consider ideological functions in situations where the material in question is a commonplace, local product (Carter 1998:41). Arbitrary divides between the meanings of exotic and local or utilitarian materials, similar to the division between functional and symbolic aspects of production, results from cultural distinctions that we have grown accustomed to in western society between decorative and functional, and between spiritual and mundane (Carter 1998). Local raw materials may in fact produce crafts of great value, often in situations where the value of the object derives from the act of production itself. The esoteric knowledge and labor required to skillfully craft raw materials translates into social prestige; those with such knowledge (as well as those who might sponsor the production or subsequently come to own the products) are held in high regard for their power and the secrecy that surrounds it (Helms 1993).

The value of skillfully crafted objects may also derive from the geologic source of the raw material. In the case of obsidian in the Early Bronze Age Aegean, for instance, it is believed that within lithic production industries, the raw material was very commonly chosen from a source believed to have not only the appropriate aesthetic and functional properties, but also the appropriate supernatural associations (Decourt 1998). Particular spaces on the landscape may become invested with spiritual, "otherworldly" significance due to some association with ancestors, important historical or mythical events, or other types of spiritual importance (Helms 1988:48). The context of production would also have served to influence the way that the meaning and value of the material and finished products were perceived, as certain spaces and circumstances lent different meanings to production processes (Carter 2008b).

Though there is no evidence to suggest that access to Melian obsidian was restricted at the sources themselves, the situation changed once the obsidian left the source. Even in the Late Neolithic, there is evidence to suggest that the production of obsidian blades was controlled within communities. This was especially the case in the Early Bronze Age, when pressure flaking – a technique first seen in the Cyclades in the Neolithic – became a prominent mode of obsidian production (Carter 1998:19). This technique, likely introduced into Early Cycladic communities via the mainland, was restricted along both spatial and social boundaries, appearing at the largest, most politically significant settlements (Carter 1998:150). Once introduced into the Cycladic communities, the knowledge behind the production technique was seemingly restricted, which contributed to the conceptualization of these objects as valuables; the specialized skills required to craft uncommon goods are held in high regard and confer a degree of power and value onto the objects themselves (Helms 1988). Accordingly, those in control of this production also had control over the construction and maintenance of hierarchies and social relationships (Carter 1998).

The Blades of the "Necrolithic"

At the onset of the Early Bronze Age, the frequency of pressure-flaked obsidian blades as Cycladic grave goods greatly increased, and continued to do so until the end of the Early Bronze Age by which point they were among the most common grave items in the Cyclades (Carter 1998; Doumas 1977, 1990a, 1990b). This period also saw the introduction of a new and very specific production technique for pressure-flaked obsidian blades that exclusively took place in the burial arena. This technique, which would have required great skill on the part of the craftsperson, produced remarkably consistent and longer-than-average blades; settlement blade length averages around 5.5 cm, while the vast majority of this new cemetery material exceeds this, with some of the longest blades reaching 15, even 20 cm (Bosanquet 1904; Carter 2007) (**Figure 12**). The artifacts produced through this technique have earned the classification of "necrolithic" due to their exclusivity to burial contexts (Carter 1998:159, 2007).

Much of what we can deduce about the production of these blades comes from the cores that were used to produce them. While the cores that have been recovered from domestic contexts were worked only on half, or sometimes two-thirds, of their surface area, the surfaces of cores of the necrolithic were worked in their entirety. In addition to suggesting a highly different stance and means of body positioning on the part of the craftsperson, it suggests a much more productive technique altogether; as many as 83 blades could have come from a single core (Carter 1998; Sheets and Muto 1972). The cores themselves seem to have been regarded highly as well, as they have been found in numerous tombs along with the blades they produced (Carter 1998, 2007).

With regard to the physical context of necrolithic production and consumption, our understanding is a bit obscure, largely due to insufficient archaeological information. The fact that no evidence of this type of pressure flaking has been located in domestic areas, however, indicates that the production of these necrolithic blades was not something done in the settlements. Furthermore, debitage from obsidian blade production located in the cemeteries themselves suggests that the necrolithic may have taken place completely in these burial contexts, and provides support for the hypothesis of the necrolithic having been part of a socially meaningful performance (**Figure 13**). The inclusion of this production ritual in burial contexts is unsurprising; acts of skilled crafting are regarded as transformations, and as such are associated with other events conceptualized as transformations, including death (Helms 1993; Metcalf and Huntington 1991).

Such a performance was possibly meant to “mystify” the relatively new method of pressure flaking that was so visually similar to the act of the predominant method of indirect percussion (Carter 1998:165). These necrolithic blades, on occasion, show minor traces of use wear, which, given the fact that their production takes place graveside, indicates that they were likely *used* graveside as well. This could explain why some pieces seem to be missing from their respective assemblages in a number of cases; some utilized pieces may have been used and taken by living participants of the burial ritual (Carter 1998:171; 2007).

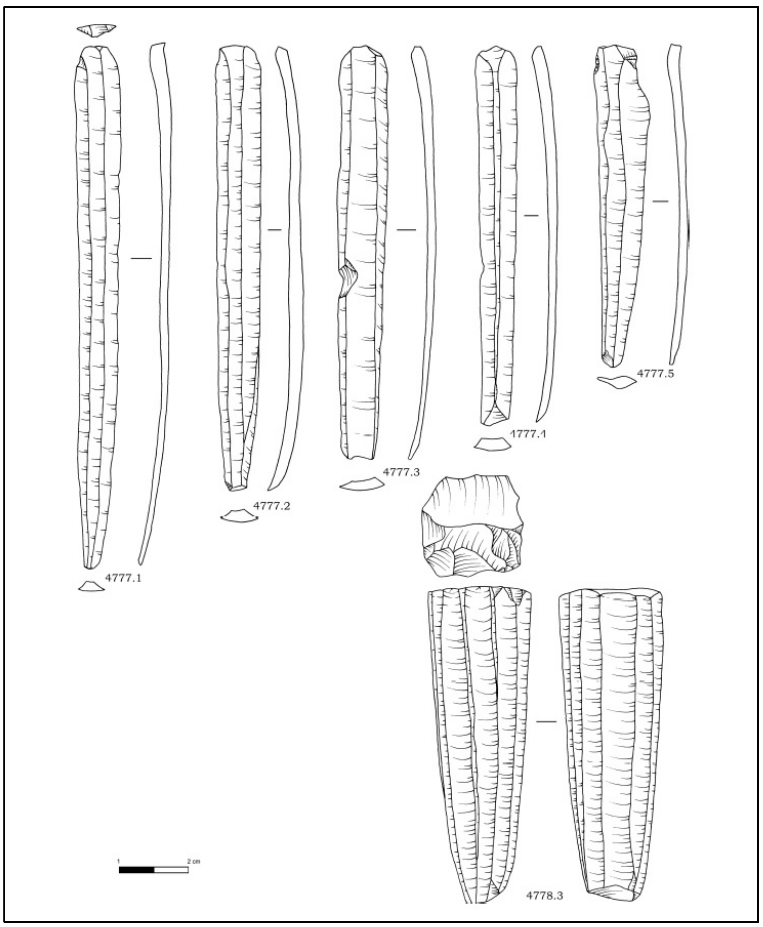

Figure 12. Necrolithic blades and core from a Paros burial. Carter 2007: Figure 6.3; used with permission (see **Appendix C**)

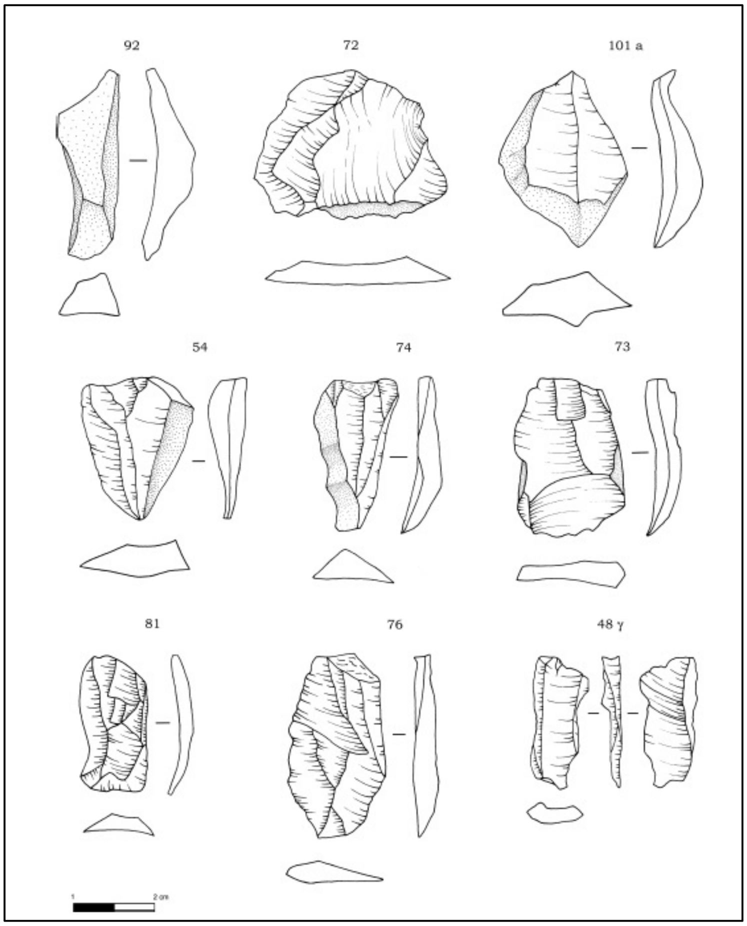

Figure 13. Surface material from the Tsikniadhes cemetery. Carter 2007: Figure 6.8; used with permission (see **Appendix C**)

But why would this performance have been a desirable undertaking? It is likely that a burial event, as an arena where members of kinship groups, trading networks, etc. would have gathered, would have been an important time and place for these individuals to form, bolster, and negotiate social relationships. In that case, the leader of the host group would have had an interest in demonstrating their influence and prestige – something that would have included the sponsorship of a knapper with the restricted knowledge of the necrolithic craft (Carter 1998:169). These politically powerful sponsors became connected with the esoteric knowledge and supernatural connotations of the craft production by association, and thus reinforced their own political clout (Helms 1988). The knappers were likely not themselves political leaders, an assumption partially supported by the likelihood that the knappers would have been highly mobile rather than maintaining associations with any one community. They would most likely, however, have held a certain degree of status due to their exclusive knowledge and mobility throughout the islands (Carter 1998; Helms 1993; Budd and Taylor 1995).

The function of the necrolithic craft as a sponsored performance provides an explanation for the fact that cores are not always deposited alongside matching blades, and why many necrolithic assemblages seem to have been produced using multiple cores. The cores would likely have circulated with the knappers, who produced a small number of blades for each burial event they were sponsored to attend, and finally deposited the core when it was exhausted. Multiple knappers could have been sponsored for particularly important events, establishing a possible reason for the presence of multiple cores. Through this circulation throughout the region and participation in the funerals of significant members of Early Cycladic society, the cores would have formed their own histories of association with past peoples and events, and become just as symbolically important as the blades themselves (Carter 1998).

From the instances where they have been located in the archaeological record, we know that some cores had function in the burial rituals beyond simply supplying the blades. The cores were also put to use as pestles, attested by the grinding of the platform and, on occasion, residues of pigments on the cores themselves (Carter 1998:175) (**Figures 14, 15, and 16**). This function comes as no surprise; the material of the necrolithic holds a strong ritual and contextual association with body modification, which serves in many instances as a way in which people express their position and identity. The blades of the necrolithic, especially the "missing" blades circulated among the living attendants or those blades showing signs of use wear, are proposed to have been implements used for tattooing, depilation, and/or scarification (Bent 1884:52; Blinkenberg 1896:54; Bosanquet 1896-97:56, 1904:221; Carter 1998:133; Dörpfeld 1927:296). These suggested uses are supported by the material's deposition alongside bone-tube pigment containers, razors, scrapers, and tweezers – all implements with known associations with body modification in antiquity – and alongside small marble figurines with pigments painted onto their faces and bodies (Carter 1998:174). The particular pigments used are also materials with restricted levels of access, both in the sense of rarity and in the sense of social access (Renfrew 1969; Blomqvist 1990).

Figure 14. Two Aplomata cores with pigments adhering

Figure 15. Close-up of red pigment adhering to a core from Aplomata

Figure 16. Close-up of blue pigment adhering to a core from Aplomata

Where the individuals interred alongside these necrolithic objects are concerned, there is an unfortunate dearth of information. Poor preservation of the skeletal record prevents the analysis of either adult age or sex of the buried individuals. The only recognizable pattern given the current information at hand is that the burials of the Early Cycladic are mostly restricted to adults; children's burials are remarkably rare. Though the use of these blades as grave goods reached the height of its popularity in the Early Bronze Age, similar pieces can be found in lower concentrations until the Middle Bronze Age (Carter 1998).

Importance of Recognizing Source Selection

Despite the fascinating hypothesized ritual associations of these assemblages, remarkably few obsidian sourcing studies have been conducted on Early Cycladic material, and in fact in the Aegean as a whole (Carter 2008b; Carter and Kilikoglou 2007:115; Frahm et al. 2013; Tykot 2002). Largely due to the previously discussed "myth of a Melian monopoly" in obsidian assemblages, this lack of detailed knowledge of source preference patterns has left archaeologists in the dark with regard to the relative usage of the two Melian quarries in the Early Cycladic periods (Georgiadis 2008:113). Due to the proximity of these two sources, it may seem an inconsequential fact that the people living in these communities selected one of them over the other. However, the act of choosing one raw material source over others, even at this small distance, is a significant and intentional decision on the part of the prehistoric individual and/or group (Carter and Kilikoglou 2007; Dobres and Hoffman 1994; Dietler and Herbich 1998).

Material culture is not simply a passive reflection of existing social and cognitive structures (Dietler and Herbich 1998; Hodder 1982; Plog 1980a; Wiessner 1983; Wobst 1977). Rather the decisions that influence source selection are actively shaped by both practical concerns – including distance to a source, ease of accessibility, quality of the material, and social relations with communities near the source – and by more ideological considerations based around belief systems and the spiritual, ritual, and ancestral connotations of a particular source (Dobres and Hoffman 1994). Source selection, together with other decisions such as procurement, transport, production, and consumption of a given material, forms a broader social process which reflects cultural understandings of "how things should be" (Carter 2008a:226).

As these decisions and actions are repeated over time, they become part of a group's *habitus*, or set of learned dispositions constructed through cultural perceptions and values (Bourdieu 1997; 1980). These structured, learned behaviors work to both facilitate and constrain the actions of groups and individuals, but are not completely static once in place; the recursive social process that creates them allows for them to either be replicated or reworked through social action (Dobres and Hoffman 1994; Ortner 1984; Bourdieu 1977; Giddens 1984). Through a process dubbed "structuration" by Giddens (1979, 1984), the practical, ideological, and cultural conditions that perpetuate these structures also allow for the possibility of alterations and improvisations that become necessary along with changing cultural perceptions of the range of possible actions which can be chosen from along each step of production and consumption (Bourdieu 1977; Dietler and Herbich 1998; Dobres and Hoffman 1994).

As such ever-present aspects of a community's social consciousness, these decisions and actions become embedded in and invested with various types and degrees of social meaning as they are reinforced and reconstructed over time. Accordingly, they develop significant roles to play in the construction and communication of social, cultural, or political identities in certain contexts (Dobres and Hoffman 1994). Michael Dietler and Ingrid Herbich suggest that this could hold especially true within the context of production and consumption in prehistoric communities, as crafting knowledge may have been passed down more commonly through imitation and apprenticeships than formalized regulations (Dietler and Herbich 1998; Herbich 1987). Material style is developed alongside, and is inseparable from, the construction of beliefs, practices, and identities, and is not an afterthought put in place as a marker for identity or meaning as has been suggested in the past (Dietler and Herbich 1998).

Within a production industry, then, if each step is carried out "correctly," certain social meanings and identities can be successfully assumed and enacted, such as those which were involved in the performance of obsidian blade production in Cycladic burial contexts (Carter 2007). Thus the source, form, function, and provenience of an artifact all exist as means through which archaeologists may extrapolate a great deal of information; they are the material correlates of ancient social decisions, beliefs, and understandings of the world (Dobres and Hoffman 1994). Given their connection with the ingrained structures in a community's habitus, a shift in something like source selection may represent some sort of shift in these cultural perceptions, so recognizing the fluctuations in source selection where they exist allows us to pinpoint and investigate otherwise obscure cultural phenomena (Bourdieu 1977, 1980; Giddens 1984).

CHAPTER FOUR

MATERIALS AND METHODS

Geologic obsidian sources, due to their spatial restriction to locations of volcanic activity, are all geographically distinct from one another. This spatial distinction sets obsidian apart from raw materials with more continuous deposition patterns, such as chert, which can be more difficult to delineate with regard to source area. It also allows for the easy identification of unique, source-specific chemical fingerprints of the obsidians; concentrations of certain elements vary from one source to another, but remain remarkably consistent within a single source, excluding instances of extreme weathering or contamination. These characteristics come together to create a material so well-suited for sourcing studies that such studies have been dubbed “one of the great success stories of archaeometry” (Carter 2008b; Carter and Kilikoglou 2007:115; Williams-Thorpe 1995).

A number of methods are available to archaeologists who wish to measure these chemical compositions, and selection of a method will involve considerations of a number of factors including cost, accessibility, and the requisite level of damage done to the sample(s). Some of these methods require destructive analysis – generally taking a small sample from the object and turning it into a fine powder and possibly dissolving that powder with a chemical solution to prepare it for analysis. These methods can produce highly successful results, but can be difficult in cases where destruction of the material is prohibited or undesirable. X-ray fluorescence spectrometry provides an excellent alternative to these destructive methods of analysis, and will be discussed in detail below.

X-ray Fluorescence Spectrometry

X-ray fluorescence (XRF) spectrometry is a method of measuring which elements are present in a given material, and in what concentrations. This technique works on principles that have been known to scientists since the early 1900s when Charles G. Barkla studied the association between the radiation of X-rays from a given material and the atomic weight of that material. This provided the basis for the now well-known relationship between an element's atomic number and the amount of energy associated with it, now the foundation of the principles of XRF (Shackley 2011). Following these principles, we now understand that by emitting X-rays, or short wavelengths of high-energy electromagnetic radiation, into a given material, we can ionize the atoms within the material. In other words, an electron on each affected atom's innermost shell (or K-shell) is excited by the X-ray energy to the point of displacement off the K-shell. This process destabilizes the atomic structure of the atoms, and the vacancy created on the K shell is filled by electrons from the outer shells, which jump to the vacant spot in an attempt to stabilize the atom. When these outer electrons jump inward within the atom, they emit secondary X-rays that are characteristic to each individual element. These secondary X-rays, which are lower-energy than the primary rays, bounce back into the XRF spectrometer energy detector, which utilizes software to produce a visual representation of the concentrations of major, minor, and trace elements within the sample material (Liritzis and Zacharias 2011; Shackley 2011).

If the sample being analyzed is small enough to fit inside the chamber of an XRF, the method remains non-destructive; no material needs to be pulverized, compounded, or broken in order to run the analysis, nor does the quality or composition of the material change in any way as a result of the application of X-rays (though obsidian rarely requires this step anyway, due to its homogenous composition). If the material is too large, however, some form of destruction may be necessary to run analyses successfully. This is not true of the portable XRF instruments, which will be discussed in depth below. Also beneficial to the integrity of the material is the minimal need for sample preparation; excessive dirt or sediment should be washed off if possible, but as long as any sediment present on the sample is minimal, and the sample itself has never been subjected to temperatures high enough to bind the sediment to the sample, only basic cleaning will suffice (Shackley and Dillian 2002; Shackley 2011). XRF analyses allow for chemical characterization to be determined remarkably quickly (in the case of obsidian, no more than a few minutes per analysis), and requires relatively little in the way of training as the methods are simple and largely automated. Due to the lack of necessary preparation, the rapidity with which analyses can be conducted, and the simplicity of the tests themselves, XRF also has a significantly lower financial investment over time relative to other similar methods (Shackley 2011).

Portable XRF instruments, like the one used to conduct the research in this thesis, are compact, lightweight, and obtain information regarding major, minor, and trace chemical elements quickly on site (Liritzis and Zacharias 2011). The machine, which is approximately the size and shape of a handheld power drill, can easily be transported to the location where analyses must take place. This eliminates the need for the loaning and shipment of artifacts that may be delicate, rare, or otherwise difficult to obtain from their curational facility. These machines also do not have the limitation of chamber size that their full-sized counterparts have, and so remain entirely non-destructive (Frahm 2014).

Other Benefits and Limitations

Researchers across a variety of disciplines have found a number of uses for XRF technology. Geologists use XRF for the on-site characterization of materials useful for constructing geologic profiles of an area of interest. Scholars in the art community put XRF to use in identifying the materials used in paints and sculpture matrix, whether it be metal or stone. Conservators may put the method to use to aid in preservation/restoration efforts; understanding what the material is that you have helps you decide what steps to take to preserve it. Archaeologists most commonly employ XRF in provenance studies aimed at establishing patterns of source use, which can then be used to answer social questions of mobility and/or exchange patterns (Liritzis and Zacharias 2011; Milić 2014; Tykot 1996, 2002). The characterization abilities of the method can aid in authentication studies in any of these disciplines, detecting anachronistic materials in an assemblage supposedly dating to a certain time period, or even to test whether or not an object being returned to a museum is the same object that was loaned out (Liritzis and Zacharias 2011).

One of the greatest benefits of the portable technology in particular is the gained ability to work with and around bureaucratic and legal regulations. Often for art historians and archaeologists, the only thing standing in the way of analyzing a set of materials are the legalities of removal from a museum collection and/or shipment across national or state borders, especially when the material is particularly fragile, valuable, or aesthetically significant. With pXRF, the individual looking to study a collection can take the machine to the collection, rather than the other way around. This means that the datasets that are sampled can be constructed more by the needs of the scholar or project, and less by the restrictions of bureaucracy. The possibility of mass-sampling is greatly increased in these instances, which allows for a much wider variety of archaeological questions to be answered (Tykot 2010; Tykot et al. 2013; Frahm 2014; Milić 2014).

Along with all possible applications and benefits come a few inevitable limitations. The fact that XRF is only capable of identifying individual elements and not the broader compounds that those elements compose can cause issues in certain cases, such as when researchers might be trying to identify individual pigments mixed into paints. Issues can also arise where “original” artifacts or works of art have been painted over, as the X-rays in XRF may penetrate the topmost layer and give information regarding the layers underneath, which may contain different material. Similarly, for someone working with metal objects or ceramics, problems can arise with surface patinas, glazes, or other finishes, as the X-rays will pick up the composition on the surface and obscure the inner matrix (Liritzis and Zacharias 2011).

Sample size and sample thickness can also affect the efficacy of XRF analysis. The accuracy of elemental measurements, particularly of heavy elements, can be negatively affected if your sample is not substantially thick enough for the critical depth of the X-rays to reach (Davis et al. 2011; Liritzis and Zacharias 2011). Similarly, if the sample is not large enough to cover the entire X-ray beam (which is generally a few centimeters in diameter), a proportion of the X-rays are essentially analyzing empty space, and the resulting spectrum may not represent the composition of the material with the desired amount of accuracy (Milić 2014; Davis et al. 2011). Though less of a concern than size and thickness, the geometry of the sample should be considered, as the sample must sit as flat as possible. Angular or irregular edges could mean that not all X-rays bounce back into the machine, thus presenting the same issue of “empty space” skewing results (Davis et al. 2011).

Reliability of XRF Technology

The accuracy and dependability of pXRF spectrometry has been a source of some contention since the first instances of its use in archaeological contexts. Some scholars argue that there is an inevitable lack of accuracy and precision in results produced through pXRF (Frahm et al. 2013; Frahm 2014; Speakman et al. 2011). Steven Shackley, one of the most prominent proponents of pXRF technology in archaeology, suggests the contrary. The archaeological discipline as a whole, he suggests, was perhaps not prepared with sufficient relevant knowledge or training to completely embrace the positive effects that pXRF could have on archaeological studies. He argues that, as long as proper protocols are followed and those using the technology perform tests of their machine's validity and reliability, the technique is entirely useful and dependable for determining elemental composition for provenance purposes (Shackley 2011).

One consideration that must be made to ensure this dependability is the calibration of raw output results. The machines used to run these analyses do not come pre-calibrated, as their desktop counterparts do. Without applying an empirical calibration based on international standards to pXRF output data, the results are only consistent internally, meaning that they are only scientifically comparable to other results produced by the same machine. Comparisons to results produced in other studies using other machines in such cases may be very difficult, which greatly limits the potential for the research itself (Shackley 2011; Craig et al. 2007; Milić 2014).

Regarding the reliability of the method when all necessary regulations are followed, a number of studies have been performed suggesting that the results it produces are valid for use in conjunction with other data in the broader scientific community. Glascock (2011) provides a comparison between the use of XRF and neutron activation analysis (NAA) through the application of both techniques on a number of obsidian artifacts from central Mexico. NAA is a chemical characterization technique wherein the nucleus of a sample atom is exposed to additional neutrons, causing the nucleus to decay and subsequently emit characteristic energy rays which can then be measured, allowing elemental composition to be determined. NAA and XRF are both excellent archaeometric techniques for analyzing the chemical composition of obsidian because each has the capability to measure a number of the "incompatible elements" (elements that exhibit higher concentrations when in the liquid magma state), which are good indicators of differences between sources (Glascock 2011:172). The concentrations of these incompatible elements within a given geologic obsidian source are determined by a number of factors, including age, pressure, temperature, and other physical properties of the liquid magma itself. NAA is more sensitive and can detect a higher number of elements than XRF, and the results are consistent between different machines and labs to a much higher degree, but the cost per sample is around twice to four times as much as XRF. NAA analyses are also destructive – samples are generally prepared by extracting small portions of the material after crushing with a Carver Press – and the machines are far less available (Glascock 2011).

Both of these methods were applied to obsidian artifacts that were collected by Robert Cobean and James Vogt in the early 1980s in an effort to conduct a systematic survey of obsidian sources in Central Mexico. More than 800 obsidian source samples were collected, 596 of which were subjected to analysis by NAA. From these analyses, 22 geochemical obsidian source groups were determined to exist in central Mexico. In 2006, 275 of the 596 samples analyzed by NAA were re-analyzed with XRF (with all 22 geochemical groups represented in this second group of analyses), largely to make it possible for archaeologists to utilize either method in their obsidian characterization work in central Mexico and still be able to calibrate their equipment using this database. When comparing the calculated group means of various elements that were measured by both XRF and NAA (K, Fe, Zn, Rb, Sr, Zr), five of the six (Fe, Zn, Rb, Sr, and Zr) demonstrated a great deal of linearity, with $R^2 = 0.99$ (Glascock 2011:184). The fact that the linearity of K was weaker is likely due to the fact that measurements of K with these techniques is more highly affected by factors such as the limited concentration range, detriments of irregular sample shape, and effects of surface irregularities and differences than the other elements considered.

Accordingly, the results were considered as substantial support for the comparability of these two methods; non-destructive analysis with XRF provided just as accurate and precise a characterization of the chemical makeup of obsidian artifacts as the more expensive and destructive NAA (Glascock 2011).

Focusing more on the accuracy of pXRF analyses between instruments, Frahm and colleagues (2013) tested the validity of these handheld devices by performing analyses on Aegean obsidians with multiple pXRF machines and comparing the results. The calibrated values produced by different machines matched, proving that there is in fact intra-instrument measurement consistency when proper protocols are followed. In a later study, Frahm confirmed these results again; even when results were compared between an early pXRF model operated by novice users and another, much newer machine with SDD and camera capabilities, the results were highly correlated (r = 0.88-0.98) (Frahm 2014:122). In the same study, Frahm also compared the results of pXRF to the results produced by other, more expensive and destructive methods, finding that pXRF matched up to the data produced by methods such as NAA, EDXRF, and ICP-MS (Frahm 2014).

In a comparison between results obtained by both non-destructive XRF and WD-XRF analysis with powder samples, De Francesco and colleagues (2011) determined that the X-ray intensity ratios that were produced through the non-destructive analysis of solid obsidian samples were able to differentiate between various geologic sources just as well as the destructive analysis could with powder samples. Thus the non-destructive technology provides a desirable alternative for researchers to lower expenditure of both time and money, without compromising data integrity (De Francesco et al. 2011). It should be considered, however, that the composition of obsidian is that of an extremely homogenous glass, and this is a huge factor in the success of pXRF applications to the material (Liritzis and Zacharias 2011). Other, less homogenous materials (such as ceramics) may fare better as powders than they do as entire pieces when compared with obsidian samples (though multiple-point analysis with pXRF can help close that gap).

Obsidian Sourcing in the Aegean

As one of the great successes of archaeological science (Carter 2008b; Carter and Kilikoglou 2007; Williams-Thorpe 1995), more and more pXRF characterization studies of obsidian are taking place all over the world. In just the past few years, studies have been completed in Italy (Tykot et al. 2013), Armenia (Frahm 2014), Peru (Kellett et al. 2013), China (Jia et al. 2013), New Zealand (McCoy et al. 2014), and beyond. However, applications of this particular technology in the Aegean are rare, as are obsidian sourcing studies in the region on the whole, largely due to the aforementioned reluctance of Aegean scholars to spend time on obsidian characterization when they are already so certain that the material came from Melos. This section will give a brief overview of what research has been completed in the Aegean regarding the archaeometric characterization of obsidian.

Renfrew and colleagues (1965) are often regarded as the initiates of archaeometric obsidian characterization in the Aegean. Prior to this, obsidian characterization in the region was often conducted through the analysis of macroscopic characteristics such as color and degree of opacity (Cann et al. 1968). These visual differences are not consistent enough to provide a reliable technique for scientific classification, as variations can also occur within individual quarries, and many sources – such as the two on Melos – are entirely undistinguishable from one another visually (Milić 2014). These macroscopic characteristics did, however, provide some degree of classification before chemical distinctions were a possibility (Braswell et al. 2000; Carter et al.

2008; Milić 2014; Renfrew et al. 1965). In their 1965 study, Renfrew and colleagues analyzed 40 geologic obsidian samples from sources in the Aegean, Anatolia, and Central Europe using optical emission spectroscopy (OES) with the goal of establishing differences in elemental composition between the sources (Renfrew et al. 1965). They succeeded in establishing broad source groups, but the method used was not sufficient to distinguish between every source. Giali and Melos, for instance, overlapped in elemental profiles when analyzed through this method, as did the two Melian sources (Renfrew et al. 1965). Yet this study still had significant impacts, as it initiated a tradition of archaeometric characterization in the Aegean which would eventually produce a wealthy bank of elemental profiles for the region's obsidian sources.

Advancing from the unexceptional distinctions provided by OES, neutron activation analysis (NAA) soon became the favored technology for obsidian provenance studies. Aspinall and colleagues (1972) applied the method to geologic samples of known origin in the Aegean, as well as to a small sample of archaeological pieces. Their research provided evidence that NAA could successfully distinguish between Melos and Giali obsidians as well as between the two Melian subsources. The method has since been put to use to source samples of archaeological obsidian, as in the work of Carter and Kilikoglou (2007) on Crete, and of Torrence and Cherry (1976) on the island of Giali in the Dodecanese. Other methods, including analysis of magnetic properties, laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) and inductively coupled plasma-spectroscopy (ICP-OES) have been shown to be able to differentiate successfully between geological samples taken from the Sta Nychia and Dhemenegaki sources, but have not been used on large samples of archaeological obsidian in the Aegean as of yet (Frahm et al. 2014; Gratuze 1999; Kilikoglou et al. 1997; McDougall et al. 1983).

X-ray fluorescence (XRF) spectrometry was soon seen to have the ability to distinguish between the Aegean sources, as well. In their 1982 study, Shelford and colleagues analyzed 92 samples from the Melian sources with XRF and 30 samples with NAA, proving that XRF was as capable as NAA for distinguishing the two subsources. As the samples taken were intentionally removed from a range of spots within each source, the study is also notable for establishing the internal homogeneity of the sources with regard to elemental composition, something that had largely been assumed until this point (Shelford et al. 1982).

The past few decades have been relatively quiet with regard to obsidian provenance studies in the Aegean. It seems that though the region found its place as a "methodological testing ground" for sourcing techniques in the 1960s-80s, the effort required to actually engage in the archaeological sourcing of obsidian has not generally been seen as worthwhile (Carter and Kilikoglou 2007:115; Tykot 2002). There have been a few recent studies, however; Kilikoglou and colleagues (1996) ran NAA analyses on 11 artifacts from the site of Mandalo in Macedonia, Greece, which represented both the Late Neolithic (n = 9) and Early Bronze Age (n = 2). Every Late Neolithic piece plus one piece from the Early Bronze Age originated from the Carpathians while the final Early Bronze Age piece sourced to Dhemenegaki on Melos. Portable-XRF instruments have found limited use in the Aegean, but have at least been employed in studies by Liritzis (2008) and by Frahm and colleagues (2014), each proving that the method is able to distinguish between the Melian subsources.

In another recent – and unprecedentedly large – study, Carter and Kilikoglou (2007) examined 222 obsidian artifacts from Bronze Age occupations on Crete – 126 from Mochlos, 60 from Middle Minoan Quartier Mu at Malia, and 36 from late Minoan Quartier Nu at Malia – through neutron activation analysis. The analyzed assemblages from each of these sites were unsurprisingly dominated by Melian obsidian, and within the Melian obsidian a clear preference was shown for the Sta Nychia quarry (Carter and Kilikoglou 2007). This study also showed an interesting distinction in the use of the two Melian sources at the Middle Minoan site at Malia, Quartier Mu, with Sta Nychia material representing almost the entire reduction sequence and Dhemenegaki only appearing either as preformed cores or premade implements (Carter and Kilikoglou 2007).

This study represents one of the first instances of recognizable patterns of differential Melian source exploitation in the Aegean, as the majority of studies before this point either focused solely on geological samples or analyzed only a handful of archaeological pieces. In the past decade or so, as a result of these larger-scale studies being conducted on artifacts, a broader pattern has been observed in the Aegean with regard to potential source preferences of which Carter and Kilikoglou's 2007 findings are a part. Broadly speaking, where sourcing studies have been carried out at Neolithic Aegean sites, a preference has been observed for the Melian source of Dhemenegaki. Sourcing studies involving Bronze Age Aegean sites, on the other hand, tend to demonstrate a preference for Sta Nychia obsidian. For instance, the obsidian assemblages of the Neolithic phases at Knossos, Phaistos, and Haghia Triada have been sourced overwhelmingly to Dhemenegaki (with the Neolithic samples taken from the latter two sites actually *all* sourcing to Dhemenegaki) (Efstratiou et al. 2004; Karydas et al. 2003). The Early Bronze Age occupations of Phaistos and Haghia Triada produced entirely Sta Nychia obsidian, while the Middle Bronze Age levels of each site produced both Dhemenegaki and Sta Nychia (Karydas et al. 2003).

Furthermore, additional work completed in August of 2014 by myself and Dr. Tristan Carter at the Institute for Aegean Prehistory in Pacchia Ammos, Crete, seems to support this temporal pattern. Obsidian artifacts from two sites on Crete – Late Neolithic Pelekita (n = 67) and

Late Bronze Age Papadiokambos (n = 92) – were analyzed with the Bruker machine in the same manner as the Cycladic pieces. Pelekita is a residential, coastal cave site on the eastern coast of Crete with evidence of Neolithic and potential Mesolithic occupation (Tomkins in press). Papadiokambos, a Late Minoan harbor town that served as home to fishers and their families, sits on the northern coast of east Crete. The site was severely damaged by and abandoned following the Theran volcanic eruption and subsequent earthquakes of the Late Bronze Age (Brogan and Sofianou 2007). The pieces from each of these sites, once sourced, served to provide extra regional context within which we can begin to understand the source selection patterns of the Early Bronze Age Cyclades.

The Late Neolithic pieces from Pelekita largely derive from two trenches excavated by Costis Davaras in 2014, and are mainly blades – both pressure and percussion flaked – as well as flakes and a few cores. The pieces split almost evenly between Sta Nychia (n = 36) and Dhemenegaki (n = 31). The Late Bronze Age pieces from Papadiokambos, excavated between the years of 2007 and 2010 from various excavation levels in two separate residential building contexts, consists of mostly flakes, with a large number of blade fragments and a few cores (Building A and Building B). These pieces sourced almost entirely to Sta Nychia (n = 87). Only four pieces from Papadiokambos sourced to Dhemenegaki, while a final piece sourced to Göllü Dağ in central Anatolia. These data could represent insight into the apparent transition in preference between the two sources, with the Late Neolithic Pelekita material serving as the middle-ground between the Neolithic inclination towards Dhemenegaki and Bronze Age preference for Sta Nychia, the latter of which is further evidenced by the Pelekita results. This potential pattern still needs to be investigated further, something that the research presented in this thesis and similar future studies will accomplish.

Sourcing Methods in this Thesis

The specific instrument used to test the obsidian artifacts in this project was a Bruker Tracer III-SD provided courtesy of Dr. Robert Tykot at the University of South Florida. All analyses were run with the tube settings turned to 40 kV and 11 µA, a 12 mil Al, 1 mil Ti, 6 mil Cu filter placed in the X-ray path, and no vacuum. Each analysis was exactly 120 seconds in length, and only one analysis per object was required due to the homogenous composition of obsidian. Once elemental analyses had been run for all samples, the data were calibrated using a program provided by the University of Missouri Columbia (Glascock 2008) and were then used to construct scatterplots in SPSS based on each piece's elemental values. Geologic obsidian samples from each Melian subsource were also analyzed, and the elemental values for each geologic sample were plotted alongside the archaeological data to provide a visual, as well as chemical, basis for attributing each artifact to a source.

These scatterplots were constructed in SPSS Statistics software using Marina Milić's (2014) work with elemental characterization as a guideline. Milić conducted a study in which 52 geologic obsidian samples of known origin were analyzed using a pXRF with the goal of establishing trace element ranges of obsidian sources in the Aegean. Considerations of sample positioning and size were addressed, with each piece placed on the window aperture in both the flattest possible manner and the position in which the greatest portion of the screen was covered. The results of this study determined that differential concentrations of zirconium, strontium, and rubidium were sufficient to distinguish material from the eight Aegean obsidian sources of Antiparos, Carpathian 1, Carpathian 2, Göllü Dağ, Nenezi Dağ, Giali, Sta Nychia, and Dhemenegaki (**Figure 17, Table 2**). Tertiary scatter plots were used to separate the groups visually, showing distinct clusters for each geochemical source. Milić (2014) determined that for the two Melian subsources – Sta Nychia and Dhemenegaki – titanium and iron concentrations were also hugely useful in creating a separation.

In total, 873 obsidian artifacts were analyzed for this thesis (see **Appendix A** for artifact specifics). The Cretan sites of Pelekita and Papadiokambos supplied 159 of these pieces, while the remaining 714 came from eleven Cycladic burial sites, eight of which – Tsikniadhes, Ayioi Anargyroi, Akrotiri, Lakkoudhes, Lakkoudhes A, Avdheli, Rhodinadhes, and Aplomata – are located on the island of Naxos. The remaining three sites – Agrilia, Tzabaris, and Skopelitou – are located on the neighboring island of Epano Kouphonisi. These sites were selected as the basis for the analyses in this thesis as they represented the entirety of the Early Cycladic obsidian collection at the Naxos Archaeological Museum. As is evidenced by **Table 3**, some of the sites produced much greater quantities of artifacts than others, but the assemblages were structurally very homogenous across the board. Five cores in total were analyzed, three from Aplomata (JMA14NM531, 652, and 716), one from Agrilia (JMA 14 NM272), and one from Tzabaris (JMA14NM512). The rest of the material consists of fine, pressure-flaked blades (as well as blade fragments) and pieces of production debris.

The sampling strategy enacted for the Pelekita and Papadiokambos material at INSTAP was limited only by time; every piece listed in an existing database was analyzed sequentially until my time at working at the institute concluded. The analyses conducted on the material at the Naxos Archaeological Museum were less constrained, as I had substantially more time to conduct work there. As such, every piece from all 11 Early Cycladic sites currently in the museum's collections were analyzed (using a Ministry of Culture permit specifically for these analyses), save for a handful of pieces that were simply too small to be properly analyzed with the by the pXRF instrument or that had been so heavily labeled with ink that analysis was hindered.

Analyses were also run on residual pigments on two of the cores analyzed, each from the Naxian site of Aplomata. As discussed in Chapter Three, the cores themselves played a significant role in the rituals of the necrolithic in the burial arena, in part coming into play in the body modification aspects of the performance (Carter 1998; 2007). One of these Aplomata cores (JMA14 NM531) had a blue pigment adhering to its side and red pigment on its tip, while the other (JMA14 NM716) had only red pigment remaining on the tip.

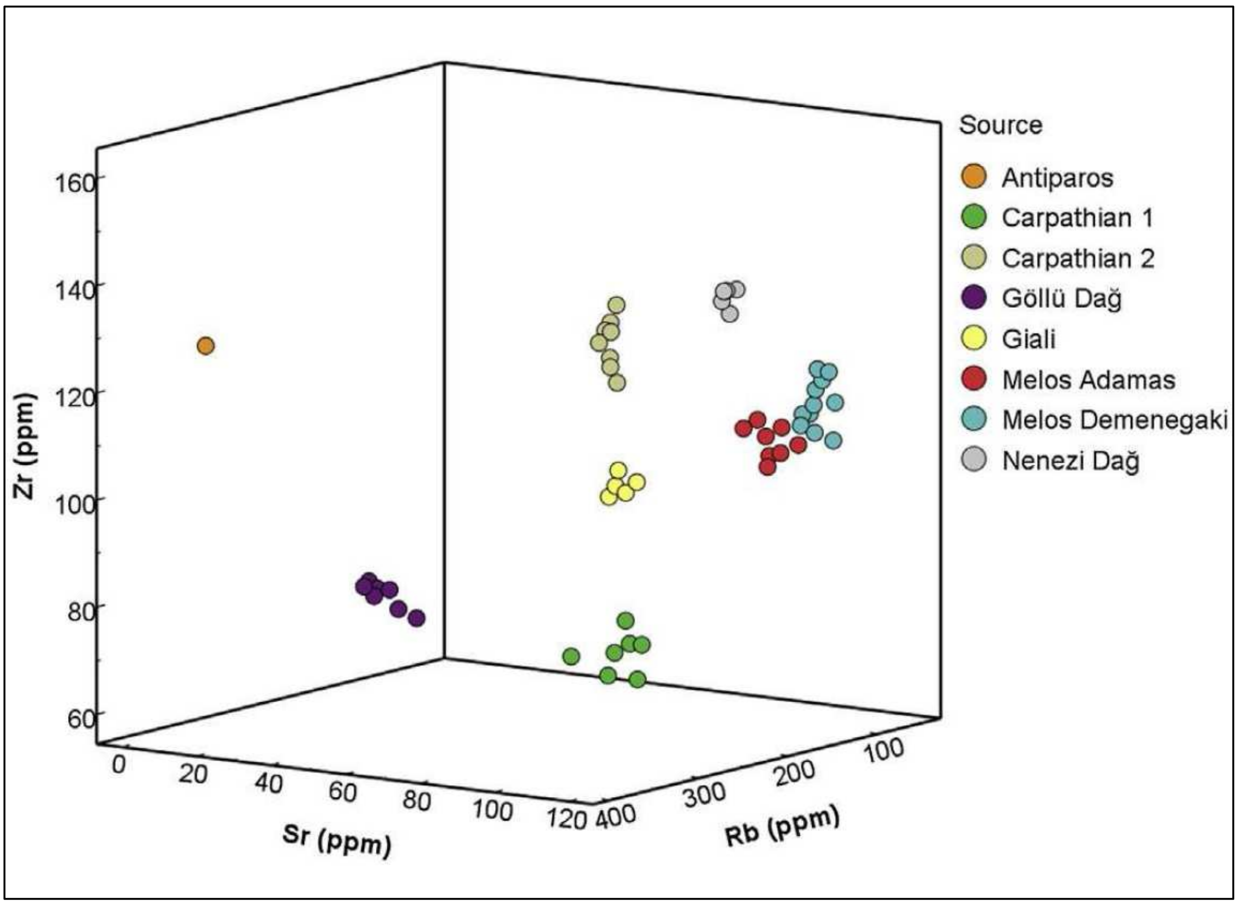

Figure 17. 3D Scatterplot showing the discrimination of relevant obsidian sources. Milić 2014: Figure 3; used with permission (see **Appendix C**)

Table 2. Average ppm values of Rb, Sr, and Zr for relevant sources. Milić 2014: Table 2; used with permission (see **Appendix C**)

Source	**Rb (ppm)**	**Sr (ppm)**	**Zr (ppm)**
Göllü Dag	166-194	8-16	69-76
Mean	178	12	74
Nenezi Dag	143-158	97-100	132-137
Mean	152	99	136
Melos Adamas	103-112	93-107	102-111
Mean	108	100	107
Melos Demenegaki	91-103	105-114	108-121
Mean	97	110	114
Antiparos	367	10	128
Giali	118-124	60-66	94-97
Mean	121	63	96
Carpathian 1	154-173	64-77	62-74
Mean	163	72	67
Carpathian 2	164-185	71-76	118-140
Mean	175	73	127

Table 3. Breakdown of site contribution to the total assemblage

Site	**Island**	**EC Phases Represented**	**Time Period**	**Artifact Count**
Tsikniadhes	Naxos	EBII	Early Bronze Age	163
Ayioi Anargyroi	Naxos	Kampos, Keros-Syros, Plastiras	Early Bronze Age	28
Akrotiri	Naxos	Pelos, Keros-Syros, Plastiras	Early Bronze Age	9
Lakkoudhes	Naxos	Pelos, Kampos	Early Bronze Age	12
Lakkoudhes A	Naxos	Keros-Syros	Early Bronze Age	2
Avdheli	Naxos	Keros-Syros	Early Bronze Age	25
Rhodinadhes	Naxos	Kastri	Early Bronze Age	3
Aplomata	Naxos	EBII	Early Bronze Age	197
Agrilia	Epano Kouphonisi	Late EBI Kampos Group	Early Bronze Age	203
Tzabaris	Epano Kouphonisi	Late EBI Kampos Group	Early Bronze Age	65
Skopelitou	Epano Kouphonisi	Late EBI Kampos Group	Early Bronze Age	7
Pelekita	Ithaca	--	Late Neolithic	67
Papadiokambos	Crete	--	Middle Bronze Age	92
Total				873

CHAPTER FIVE

RESULTS AND DISCUSSIONS

The scatterplots constructed for the Early Cycladic obsidian reveal two clear patterns in the data. First, the vast majority of all pieces analyzed (711 of 714) are chemically consistent with the geologic samples from Melos analyzed with the same instrument. Two pieces of non-Melian obsidian were detected, each from the site of Agrilia on Naxos. One of the pieces, a small spherulitic nodule (0.78 cm in diameter), matched chemically to sources from Giali, an island in the Dodecanese (an Aegean island cluster east of the Cyclades). The second non-Melian piece, a near-transparent blade fragment, matches with the central Anatolian source of Göllü Dağ. The inclusion of objects from these sources is not unprecedented; these sources were widely exploited in the Early Bronze Age Aegean and it is not surprising that they would end up on Naxos. The final piece (JMANM384 from Tsikniadhes) turned out to be a piece of brown rhyolite. **Figure 18** shows the grouping of every sourced archaeological piece alongside all of the analyzed geologic pieces taken straight from the Melian sources.

The second pattern seen in these plots is one within the 711 Melian pieces (**Figure 19**). Of these objects, 628 – approximately 88% – were positively sourced to the Sta Nychia quarry, while only 83 matched to the quarry at Dhemenegaki. These objects were matched to each Melian source first by analyzing their positioning in the elemental scatterplot, which was constructed using the elements most useful for distinguishing Aegean obsidians (Rb, Sr, and a ratio of Ti/Fe), and by subsequent comparison of each object's calibrated elemental values with those provided by Milić (2014) in order to establish the line of separation between Sta Nychia and Dhemenegaki material. Especially useful in determining this separation are the major elements Ti and Fe, and minor elements Rb, Sr, and Zr, which are the most highly variable between Sta Nychia and Dhemenegaki obsidians (**Table 2, Appendix B**). Certain elements picked up by the pXRF were left out of consideration entirely, such as Al and K which are absorbed into the air upon analysis when no vacuum is used, and are not of use in distinguishing Aegean obsidian sources to begin with. Other elements, such as Co, Ni, and Cu present similar values across the board, and so were also not taken into account in the sourcing of each artifact.

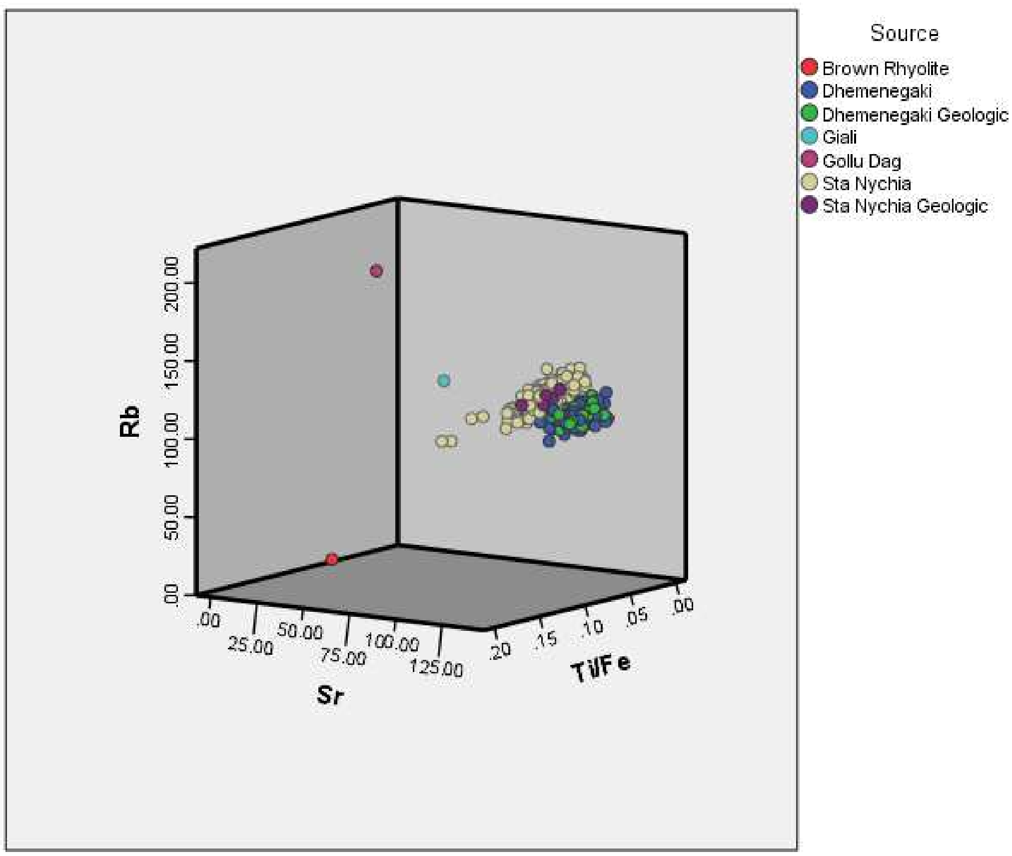

Figure 18. Scatterplot of every analyzed archaeological and geologic piece

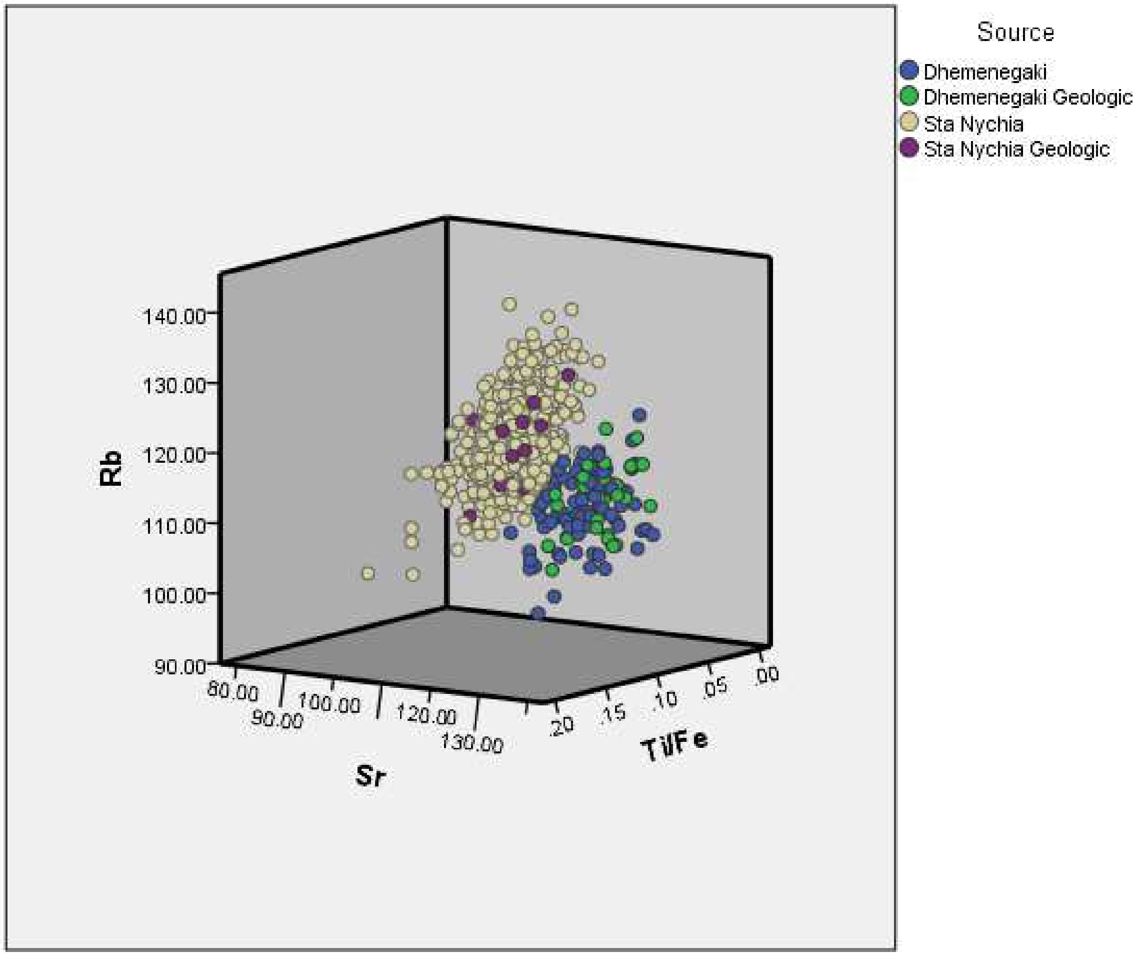

Figure 19. Scatterplot zoomed in on just the Melian artifacts

Table 4 shows the breakdown of the sourcing results from each of the Early Cycladic sites tested, while **Table 5** shows the breakdown by island. There is not a great deal of difference between the source proportions of sites on Naxos and sites on Epano Kouphonisi; each island seems to favor Sta Nychia obsidian to the same degree. Between individual sites, much of the variation in proportions of Sta Nychia and Dhemenegaki obsidians can likely be explained by variant samples sizes; I do not believe that it is coincidence that the sites with the highest percentages of Dhemenegaki obsidian tend to be those with the lowest samples sizes. However, variation exists even between those sites with large sample sizes, such as between Tsikniadhes (with 25% Dhemenegaki) and Aplomata (with only 3% Dhemenegaki). The fact that these two sites exist on the same island and represent similar assemblages from the same time period suggests that some level of variation in source exploitation may have existed even on very small spatial and chronological levels. Future research will, I hope, shed some insight into these different patterns.

Overall, the results of the sourcing analyses show a striking bias in obsidian procurement practices among these communities. This pattern of exploitation bias should not be overlooked as incidental, but rather as an intentional favoring of a single obsidian quarry. By striving to understand the potential reasons for this shift – a variety of which will be discussed below – a great deal of insight could be gained into Early Cycladic society, particularly where production, consumption, and social conceptions of meaning and prestige are concerned.

Also analyzed were the blue and red pigments adhering to the two cores from Aplomata, which were determined to be a copper-based pigment (azurite or malachite) and cinnabar, respectively. Cinnabar, the main ore of mercury, is known to have been rare in the Early Bronze Age Aegean, particularly when compared to ochre, the most commonly used red pigment of the time. Together with azurite and malachite, cinnabar was classified by the Roman author and philosopher Pliny as a particularly "vivid" and prized pigment, with nearly every other known pigment being described as "subdued" and less valuable (Carter 2008a:122-23). The elevated social and political value of cinnabar in particular has been nicely documented in nearby societies from which there are surviving written records, for instance having been used in Roman ceremonies to cover statues of the god Jupiter and as a highly valued ingredient in medicinal and alchemic processes. It seems, then, that these pigments are in themselves active contributing factors to the prestige of the necrolithic (Carter 2008a).

Table 4. Percentages of Melian artifacts at each Early Cycladic site

Site	Sta Nychia Percentage	Dhemenegaki Percentage	Other Percentage	N Total
Tsikniadhes	74% ± 3.4% (n=120)	25% ± 3.4% (n=42)	1% ± 0.8 % (n=1)	163
Ayioi Anargyroi	96% ± 3.7% (n=27)	4% ± 3.7 % (n=1)	0%	28
Akrotiri	44% ± 16.5% (n=4)	56% ± 16.5% (n=5)	0%	9
Lakkoudhes	67% ± 13.6% (n=8)	33% ± 13.6% (n=4)	0%	12
Lakkoudhes A	100% ± 0% (n=2)	0%	0%	2
Avdheli	100% ± 0% (n=25)	0%	0%	25
Rhodinadhes	100% ± 0% (n=3)	0%	0%	3
Aplomata	97% ± 1.2% (n=191)	3% ± 1.2% (n=6)	0%	197
Agrilia	89% ± 2.2% (n=181)	10% ± 2.1% (n=20)	1% ± 0.7% (n=2)	203
Tzabaris	94% ± 2.9% (n=61)	6% ± 2.9% (n=4)	0%	65
Skopelitou	86% ± 13.1% (n=6)	14% ± 13.1% (n=1)	0%	7

Table 5. Percentages of Melian artifacts from each Early Cycladic island

Island	Sta Nychia Percentage	Dhemenegaki Percentage	Other Percentage	N Total
Naxos	87% ± 1.6% (n=380)	13% ± 1.6% (n=58)	<1% ± 0.2% (n=1)	438
Epano Kouphonisi	91% ± 1.7% (n=248)	9% ± 1.7% (n=25)	<1% ± 0.5% (n=2)	273

The artifacts analyzed from Pelekita and Papadiokambos on Crete add some much-needed chronological and regional context to the Early Cycladic results. The 67 Late Neolithic pieces from Pelekita sourced entirely to Melos, and were split almost evenly between Sta Nychia (n = 36) and Dhemenegaki (n = 31). Of the 92 Late Bronze Age pieces analyzed from Papadiokambos, 87 sourced to Sta Nychia. Only four pieces from Papadiokambos sourced to Dhemenegaki, while a final piece sourced to the Göllü Dağ source in central Anatolia.

Discussion

The results presented here, both of the Early Cycladic cemetery pieces and of the Late Neolithic and Late Bronze Age pieces from Crete, seem to fit into the broader context of obsidian source exploitation in the Neolithic and Bronze Age (Carter 200b; Carter and Kilikoglou 2007; Efstratiou et al. 2004; Karydas et al. 2003). Where Neolithic sites show a preliminary preference for Dhemenegaki, the Late Neolithic occupation of Pelekita has produced what may represent a transitional phase, showing a relatively even split between the two Melian sources (Efstratiou et al. 2004). The Early Cycladic material shows an overall 88% preference for Sta Nychia, while other Bronze Age sites that have been analyzed – including the new data from Papadiokambos – demonstrate a similar proclivity towards Sta Nychia (Carter and Kilikoglou 2007; Karydas et al. 2003).

Though determining source of origin for these artifacts, in addition to revealing overall patterns of source exploitation, is now a remarkably straightforward scientific process, actually defining the reasons for this shift in source selection takes us further into the realm of informed speculation. There is, unfortunately, no written documentary evidence from the Bronze Age settlements of the Cycladic islands to aid in explaining this shift. Though present in the archaeological record, even the Linear A text of the neighboring Minoans is untranslatable and thus is of no current aid in developing our understanding of Neolithic or Bronze Age trading behaviors throughout the Aegean. Linear B, the script of the Mycenaeans and later Minoans, has been deciphered to some degree, but there are no known references to Neolithic or Early Bronze

Age obsidian trade that may shed insight into this issue. Thus the potential reasons for this shift, while numerous, cannot be definitively supported by any other means than material evidence in the archaeological record and comparisons to ethnological correlates.

There are some explanations that can be ruled out relatively easily with the material evidence at hand, however. For instance, exhaustion of the source material at Dhemenegaki around the start of the Bronze Age was certainly not responsible for this shift; a visit to the two Melian sources today reveals that each is still littered with obsidian nodules. Equally improbable is that this shift in source exploitation resulted from changes in the technological requirements of obsidian implement production. Even in the face of changing blade technologies, as in the case of the longer-than-average, pressure-flaked necrolithic blades, the two Melian subsources surely would have presented comparable options. The material from each Melian source is remarkably similar in color, fracture properties, availability, and in raw nodule size.

The last of these qualities is evidenced by an analysis of the distribution of lengths of the blade fragments analyzed in this study (**Figure 20**). Only blade fragments were analyzed in this way as the vast majority of the complete blades in the assemblage sourced to Sta Nychia and thus caused major distortion in the distributions (**Table 6**). The resultant boxplots shown in **Figure 20** indicate that the Dhemenegaki blade fragments, overall, are no shorter than the Sta Nychia blade fragments. The boxes themselves represent the middle two quartiles of the distributions, while the vertical lines represent the extent of the upper and lower quartiles and the horizontal lines represent the medians. Though not ideal evidence due to the breakage of the artifacts, the similarities of the medians and distributions of lengths from each source indicate that the obsidian from Sta Nychia did not necessarily produce longer blades than the Dhemenegaki obsidian would have (save for the five outliers from Sta Nychia, indicated by the circles at the top of the plot). In such a case, enactors of the necrolithic would not have needed to look to one source over the other for sufficiently large material (Milić 2014; Renfrew et al. 1965). Furthermore, the fact that the Early Bronze Age preference for Sta Nychia material is observable even outside of the Cyclades' necrolithic assemblages, where the technological processes of obsidian blade production differ, suggests that technological requirement was not a motivator.

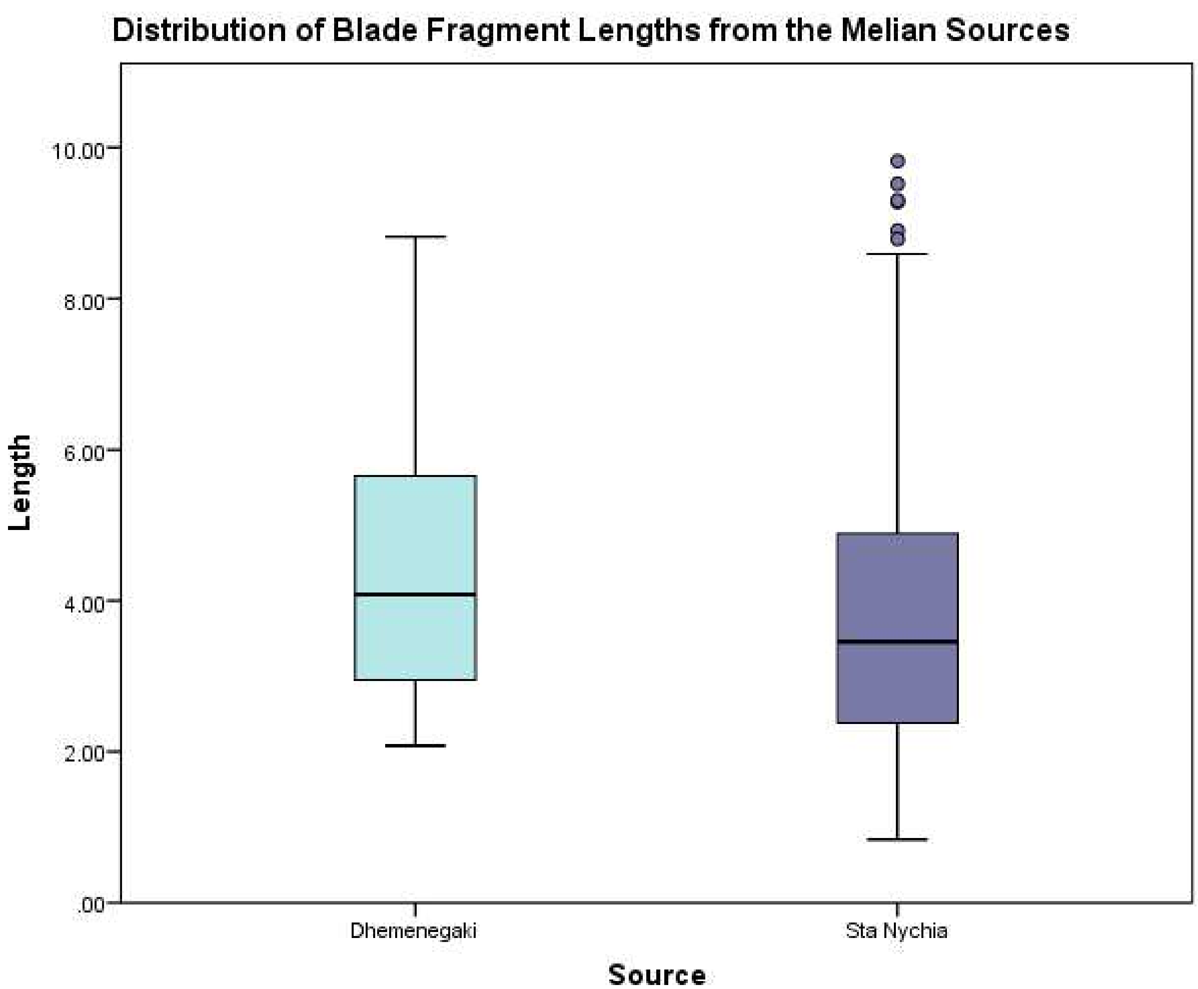

Figure 20: Boxplot of blade fragment lengths from Dhemenegaki and Sta Nychia

Table 6: Mean lengths with error ranges of the complete blades from each source

Source	Mean Length	Sample Size
Sta Nychia	9.24 ± 0.28	126
Dhemenegaki	8.04 ± 1.76	2

Another potential driving force behind the observed shift in Melian source preference could involve the relationships between members of the communities from which artifacts have been sourced and the Melians themselves. The transition from the Neolithic to the Bronze Age was a time in which the farming communities of Melos began to grow and consolidate into larger, more influential settlements, a process which was ultimately responsible for the development of Phylakopi, perhaps the most notable and powerful of these large settlements. The development and presence of such an influential settlement so close to the quarries – in addition to the presence of other new Early Bronze Age settlements – could certainly have had significant impacts on outsider access to the raw material at each source.

Unfortunately, given the archaeological evidence we have at hand at the current time, restriction of source material on the part of the Melians cannot be proven definitively. The bay location of the Sta Nychia quarry implies the potential for easy protection that may not have left a material trace, perhaps in the form of a boat or two guarding the mouth of the bay (though it would be interesting in this case that the restriction of Sta Nychia seemingly occurred in the Neolithic and not the Bronze Age). However, even at the height of the settlement of Phylakopi, there is no indication in the material record that the Melians – or anyone else – carried out control over the obsidian sources in the Neolithic or Bronze Age. At neither source is there any evidence of walls, or other marked boundaries serving to restrict access to the obsidian. Furthermore there has been no evidence found that the extraction techniques undertaken at these quarries were systematic in any way, as would be expected if a commercial obsidian industry existed. Rather, extraction seems to have taken place in a manner that favored expediency over efficiency, with a relatively small investment of time and labor (Renfrew 1972; Torrence 1982, 1986).

Further suggestion that politics were at least not the main motivation behind this pattern comes from the idea that the economic value of obsidian was not significant enough for it to have been a profitable commodity in either the Neolithic or Bronze Age Aegean. Obsidian, according to this perspective, was not geologically uncommon or economically restricted enough to have been responsible for considerable amounts of the development and prosperity of Melian settlements like Phylakopi (which was instead driven by the economic spread and consumption of metals). In such a case the potential motivations for the restriction of obsidian at its sources seem weak (Renfrew 1972; Torrence 1986).

Even if the shift was not directly caused by Melian-imposed restrictions, it remains that trade networks are engrained in political, economic, and ideological systems, and accordingly provide a mechanism for the development of social relationships and identities. As a large part of those trade networks, the selection of a raw material source was surely wrapped up in politics and ideologies to some degree, even if those political or ideological influences were not direct products of Melian political centers (Carter and Kilikoglou 2007; Day et al. 1998; Knappett 1997, 1999; Whitelaw et al. 1997). Perhaps the most likely explanation is that the shift in source preference was simply a reflection of changing regional perceptions of the values of the material from each source (Decourt 1998). Such phenomena have been documented ethnographically in communities such as that of the Australian Aborigines, where individuals often invest a great deal of time and energy in order to retrieve lithic raw material that is similar (with regard to fracturing and other technical properties) to stones that could have been obtained more easily and/or closer to home due to the perceived sacred values and spiritual associations of the distant sources (Gould 2000:141; Taçon 1991).

Such ideological explanations would certainly require further investigation, particularly given the geographic and contextual diversity of the locations from which this pattern has been observed thus far. Perhaps a spiritual association existed with Sta Nychia obsidian that made it important for Early Bronze Age burial contexts, but only in the Cyclades. Perhaps Dhemenegaki obsidian had special associations with certain rituals on Neolithic Crete, but not the Cyclades. It is not entirely unlikely that these ideological associations could cross these geographic boundaries, however, as it is known that mutual cultural influences circulated widely throughout the region at this time (Doumas 1990a). Sourcing studies conducted on statistically significant samples from as yet unsampled context types – such as residential sites in the Cyclades and burial contexts on Crete and the mainland – will serve to determine the extent of these similarities.

Any combination of factors, from the most practical and political to the most ideologically engrained, worked to shape not only obsidian preferences, but exchange networks as a whole in the prehistoric Aegean (Carter 2008b; Carter and Kilikoglou 2007). Understanding the material correlates and spatial patterns of these networks and preferences thus provides a method through which we can begin to trace their boundaries. By integrating these newly defined patterns of source preference with previously defined patterns in other material practices, such as ceramic technology, architectural practices, and particularly obsidian blade technology, we can begin to trace synchronous communities of practice throughout the broader Aegean (Carter 2004; Carter and Kilikoglou 2007).

CHAPTER SIX

CONCLUSIONS

Throughout the Neolithic and Bronze Age, obsidian played a significant role in the culture, politics, and economies of Aegean communities. Obsidian was used as a medium for works of art, pieces of personal adornment, and tools, all of which played a role in Aegean life and death alike (Doumas 1990a, 1990b; Torrence 1986). The obsidian pieces of the "necrolithic" – a classification of blades and cores appearing exclusively in Early Cycladic burials – seem to have had especially important roles to play in these facets of Aegean society. These objects have obvious connections to the dead, and recent research has also drawn connections between them and the socio-political dealings of the living (Carter 1998, 2007). These pieces demonstrate a close association with the politically-charged process of body modification, a fact that now has found additional support through the chemical analysis of the pigments adhering to two necrolithic cores in this study.

Though archaeologists have reconstructed a great deal of prehistoric Aegean life, including information regarding obsidian exchange and consumption, studies that actually discern the source of the obsidian artifacts have been few and far between. This has been especially true in the past few decades, and patterns in obsidian source preference in these communities have remained obscure as a result. Through the research discussed in this thesis, I set out to determine the proportions of obsidian source use in the necrolithic assemblages from 11 Cycladic communities on the islands of Naxos and Epano Kouphonisi. This work was done in the hopes of establishing a greater understanding of obsidian's role in the various facets of Early Cycladic life, and by extension a better understanding of the society as a whole.

This goal was accomplished through the use of portable X-ray fluorescence spectrometry, a non-destructive archaeometric technique of elemental characterization, which was applied to the analysis of 873 total obsidian artifacts, the largest sample size to date of an Aegean obsidian sourcing study. Of these artifacts, 714 derived from the 11 burial contexts of Naxos and Epano Kouphonisi. These objects are all housed in, and were analyzed with the permission of, the Naxos Archaeological Museum on Naxos, Greece. In order to provide a sound basis for source determination, geologic obsidian samples from the two sources on the island of Melos were also analyzed using the same machine and settings. An additional 159 artifacts from the Late Neolithic site of Pelekita (n = 67) and the Late Bronze Age site of Papadiokambos (n = 92), each on Crete, were analyzed in order to broaden the regional and chronological context available to interpret patterns of Aegean obsidian source use. The raw output results of the pXRF analyses were calibrated using Microsoft Excel, and the resultant elemental values were used to construct SPSS scatterplots of each archaeological piece together with the geologic samples.

These scatterplots plainly demonstrated that the Cycladic island of Melos was overwhelmingly the main provider of obsidian for these 11 cemeteries, as well as for both Cretan sites. The nature of the methods utilized in this research allowed for the definitive recognition of source beyond visual characteristics, which provide a much less reliable method of attribution. The nature of pXRF, together with the large number of samples analyzed, also allowed for the identification of a small number of more "exotic" pieces that may have otherwise gone unnoticed. For the Early Cycladic material, two clearly non-Melian pieces, each from the site of Agrilia on Kouphonisi, were sourced: a small nodule from the Dodecanesian island of Giali, and a blade fragment from the Central Anatolian source of Göllü Dağ. An additional piece from Göllü Dağ was identified from the site of Papadiokambos, as well.

An overall pattern was observed across all of the Early Cycladic sites studied with regard to the two obsidian subsources on the island of Melos. Of the Melian pieces (n = 711), only 49 were sourced to the quarry of Dhemenegaki, with the remaining 662 coming from the Sta Nychia source. This staggering bias in source exploitation practices fits nicely into a broader pattern that has been observed in the prehistoric Aegean (Carter 2008b; Carter and Kilikoglou 2007; Efstratiou et al. 2004). While Neolithic communities seem to have preferred (or have had the easiest access to) the obsidian from Dhemenegaki, Bronze Age communities in the same area begin to prefer Sta Nychia obsidian. The material analyzed from Pelekita and Papadiokambos seems to support this observed pattern as well, as the Late Neolithic material from Pelekita sources nearly evenly to both subsources – potentially marking a transitional phase between preference for Dhemenegaki and Sta Nychia – and 95% the Late Bronze Age material from Papadiokambos sourced to Sta Nychia.

It is of course necessary to acknowledge the limitations of these analyses. Some pieces from the excavated assemblages at Pelekita and Papadiokambos were left unanalyzed simply due to time constraints, as we only had a limited time to conduct the work. Analysis of a larger number of samples, ideally from varying contexts within the sites, might reveal new nuances to these source exploitation patterns. The samples analyzed from each Early Cycladic burial site were as representative as possible; every piece from each site currently in the collections of the Naxos Archaeological Museum were analyzed. However, many of the sites were disturbed, looted, or otherwise compromised prior to excavation. Furthermore, these samples represent only 11 of the many Early Bronze Age communities on the Cycladic islands, and within those communities represent only burial contexts. The possibility exists that variation in source preference, even within the Early Bronze Age Cyclades, could have been in place.

However, I hold that the results produced by this study, in light of broad patterns that have become apparent through previous research, are representative of a bigger-picture phenomenon in the Aegean world. A pattern of shifting obsidian source preferences, likely caused by ideological and/or political changes, was in place in the Neolithic and Early Bronze Age Aegean. Similar studies conducted in the near future will certainly add insight and complexity to these observed patterns, and our understandings will become even more detailed as mass-sampling technologies continue to spread and develop. Analyses of domestic Cycladic contexts would be particularly useful in determining that the preference for Sta Nychia is not just a phenomenon of necrolithic burial assemblages, but extends to other contexts of obsidian uses. Additional studies of various periods within the Neolithic and Bronze Age will also shed light on potential variations of the broader pattern within these time frames, as little is known at the current time of differences that may exist between the Early and Late Bronze Ages, instance. These sourcing data, when integrated with previously defined regional distinctions in obsidian blade technology, can be used to begin to map potential communities of practice across the broader Aegean world.

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APPENDIX A

DATABASE OF ALL ANALYZED OBJECTS

(measurements courtesy of Dr. Tristan Carter)

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM1	10326	Tsikniadhes	4/8/2014	80	1.86	1.25	0.97	Sta Nychia
JMA14 NM2	10327	Tsikniadhes	4/8/2014	0	3.72	0.79	0.26	Sta Nychia
JMA14 NM3	10328	Tsikniadhes	4/8/2014	0	4.38	2.23	0.51	Sta Nychia
JMA14 NM4	10329	Tsikniadhes	4/8/2014	0	3.93	0.93	0.32	Sta Nychia
JMA14 NM5	10330	Tsikniadhes	4/8/2014	0	2.25	2.1	0.51	Sta Nychia
JMA14 NM6	10331	Tsikniadhes	4/8/2014	10	2.16	1.75	0.51	Dhemenegaki
JMA14 NM7	10332α	Tsikniadhes	4/8/2014	0	1.56	1.03	0.54	Dhemenegaki
JMA14 NM8	10332β	Tsikniadhes	4/8/2014	0	1.16	0.77	0.24	Sta Nychia
JMA14 NM9	10332γ	Tsikniadhes	4/8/2014	0	1.1	0.6	0.12	Dhemenegaki
JMA14 NM10	10333	Tsikniadhes	4/8/2014	0	2.47	1.15	0.31	Sta Nychia
JMA14 NM11	10334	Tsikniadhes	4/8/2014	0	2.01	0.76	0.25	Sta Nychia
JMA14 NM12	10335	Tsikniadhes	4/8/2014	50	2.96	3.26	0.83	Sta Nychia
JMA14 NM13	10336	Tsikniadhes	4/8/2014	0	3.16	2.59	0.38	Sta Nychia
JMA14 NM14	10337	Tsikniadhes	4/8/2014	0	1.78	2.41	0.39	Sta Nychia
JMA14 NM15	10338	Tsikniadhes	4/8/2014	0	2.11	0.7	0.47	Dhemenegaki
JMA14 NM16	10340	Tsikniadhes	4/8/2014	0	5	0.95	0.26	Sta Nychia
JMA14 NM17	10341α	Tsikniadhes	4/8/2014	0	4.12	1.24	0.36	Sta Nychia
JMA14 NM18	10341β	Tsikniadhes	4/8/2014	0	2.23	0.69	0.18	Sta Nychia
JMA14 NM19	10341γ	Tsikniadhes	4/8/2014	0	1.79	0.49	0.12	Sta Nychia
JMA14 NM20	10342	Tsikniadhes	4/8/2014	0	5.71	1.06	0.28	Sta Nychia
JMA14 NM21	10343α	Tsikniadhes	4/8/2014	0	2.22	1.36	0.39	Sta Nychia
JMA14 NM22	10343β	Tsikniadhes	4/8/2014	5	3.36	2.17	0.34	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM23	10343γ	Tsikniadhes	4/8/2014	0	2.68	4.21	1.36	Sta Nychia
JMA14 NM24	10344α	Tsikniadhes	4/8/2014	0	2.8	1.73	0.28	Sta Nychia
JMA14 NM25	10344β	Tsikniadhes	4/8/2014	20	1.92	1.37	0.32	Sta Nychia
JMA14 NM26	10344γ	Tsikniadhes	4/8/2014	20	1.37	0.91	0.3	Sta Nychia
JMA14 NM27	10344δ	Tsikniadhes	4/8/2014	0	1.36	0.76	0.27	Sta Nychia
JMA14 NM28	10345α	Tsikniadhes	4/8/2014	0	8.65	1.37	0.28	Sta Nychia
JMA14 NM29	10345β	Tsikniadhes	4/8/2014	0	2.7	1.47	0.35	Sta Nychia
JMA14 NM30	10345γ	Tsikniadhes	4/8/2014	0	-	-	-	Sta Nychia
JMA14 NM31	10346α	Tsikniadhes	4/8/2014	0	5.02	1.03	0.28	Sta Nychia
JMA14 NM32	10346β	Tsikniadhes	4/8/2014	0	2.48	0.8	0.24	Sta Nychia
JMA14 NM33	10347	Tsikniadhes	4/8/2014	0	6.74	1.09	0.28	Sta Nychia
JMA14 NM34	10348	Tsikniadhes	4/8/2014	0	1.36	1.44	0.9	Sta Nychia
JMA14 NM35	10349	Tsikniadhes	4/8/2014	0	9.56	1.63	0.48	Sta Nychia
JMA14 NM36	10350	Tsikniadhes	4/8/2014	0	7.63	1.09	0.34	Sta Nychia
JMA14 NM37	10351	Tsikniadhes	4/8/2014	0	9.43	1.15	0.28	Sta Nychia
JMA14 NM38	10352	Tsikniadhes	4/8/2014	0	-	-	-	Sta Nychia
JMA14 NM39	10353	Tsikniadhes	4/8/2014	0	9.44	1.22	0.4	Sta Nychia
JMA14 NM40	10354	Tsikniadhes	4/8/2014	90	1.95	1.29	0.76	Dhemenegaki
JMA14 NM41	10355α	Tsikniadhes	4/8/2014	-	-	-	-	Sta Nychia
JMA14 NM42	10355β	Tsikniadhes	4/8/2014	10	3.32	1.21	0.2	Sta Nychia
JMA14 NM43	10356α	Tsikniadhes	4/8/2014	0	8.97	1.46	0.34	Sta Nychia
JMA14 NM44	10356β	Tsikniadhes	4/8/2014	0	1.6	1.25	0.3	Sta Nychia
JMA14 NM45	10356γ	Tsikniadhes	4/8/2014	0	1.76	0.59	0.18	Sta Nychia
JMA14 NM46	10357	Tsikniadhes	4/8/2014	40	1.8	0.77	0.48	Sta Nychia
JMA14 NM47	10358	Tsikniadhes	5/8/2014	0	3.46	1.31	0.27	Sta Nychia
JMA14 NM48	10359	Tsikniadhes	5/8/2014	0	3.79	1.01	0.21	Sta Nychia
JMA14 NM49	10360α	Tsikniadhes	5/8/2014	0	2.19	1.56	0.57	Dhemenegaki
JMA14 NM50	10360β	Tsikniadhes	5/8/2014	0	2.36	broken	0.34	Sta Nychia
JMA14 NM51	10361α	Tsikniadhes	5/8/2014	0	1.56	0.92	0.2	Sta Nychia
JMA14 NM52	10361β	Tsikniadhes	5/8/2014	10	2.27	0.72	0.58	Dhemenegaki
JMA14 NM53	10361γ	Tsikniadhes	5/8/2014	80	1.4	1.87	0.43	Dhemenegaki
JMA14 NM54	10361δ	Tsikniadhes	5/8/2014	0	1.69	0.96	0.41	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM55	10362	Tsikniadhes	5/8/2014	0	2.2	1.18	0.31	Dhemenegaki
JMA14 NM56	10363	Tsikniadhes	5/8/2014	0	2.37	2.51	0.36	Dhemenegaki
JMA14 NM57	10364α	Tsikniadhes	5/8/2014	0	2.37	0.94	0.3	Sta Nychia
JMA14 NM58	10365	Tsikniadhes	5/8/2014	0	3.06	1.44	0.51	Sta Nychia
JMA14 NM59	10366α	Tsikniadhes	5/8/2014	0	5.1	1.28	0.34	Sta Nychia
JMA14 NM60	10366β	Tsikniadhes	5/8/2014	0	1.42	1.41	0.26	Sta Nychia
JMA14 NM61	10367α	Tsikniadhes	5/8/2014	40	3.01	0.87	0.32	Sta Nychia
JMA14 NM62	10367β	Tsikniadhes	5/8/2014	0	4.54	1.33	0.27	Sta Nychia
JMA14 NM63	10367 (α, β, γ)	Tsikniadhes	5/8/2014	0	6.11	1.04	0.19	Sta Nychia
JMA14 NM64	1934δ	Ayioi Anargyroi	5/8/2014	0	4.34	1.49	0.38	Sta Nychia
JMA14 NM65	1929	Ayioi Anargyroi	5/8/2014	0	6.84	1.23	0.28	Sta Nychia
JMA14 NM66	1933δ	Ayioi Anargyroi	5/8/2014	0	5.7	0.9	0.19	Sta Nychia
JMA14 NM67	1933η	Ayioi Anargyroi	5/8/2014	0	6.74	0.83	0.2	Sta Nychia
JMA14 NM72	1932	Ayioi Anargyroi	5/8/2014	0	6.81	0.8	0.28	Sta Nychia
JMA14 NM68	1925	Ayioi Anargyroi	5/8/2014	0	10.29	1.14	0.31	Sta Nychia
JMA14 NM69	5445	Ayioi Anargyroi	5/8/2014	0	2.07	0.73	0.21	Sta Nychia
JMA14 NM70	1934β	Ayioi Anargyroi	5/8/2014	0	4.59	1.14	0.32	Dhemenegaki
JMA14 NM71	1930	Ayioi Anargyroi	5/8/2014	0	9.15	1.18	0.28	Sta Nychia
JMA14 NM73	1926	Ayioi Anargyroi	5/8/2014	0	10.57	1	0.23	Sta Nychia
JMA14 NM74	1927	Ayioi Anargyroi	5/8/2014	0	9.28	0.88	0.27	Sta Nychia
JMA14 NM75	1928	Ayioi Anargyroi	5/8/2014	0	9.96	1.35	0.29	Sta Nychia
JMA14 NM76	1931	Ayioi Anargyroi	5/8/2014	0	7.86	1.3	0.22	Sta Nychia
JMA14 NM77	1933ε	Ayioi Anargyroi	5/8/2014	0	5.74	1.01	0.3	Sta Nychia
JMA14 NM78	1933στ	Ayioi Anargyroi	5/8/2014	0	5.74	0.76	0.26	Sta Nychia
JMA14 NM79	1933ζ	Ayioi Anargyroi	5/8/2014	0	7.6	0.84	0.22	Sta Nychia
JMA14 NM80	1933θ	Ayioi Anargyroi	5/8/2014	0	7.77	0.82	0.26	Sta Nychia
JMA14 NM81	1934α	Ayioi Anargyroi	5/8/2014	0	7.26	1.31	0.25	Sta Nychia
JMA14 NM82	1934ε	Ayioi Anargyroi	5/8/2014	0	4.84	1.5	0.28	Sta Nychia
JMA14 NM83	1934στ	Ayioi Anargyroi	5/8/2014	0	5.2	1.39	0.34	Sta Nychia
JMA14 NM84	1933α	Ayioi Anargyroi	5/8/2014	0	4.55	0.72	0.23	Sta Nychia
JMA14 NM85	1933γ	Ayioi Anargyroi	5/8/2014	0	4.89	0.75	0.25	Sta Nychia
JMA14 NM86	1934ζ	Ayioi Anargyroi	5/8/2014	0	3.4	1	0.23	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM87	5477-1	Ayioi Anargyroi	5/8/2014	0	2.92	0.94	0.29	Sta Nychia
JMA14 NM88	5477-2	Ayioi Anargyroi	5/8/2014	0	2.88	1.22	0.3	Sta Nychia
JMA14 NM89	5477-3	Ayioi Anargyroi	5/8/2014	0	4.05	1.13	0.5	Sta Nychia
JMA14 NM90	5477-4	Ayioi Anargyroi	5/8/2014	0	1.61	1.13	0.44	Sta Nychia
JMA14 NM91	5477-5	Ayioi Anargyroi	5/8/2014	0	1.77	0.89	0.25	Sta Nychia
JMA14 NM92	1984	Akrotiri	5/8/2014	0	4.39	1.06	0.19	Dhemenegaki
JMA14 NM93	2012α	Akrotiri	5/8/2014	0	1.81	1.17	0.37	Dhemenegaki
JMA14 NM94	2012β	Akrotiri	5/8/2014	0	1.81	1.14	0.39	Sta Nychia
JMA14 NM95	2012γ	Akrotiri	5/8/2014	0	3.57	1.1	0.28	Sta Nychia
JMA14 NM96	2012δ	Akrotiri	5/8/2014	0	4.59	1.11	0.34	Sta Nychia
JMA14 NM97	2013β	Akrotiri	5/8/2014	0	2.09	1.04	0.49	Dhemenegaki
JMA14 NM98	2013γ	Akrotiri	5/8/2014	0	1.23	1.07	0.33	Sta Nychia
JMA14 NM99	2013δ	Akrotiri	5/8/2014	0	1.43	0.97	0.3	Dhemenegaki
JMA14 NM101	2014	Akrotiri	5/8/2014	0	7.26	1.3	0.36	Dhemenegaki
JMA14 NM102	1954α	Lakkoudhes	5/8/2014	0	5.51	1.08	0.3	Sta Nychia
JMA14 NM103	1954γ	Lakkoudhes	5/8/2014	0	4.27	1.16	0.3	Dhemenegaki
JMA14 NM104	1954β	Lakkoudhes	5/8/2014	0	4.85	1.18	0.32	Sta Nychia
JMA14 NM105	5438	Lakkoudhes	5/8/2014	30	5.09	1	0.33	Sta Nychia
JMA14 NM106	5446	Lakkoudhes	5/8/2014	0	1.89	0.88	0.15	Sta Nychia
JMA14 NM107	5439	Lakkoudhes	5/8/2014	0	2.6	2.92	0.69	Dhemenegaki
JMA14 NM108	1954δ	Lakkoudhes	5/8/2014	0	6.82	1.09	0.31	Sta Nychia
JMA14 NM109	1954ε	Lakkoudhes	5/8/2014	0	5.39	1.03	0.24	Sta Nychia
JMA14 NM110	1954στ	Lakkoudhes	5/8/2014	0	2.62	0.97	0.24	Sta Nychia
JMA14 NM111	1954ζ	Lakkoudhes	5/8/2014	0	2.47	1.41	0.42	Dhemenegaki
JMA14 NM112	1954η	Lakkoudhes	5/8/2014	0	3.81	1.68	0.43	Dhemenegaki
JMA14 NM113	1954θ	Lakkoudhes	5/8/2014	0	1.77	1.16	0.27	Sta Nychia
JMA14 NM114	1953α	Lakkoudhes A	5/8/2014	0	9.45	1.25	0.33	Sta Nychia
JMA14 NM115	1954β	Lakkoudhes A	5/8/2014	0	7.67	0.79	0.22	Sta Nychia
JMA14 NM116	2026α	Avdheli	5/8/2014	0	10.1	1.18	0.37	Sta Nychia
JMA14 NM117	2026β	Avdheli	5/8/2014	0	9.87	0.89	0.28	Sta Nychia
JMA14 NM118	2026ε	Avdheli	5/8/2014	0	8.69	1.12	0.24	Sta Nychia
JMA14 NM119	2026δ	Avdheli	5/8/2014	0	7.44	1.13	0.24	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM120	2026γ	Avdheli	5/8/2014	0	4.2	0.65	0.22	Sta Nychia
JMA14 NM121	2027α	Avdheli	5/8/2014	0	8.9	1.16	0.28	Sta Nychia
JMA14 NM122	2027β	Avdheli	5/8/2014	0	6.33	0.98	0.26	Sta Nychia
JMA14 NM123	2028-1	Avdheli	5/8/2014	0	2.66	0.92	0.27	Sta Nychia
JMA14 NM124	2028-2	Avdheli	5/8/2014	0	1.75	0.82	0.17	Sta Nychia
JMA14 NM125	2028-3	Avdheli	5/8/2014	0	1.24	0.74	0.19	Sta Nychia
JMA14 NM126	2028-4	Avdheli	5/8/2014	0	2.56	1.09	0.25	Sta Nychia
JMA14 NM127	2028-5	Avdheli	5/8/2014	0	1	0.9	0.2	Sta Nychia
JMA14 NM128	2028-6	Avdheli	5/8/2014	0	1.04	0.84	0.21	Sta Nychia
JMA14 NM129	5443-1	Avdheli	5/8/2014	0	2.91	0.8	0.23	Sta Nychia
JMA14 NM130	5443-2	Avdheli	5/8/2014	0	0.85	0.8	0.23	Sta Nychia
JMA14 NM131	5444	Avdheli	5/8/2014	30	1.99	1.91	0.98	Sta Nychia
JMA14 NM132	2029α	Avdheli	5/8/2014	0	4.26	1.17	0.34	Sta Nychia
JMA14 NM133	2029β	Avdheli	5/8/2014	0	4.02	1.22	0.32	Sta Nychia
JMA14 NM134	5440α	Avdheli	5/8/2014	0	6.75	0.9	0.24	Sta Nychia
JMA14 NM135	5440β	Avdheli	5/8/2014	0	3.48	1.13	0.21	Sta Nychia
JMA14 NM136	5441	Avdheli	5/8/2014	0	4.28	0.94	0.21	Sta Nychia
JMA14 NM137	5441-2	Avdheli	5/8/2014	0	4.25	1.13	0.26	Sta Nychia
JMA14 NM138	5441-3	Avdheli	5/8/2014	0	4.18	0.74	0.16	Sta Nychia
JMA14 NM139	5441-4	Avdheli	5/8/2014	0	2.68	0.92	0.25	Sta Nychia
JMA14 NM140	5442	Avdheli	5/8/2014	0	3.54	1.26	0.39	Sta Nychia
JMA14 NM141	2025α	Rhodinadhes	5/8/2014	0	3.91	0.69	0.19	Sta Nychia
JMA14 NM142	2025β	Rhodinadhes	5/8/2014	0	1.49	0.54	0.13	Sta Nychia
JMA14 NM143	2025γ	Rhodinadhes	5/8/2014	20	1.42	2.9	0.61	Sta Nychia
JMA14 NM145	8473	Agrilia	6/8/2014	0	6.65	1	0.23	Sta Nychia
JMA14 NM146	8474	Agrilia	6/8/2014	0	5.19	0.88	0.26	Sta Nychia
JMA14 NM147	8475	Agrilia	6/8/2014	0	3.64	0.94	0.2	Sta Nychia
JMA14 NM148	8476	Agrilia	6/8/2014	0	2.64	0.93	0.21	Sta Nychia
JMA14 NM149	8477	Agrilia	6/8/2014	0	3.93	0.66	0.14	Sta Nychia
JMA14 NM150	8478	Agrilia	6/8/2014	0	4.38	0.87	0.15	Sta Nychia
JMA14 NM151	8479	Agrilia	6/8/2014	0	2.6	0.62	0.16	Sta Nychia
JMA14 NM152	5383	Agrilia	6/8/2014	0	9.89	1.64	0.38	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM153	5384	Agrilia	6/8/2014	0	9.21	1.24	0.28	Sta Nychia
JMA14 NM154	5385	Agrilia	6/8/2014	0	8.65	1.23	0.3	Sta Nychia
JMA14 NM155	5386	Agrilia	6/8/2014	0	8.26	1.33	0.31	Sta Nychia
JMA14 NM156	5387	Agrilia	6/8/2014	0	8.57	1.22	0.34	Sta Nychia
JMA14 NM157	5388	Agrilia	6/8/2014	0	7.21	1.08	0.33	Sta Nychia
JMA14 NM158	5389	Agrilia	6/8/2014	0	7.71	1.31	0.42	Sta Nychia
JMA14 NM159	8343	Agrilia	6/8/2014	0	8.08	1.63	0.47	Sta Nychia
JMA14 NM160	8344	Agrilia	6/8/2014	0	7.08	1.59	0.31	Sta Nychia
JMA14 NM161	8343/8351	Agrilia	6/8/2014	0	8.37	1.45	0.47	Sta Nychia
JMA14 NM162	8348/8346	Agrilia	6/8/2014	0	8.9	1.47	0.35	Sta Nychia
JMA14 NM163	8349	Agrilia	6/8/2014	0	3.28	0.78	0.17	Sta Nychia
JMA14 NM164	8350/8347/ 8352	Agrilia	6/8/2014	0	8.59	1.58	0.45	Sta Nychia
JMA14 NM165	8456/8359/ 8360	Agrilia	6/8/2014	0	9.96	1.19	0.26	Sta Nychia
JMA14 NM166	8458/8361/?/ 8357	Agrilia	6/8/2014	0	9.79	1.1	0.24	Sta Nychia
JMA14 NM167	8466	Agrilia	6/8/2014	0	7.03	1.31	0.29	Sta Nychia
JMA14 NM168	8467	Agrilia	6/8/2014	0	6.11	1.02	0.36	Dhemenegaki
JMA14 NM169	8468	Agrilia	6/8/2014	0	5.16	1.24	0.34	Sta Nychia
JMA14 NM170	8469	Agrilia	6/8/2014	0	5.16	1.07	0.25	Dhemenegaki
JMA14 NM171	8470/71	Agrilia	6/8/2014	0	6.34	1.17	0.33	Dhemenegaki
JMA14 NM172	8472	Agrilia	6/8/2014	20	2.18	1.53	0.57	Sta Nychia
JMA14 NM173	8492	Agrilia	6/8/2014	0	5.85	1.08	0.19	Sta Nychia
JMA14 NM174	8494/8507	Agrilia	6/8/2014	0	8.37	1.28	0.31	Sta Nychia
JMA14 NM175	8494/93	Agrilia	6/8/2014	0	11.1	1.24	0.26	Sta Nychia
JMA14 NM176	8496/8500	Agrilia	6/8/2014	20	8.53	1.83	0.46	Sta Nychia
JMA14 NM177	8497	Agrilia	6/8/2014	0	4.26	1.12	0.24	Sta Nychia
JMA14 NM178	8506/8498	Agrilia	6/8/2014	0	6.78	1.03	0.19	Sta Nychia
JMA14 NM179	8499	Agrilia	6/8/2014	0	4.29	1.45	0.37	Sta Nychia
JMA14 NM180	8505	Agrilia	6/8/2014	0	2.95	1.26	0.31	Sta Nychia
JMA14 NM181	8502/04/08	Agrilia	6/8/2014	0	7.63	1.36	0.26	Sta Nychia
JMA14 NM182	8503	Agrilia	6/8/2014	0	3.01	1.02	0.24	Sta Nychia
JMA14 NM183	8311/01/09/10	Agrilia	6/8/2014	0	8.44	1.19	0.29	Sta Nychia
JMA14 NM184	8405	Agrilia	6/8/2014	0	10.06	1.26	0.32	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM185	8406	Agrilia	6/8/2014	0	6.88	0.94	0.24	Sta Nychia
JMA14 NM186	8407	Agrilia	6/8/2014	0	4.95	0.82	0.24	Sta Nychia
JMA14 NM187	8409/08	Agrilia	6/8/2014	0	8.35	0.91	0.28	Sta Nychia
JMA14 NM188	8410	Agrilia	6/8/2014	0	2.95	0.79	0.21	Sta Nychia
JMA14 NM189	8412	Agrilia	6/8/2014	0	4.43	0.99	0.23	Sta Nychia
JMA14 NM190	8377	Agrilia	6/8/2014	0	5.73	1.43	0.5	Sta Nychia
JMA14 NM191	8453	Agrilia	6/8/2014	0	3.45	1.13	0.23	Sta Nychia
JMA14 NM192	8316	Agrilia	6/8/2014	0	6.9	0.8	0.23	Sta Nychia
JMA14 NM193	8317	Agrilia	6/8/2014	0	7.18	0.78	0.24	Sta Nychia
JMA14 NM194	8331/30	Agrilia	6/8/2014	0	6.77	1.01	0.17	Sta Nychia
JMA14 NM195	8334/27	Agrilia	6/8/2014	0	7.4	0.82	0.23	Sta Nychia
JMA14 NM196	8318	Agrilia	6/8/2014	0	5.8	0.82	0.22	Sta Nychia
JMA14 NM197	8319	Agrilia	6/8/2014	0	5.47	0.81	0.24	Sta Nychia
JMA14 NM198	8320/42	Agrilia	6/8/2014	0	7.73	0.73	0.25	Sta Nychia
JMA14 NM199	8325	Agrilia	6/8/2014	0	4.1	0.81	0.21	Sta Nychia
JMA14 NM200	8335	Agrilia	6/8/2014	0	3.35	0.78	0.21	Sta Nychia
JMA14 NM201	8321	Agrilia	6/8/2014	0	4.41	0.76	0.18	Sta Nychia
JMA14 NM202	8325β	Agrilia	6/8/2014	0	3.68	0.72	0.21	Sta Nychia
JMA14 NM203	8326	Agrilia	6/8/2014	0	3.84	0.85	0.18	Sta Nychia
JMA14 NM204	8332	Agrilia	6/8/2014	0	3.35	0.82	0.21	Sta Nychia
JMA14 NM205	8322/38	Agrilia	6/8/2014	0	7.25	0.77	0.21	Sta Nychia
JMA14 NM206	8323/36	Agrilia	6/8/2014	0	6.72	0.84	0.22	Sta Nychia
JMA14 NM207	8333	Agrilia	6/8/2014	0	3.45	0.61	0.13	Sta Nychia
JMA14 NM208	8324/28	Agrilia	6/8/2014	0	8.42	1.62	0.52	Sta Nychia
JMA14 NM209	8337	Agrilia	6/8/2014	0	2.38	0.69	0.18	Sta Nychia
JMA14 NM210	8329	Agrilia	6/8/2014	0	3.66	0.71	0.18	Sta Nychia
JMA14 NM211	8340	Agrilia	6/8/2014	0	1.79	1.04	0.29	Sta Nychia
JMA14 NM212	8435	Agrilia	6/8/2014	0	6.35	0.98	0.26	Sta Nychia
JMA14 NM213	8436/43	Agrilia	6/8/2014	0	8.79	0.84	0.25	Sta Nychia
JMA14 NM214	8438/42	Agrilia	6/8/2014	0	6.96	1.35	0.27	Sta Nychia
JMA14 NM215	8439/45	Agrilia	6/8/2014	0	5.36	0.17	0.28	Sta Nychia
JMA14 NM216	8440/37	Agrilia	6/8/2014	0	8.91	0.96	0.26	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM217	8444	Agrilia	6/8/2014	0	2.47	0.93	0.28	Sta Nychia
JMA14 NM218	8441	Agrilia	6/8/2014	0	3.44	0.94	0.23	Sta Nychia
JMA14 NM219	8381	Agrilia	6/8/2014	0	3.13	1.21	0.24	Sta Nychia
JMA14 NM220	8382	Agrilia	6/8/2014	0	2.78	1	0.28	Sta Nychia
JMA14 NM221	8383	Agrilia	6/8/2014	0	2.17	0.86	0.28	Sta Nychia
JMA14 NM222	8454	Agrilia	6/8/2014	0	8.54	1.18	0.35	Sta Nychia
JMA14 NM223	8455/8215	Agrilia	6/8/2014	0	7.76	0.88	0.21	Sta Nychia
JMA14 NM224	8216/8214	Agrilia	6/8/2014	0	6.89	0.89	0.26	Sta Nychia
JMA14 NM225	9203	Agrilia	6/8/2014	0	7.28	1.36	0.22	Sta Nychia
JMA14 NM226	9204	Agrilia	6/8/2014	0	4.53	1.82	0.2	Sta Nychia
JMA14 NM227	9205	Agrilia	6/8/2014	0	1.57	0.92	0.28	Sta Nychia
JMA14 NM228	9206	Agrilia	6/8/2014	0	1.99	0.96	0.18	Sta Nychia
JMA14 NM229	9207	Agrilia	6/8/2014	15	2.94	2.14	0.82	Dhemenegaki
JMA14 NM230	8447	Agrilia	6/8/2014	0	8.82	1	0.42	Dhemenegaki
JMA14 NM231	8448	Agrilia	6/8/2014	0	6.13	1.03	0.22	Sta Nychia
JMA14 NM232	8449	Agrilia	6/8/2014	0	4.64	1.15	0.31	Sta Nychia
JMA14 NM233	8427/8434/ 8433	Agrilia	6/8/2014	0	11.88	1.11	0.23	Sta Nychia
JMA14 NM234	9209/8429/ 8430	Agrilia	6/8/2014	0	11.37	1.5	0.38	Sta Nychia
JMA14 NM235	8432/8431/ 8428	Agrilia	6/8/2014	0	13.5	1.4	0.31	Sta Nychia
JMA14 NM236	9211/9210	Agrilia	6/8/2014	0	2.5	1.1	0.31	Sta Nychia
JMA14 NM237	8451/50	Agrilia	6/8/2014	0	8.57	0.98	0.35	Sta Nychia
JMA14 NM238	8452	Agrilia	6/8/2014	0	2.2	0.67	0.64	Sta Nychia
JMA14 NM239	9212	Agrilia	6/8/2014	0	1.78	0.9	0.24	Dhemenegaki
JMA14 NM240	8384	Agrilia	6/8/2014	0	5.02	0.92	0.22	Sta Nychia
JMA14 NM241	8386/8385	Agrilia	6/8/2014	0	7.73	1.37	0.4	Sta Nychia
JMA14 NM242	8387	Agrilia	6/8/2014	0	2.12	0.69	0.19	Sta Nychia
JMA14 NM243	5390	Agrilia	6/8/2014	0	8.39	1.45	0.45	Sta Nychia
JMA14 NM244	5382	Agrilia	6/8/2014	0	6.49	1.77	0.39	Dhemenegaki
JMA14 NM245	8218	Agrilia	6/8/2014	0	4.88	1.23	0.29	Sta Nychia
JMA14 NM246	8160	Agrilia	6/8/2014	0	5.01	1.35	0.35	Sta Nychia
JMA14 NM247	8217	Agrilia	6/8/2014	0	1.99	1.48	0.23	Dhemenegaki
JMA14 NM248	5391	Agrilia	6/8/2014	0	8.02	1.3	0.36	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM249	8480/8481/ 8482	Agrilia	7/8/2014	0	10.16	1.34	0.21	Sta Nychia
JMA14 NM250	8485/8482	Agrilia	7/8/2014	0	4.74	1.19	0.3	Sta Nychia
JMA14 NM251	8484	Agrilia	7/8/2014	0	1.76	1.12	0.37	Sta Nychia
JMA14 NM252	8412	Agrilia	7/8/2014	0	2.16	1.34	0.28	Sta Nychia
JMA14 NM253	8413	Agrilia	7/8/2014	0	1.72	0.85	0.52	Dhemenegaki
JMA14 NM254	8462	Agrilia	7/8/2014	0	4.63	1.15	0.33	Sta Nychia
JMA14 NM255	8463	Agrilia	7/8/2014	0	3.53	1.03	0.24	Dhemenegaki
JMA14 NM256	8464	Agrilia	7/8/2014	0	2.49	1.14	0.37	Sta Nychia
JMA14 NM257	8465	Agrilia	7/8/2014	0	1.79	1.07	0.36	Sta Nychia
JMA14 NM258	8392	Agrilia	7/8/2014	0	5.65	0.84	0.22	Sta Nychia
JMA14 NM259	8393	Agrilia	7/8/2014	0	3.19	1.49	0.4	Sta Nychia
JMA14 NM260	8394	Agrilia	7/8/2014	0	2.46	1.32	0.29	Sta Nychia
JMA14 NM261	8395	Agrilia	7/8/2014	0	1.87	1.41	0.37	Sta Nychia
JMA14 NM262	8396	Agrilia	7/8/2014	0	2.04	0.88	0.19	Sta Nychia
JMA14 NM263	8397/98	Agrilia	7/8/2014	0	3	0.89	0.19	Sta Nychia
JMA14 NM264	8399	Agrilia	7/8/2014	40	3.34	2.14	1.6	Sta Nychia
JMA14 NM265	8400	Agrilia	7/8/2014	50	3.2	1.88	0.5	Dhemenegaki
JMA14 NM266	8401	Agrilia	7/8/2014	80	2.08	1.61	0.62	Dhemenegaki
JMA14 NM267	8402	Agrilia	7/8/2014	0	1.7	1.14	0.33	Dhemenegaki
JMA14 NM268	5375	Agrilia	7/8/2014	0	9.8	1.45	0.37	Dhemenegaki
JMA14 NM269	5376	Agrilia	7/8/2014	0	9.89	0.96	0.27	Sta Nychia
JMA14 NM270	5377	Agrilia	7/8/2014	0	9.63	1.27	0.2	Sta Nychia
JMA14 NM271	5378	Agrilia	7/8/2014	0	7.45	1.03	0.23	Sta Nychia
JMA14 NM272	5374 (core)	Agrilia	7/8/2014	0	8.57	2.24	1.89	Sta Nychia
JMA14 NM273	8403	Agrilia	7/8/2014	0	1.81	0.73	0.19	Sta Nychia
JMA14 NM274	8404	Agrilia	7/8/2014	0	2.3	2.42	0.8	Sta Nychia
JMA14 NM275	8541	Agrilia	7/8/2014	0	6.33	0.72	0.23	Sta Nychia
JMA14 NM276	8542	Agrilia	7/8/2014	0	5.18	0.98	0.16	Sta Nychia
JMA14 NM277	8543	Agrilia	7/8/2014	0	5.34	0.95	0.27	Sta Nychia
JMA14 NM278	8544	Agrilia	7/8/2014	0	4.25	1.06	0.27	Sta Nychia
JMA14 NM279	8545/8550	Agrilia	7/8/2014	0	6.13	0.76	0.2	Sta Nychia
JMA14 NM280	8546	Agrilia	7/8/2014	0	4.25	0.85	0.24	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM281	8547	Agrilia	7/8/2014	0	3.76	1.02	0.26	Sta Nychia
JMA14 NM282	8548	Agrilia	7/8/2014	0	2.94	0.7	0.22	Sta Nychia
JMA14 NM283	8549	Agrilia	7/8/2014	0	2.92	0.65	0.16	Sta Nychia
JMA14 NM284	8551	Agrilia	7/8/2014	0	2.04	1.05	0.19	Sta Nychia
JMA14 NM285	8512	Agrilia	7/8/2014	0	-	-	-	Sta Nychia
JMA14 NM286	8513	Agrilia	7/8/2014	0	1.63	3.48	1.42	Sta Nychia
JMA14 NM287	8514	Agrilia	7/8/2014	0	1.62	2.1	0.47	Sta Nychia
JMA14 NM288	8515	Agrilia	7/8/2014	0	2.37	1.16	0.63	Sta Nychia
JMA14 NM289	8516	Agrilia	7/8/2014	0	2.87	1.33	0.75	Dhemenegaki
JMA14 NM290	8517	Agrilia	7/8/2014	30	1.89	2.06	0.38	Sta Nychia
JMA14 NM291	8486	Agrilia	7/8/2014	0	4.6	1.31	0.3	Sta Nychia
JMA14 NM292	8487	Agrilia	7/8/2014	0	2.58	0.77	0.26	Dhemenegaki
JMA14 NM293	8488	Agrilia	7/8/2014	0	1.04	1.07	0.21	Sta Nychia
JMA14 NM294	8489	Agrilia	7/8/2014	0	1.14	1.35	0.37	Sta Nychia
JMA14 NM295	8490	Agrilia	7/8/2014	90	2.16	3.05	0.53	Sta Nychia
JMA14 NM296	8491	Agrilia	7/8/2014	100	2.22	1.57	0.69	Sta Nychia
JMA14 NM297	?.1	Agrilia	7/8/2014	20	0.79	0.57	0.13	Sta Nychia
JMA14 NM298	?.2	Agrilia	7/8/2014	0	1.26	0.47	0.15	Sta Nychia
JMA14 NM299	8518	Agrilia	7/8/2014	0	8.33	1.09	0.33	Sta Nychia
JMA14 NM300	8519	Agrilia	7/8/2014	0	8.04	1.37	0.47	Sta Nychia
JMA14 NM301	8520	Agrilia	7/8/2014	0	7.76	1.19	0.3	Sta Nychia
JMA14 NM302	8521	Agrilia	7/8/2014	0	7.34	1.28	0.3	Sta Nychia
JMA14 NM303	8522	Agrilia	7/8/2014	0	7.43	1.07	0.29	Sta Nychia
JMA14 NM304	8523	Agrilia	7/8/2014	0	7.19	1.02	0.2	Sta Nychia
JMA14 NM305	8524	Agrilia	7/8/2014	0	7.74	1.26	0.31	Sta Nychia
JMA14 NM306	8526	Agrilia	7/8/2014	0	5.58	0.81	0.29	Dhemenegaki
JMA14 NM307	8527/36	Agrilia	7/8/2014	0	7.64	0.85	0.23	Sta Nychia
JMA14 NM308	8528	Agrilia	7/8/2014	0	4.89	1.12	0.25	Sta Nychia
JMA14 NM309	8529	Agrilia	7/8/2014	0	4.57	0.6	0.26	Sta Nychia
JMA14 NM310	8530	Agrilia	7/8/2014	0	4.65	1.2	0.31	Sta Nychia
JMA14 NM311	8531	Agrilia	7/8/2014	0	5.5	0.94	0.28	Sta Nychia
JMA14 NM312	8532/38	Agrilia	7/8/2014	0	6.49	1.04	0.23	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM313	8533	Agrilia	7/8/2014	0	4.17	0.76	0.21	Sta Nychia
JMA14 NM314	8534	Agrilia	7/8/2014	0	3.7	0.85	0.19	Sta Nychia
JMA14 NM315	8535	Agrilia	7/8/2014	0	3.5	0.86	0.26	Sta Nychia
JMA14 NM316	8537	Agrilia	7/8/2014	0	3.46	0.8	0.19	Sta Nychia
JMA14 NM317	8539	Agrilia	7/8/2014	0	2.7	0.91	0.21	Dhemenegaki
JMA14 NM318	8540	Agrilia	7/8/2014	0	5.84	1.1	0.28	Sta Nychia
JMA14 NM319	?6	Agrilia	7/8/2014	0	0.78	0.78	0.78	Giali
JMA14 NM320	5379	Agrilia	7/8/2014	0	10.56	1.58	0.32	Sta Nychia
JMA14 NM321	5380	Agrilia	7/8/2014	0	8.51	1	0.37	Sta Nychia
JMA14 NM322	5381	Agrilia	7/8/2014	0	8.45	1.13	0.28	Sta Nychia
JMA14 NM323	8250/8254	Agrilia	7/8/2014	0	9.72	1.24	0.33	Sta Nychia
JMA14 NM324	8251/8260	Agrilia	7/8/2014	0	7.11	0.99	0.17	Sta Nychia
JMA14 NM325	8252/8256	Agrilia	7/8/2014	0	8.23	1.14	0.25	Sta Nychia
JMA14 NM326	8253/8249	Agrilia	7/8/2014	0	9.52	1.17	0.19	Sta Nychia
JMA14 NM327	8255/8248	Agrilia	7/8/2014	0	10.32	1.23	0.28	Sta Nychia
JMA14 NM328	8257/8258	Agrilia	7/8/2014	0	7.48	1.19	0.22	Sta Nychia
JMA14 NM329	8259/8247	Agrilia	7/8/2014	0	9.3	1.27	0.16	Sta Nychia
JMA14 NM330	8416	Agrilia	7/8/2014	0	7.21	0.83	0.21	Sta Nychia
JMA14 NM331	8417	Agrilia	7/8/2014	0	6.5	0.73	0.11	Sta Nychia
JMA14 NM332	8418/8425/ 8426	Agrilia	7/8/2014	0	8.85	0.93	0.23	Sta Nychia
JMA14 NM333	8420/8419	Agrilia	7/8/2014	0	9.32	1.06	0.25	Sta Nychia
JMA14 NM334	8421/8422	Agrilia	7/8/2014	0	7.32	0.79	0.26	Sta Nychia
JMA14 NM335	8423	Agrilia	7/8/2014	0	3.65	0.73	0.22	Dhemenegaki
JMA14 NM336	8424	Agrilia	7/8/2014	0	3.39	1.23	0.36	Gollu Dag
JMA14 NM337	8415	Agrilia	7/8/2014	0	9.94	1.04	0.24	Sta Nychia
JMA14 NM338	8378	Agrilia	7/8/2014	0	6.76	1.19	0.32	Sta Nychia
JMA14 NM339	8379	Agrilia	7/8/2014	0	4.72	0.81	0.24	Sta Nychia
JMA14 NM340	8380	Agrilia	7/8/2014	0	3.13	0.11	0.29	Sta Nychia
JMA14 NM341	5392	Agrilia	7/8/2014	0	8.19	1.48	0.38	Sta Nychia
JMA14 NM342	8388	Agrilia	7/8/2014	0	4.04	1.45	0.33	Sta Nychia
JMA14 NM343	8390/89	Agrilia	7/8/2014	0	7.39	1.53	0.43	Sta Nychia
JMA14 NM344	8391	Agrilia	7/8/2014	0	2.6	1.07	0.27	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM345	5393	Agrilia	7/8/2014	0	7.45	1.28	0.27	Sta Nychia
JMA14 NM346	5394	Agrilia	7/8/2014	0	6.28	0.7	0.21	Dhemenegaki
JMA14 NM347	5395	Agrilia	7/8/2014	0	5.22	0.96	0.16	Sta Nychia
JMA14 NM348	10369	Tsikniadhes	8/8/2014	-	-	-	-	Sta Nychia
JMA14 NM349	10370α	Tsikniadhes	8/8/2014	0	5.41	0.86	0.25	Sta Nychia
JMA14 NM350	10370β	Tsikniadhes	8/8/2014	0	1.58	0.53	0.18	Sta Nychia
JMA14 NM351	10371α	Tsikniadhes	8/8/2014	-	-	-	-	Sta Nychia
JMA14 NM352	10371β	Tsikniadhes	8/8/2014	0	1.27	1.12	0.33	Sta Nychia
JMA14 NM353	10372	Tsikniadhes	8/8/2014	0	3.52	2.02	0.73	Sta Nychia
JMA14 NM354	Tomh 1	Tsikniadhes	8/8/2014	0	3.66	1.87	0.71	Sta Nychia
JMA14 NM355	10108α	Tsikniadhes	8/8/2014	0	3.43	1.99	0.31	Sta Nychia
JMA14 NM356	10108β	Tsikniadhes	8/8/2014	30	2.21	1.54	0.87	Sta Nychia
JMA14 NM357	10108γ	Tsikniadhes	8/8/2014	0	3.24	1.43	0.28	Sta Nychia
JMA14 NM358	Tomh 1	Tsikniadhes	8/8/2014	0	3.69	1.67	0.42	Sta Nychia
JMA14 NM359	Tomh 1	Tsikniadhes	8/8/2014	0	1.79	0.8	0.21	Sta Nychia
JMA14 NM360	Tomh 1	Tsikniadhes	8/8/2014	0	2.87	1.68	0.61	Dhemenegaki
JMA14 NM361	10409	Tsikniadhes	8/8/2014	50	2.18	1.49	0.57	Sta Nychia
JMA14 NM362	Tomh 1	Tsikniadhes	8/8/2014	5	3.38	2.61	0.49	Dhemenegaki
JMA14 NM363	Tomh 1	Tsikniadhes	8/8/2014	0	2.48	2.12	0.64	Dhemenegaki
JMA14 NM364	10399	Tsikniadhes	8/8/2014	20	3.53	2.78	0.94	Sta Nychia
JMA14 NM365	Tomh 1	Tsikniadhes	8/8/2014	0	3.06	1.74	1.13	Sta Nychia
JMA14 NM366	Tomh 1	Tsikniadhes	8/8/2014	0	2	0.87	0.21	Sta Nychia
JMA14 NM367	Tomh 1	Tsikniadhes	8/8/2014	0	2.61	1.04	0.26	Sta Nychia
JMA14 NM368	Tomh 1	Tsikniadhes	8/8/2014	20	3.32	2.51	0.81	Dhemenegaki
JMA14 NM369	Tomh 1	Tsikniadhes	8/8/2014	0	3.72	0.99	0.3	Sta Nychia
JMA14 NM370	Tomh 1	Tsikniadhes	8/8/2014	45	2.72	1.15	0.26	Dhemenegaki
JMA14 NM371	Tomh 1	Tsikniadhes	8/8/2014	15	2.65	1.03	0.73	Dhemenegaki
JMA14 NM372	Tomh 1	Tsikniadhes	8/8/2014	0	5.87	1.03	0.47	Sta Nychia
JMA14 NM373	Tomh 1	Tsikniadhes	8/8/2014	0	2.12	1.26	0.31	Dhemenegaki
JMA14 NM374	Tomh 1	Tsikniadhes	8/8/2014	0	1.07	1.4	0.44	Sta Nychia
JMA14 NM375	Tomh 1	Tsikniadhes	8/8/2014	0	2.87	1.27	0.4	Sta Nychia
JMA14 NM376	Tomh 2B β	Tsikniadhes	8/8/2014	25	2.24	3.63	0.55	Dhemenegaki

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM377	Tomh 2	Tsikniadhes	8/8/2014	0	2.03	1.79	0.35	Dhemenegaki
JMA14 NM378	Tomh 2B	Tsikniadhes	8/8/2014	30	3.11	1.96	0.6	Sta Nychia
JMA14 NM379	Tomh 2B β	Tsikniadhes	8/8/2014	0	1.9	1.02	0.27	Sta Nychia
JMA14 NM380	Tomh 2B α	Tsikniadhes	8/8/2014	0	2.32	1.24	0.38	Sta Nychia
JMA14 NM381	Tomh 2H	Tsikniadhes	8/8/2014	0	1.99	1.93	0.41	Sta Nychia
JMA14 NM382	Tomh 2H	Tsikniadhes	8/8/2014	0	0.61	0.87	0.13	Dhemenegaki
JMA14 NM383	Tomh 2AB β	Tsikniadhes	8/8/2014	35	2.15	2.78	1.09	Sta Nychia
JMA14 NM384	10400	Tsikniadhes	8/8/2014	0	2.72	2.37	0.99	*Brown Rhyolite*
JMA14 NM385	10410	Tsikniadhes	8/8/2014	10	3.65	4.68	0.7	Sta Nychia
JMA14 NM386	10401	Tsikniadhes	8/8/2014	10	3.94	2.64	0.65	Sta Nychia
JMA14 NM387	10402	Tsikniadhes	8/8/2014	25	3.72	1.96	0.62	Dhemenegaki
JMA14 NM388	Tomh 3	Tsikniadhes	8/8/2014	0	1.9	2.08	0.7	Sta Nychia
JMA14 NM389	10403	Tsikniadhes	8/8/2014	0	4.6	2.47	0.44	Dhemenegaki
JMA14 NM390	Tomh 3	Tsikniadhes	8/8/2014	100	6.37	4.87	1.03	Sta Nychia
JMA14 NM391	Tomh 3	Tsikniadhes	8/8/2014	-	-	-	-	Sta Nychia
JMA14 NM392	Tomh 3	Tsikniadhes	8/8/2014	-	-	-	-	Sta Nychia
JMA14 NM393	10404	Tsikniadhes	8/8/2014	0	3.6	1.92	0.61	Sta Nychia
JMA14 NM394	10405	Tsikniadhes	8/8/2014	0	3.31	1.78	0.31	Dhemenegaki
JMA14 NM395	Tomh 3	Tsikniadhes	8/8/2014	20	2.55	1.42	0.46	Dhemenegaki
JMA14 NM396	Tomh 3	Tsikniadhes	8/8/2014	20	3.45	1.71	0.42	Sta Nychia
JMA14 NM397	Tomh 3	Tsikniadhes	8/8/2014	20	3.12	1.56	0.66	Dhemenegaki
JMA14 NM398	Tomh 3	Tsikniadhes	8/8/2014	10	2.89	3.52	0.79	Dhemenegaki
JMA14 NM399	Tomh 3	Tsikniadhes	8/8/2014	0	2.61	2.38	0.42	Sta Nychia
JMA14 NM400	Tomh 3	Tsikniadhes	8/8/2014	0	2.95	2.27	0.5	Sta Nychia
JMA14 NM401	Tomh 3	Tsikniadhes	8/8/2014	0	2.31	1.5	0.45	Dhemenegaki
JMA14 NM402	Tomh 3	Tsikniadhes	8/8/2014	20	1.94	0.85	0.28	Sta Nychia
JMA14 NM403	Tomh 3	Tsikniadhes	8/8/2014	5	3.58	2.57	0.4	Sta Nychia
JMA14 NM404	Tomh 4	Tsikniadhes	8/8/2014	0	2.13	0.91	0.28	Sta Nychia
JMA14 NM405	Tomh 6	Tsikniadhes	8/8/2014	0	2.06	2.02	0.19	Sta Nychia
JMA14 NM406	10411	Tsikniadhes	8/8/2014	100	4.72	1.54	0.9	Sta Nychia
JMA14 NM407	Tomh 8/11	Tsikniadhes	8/8/2014	30	4.13	2.26	0.77	Dhemenegaki
JMA14 NM408	10406	Tsikniadhes	8/8/2014	0	3.83	1.21	0.29	Sta Nychia

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JMA14 NM409	10339	Tsikniadhes	8/8/2014	10	3.61	1.94	0.42	Sta Nychia
JMA14 NM410	Tomh 10	Tsikniadhes	8/8/2014	0	1.3	broken	0.31	Sta Nychia
JMA14 NM411	Tomh 10/12	Tsikniadhes	8/8/2014	45	2.92	2.07	1.46	Sta Nychia
JMA14 NM412	Tomh 12	Tsikniadhes	8/8/2014	10	3.33	1.91	0.83	Sta Nychia
JMA14 NM413	Tomh 12	Tsikniadhes	8/8/2014	10	2.52	2.68	0.78	Dhemenegaki
JMA14 NM414	Tomh 12	Tsikniadhes	8/8/2014	10	2.92	1.68	0.85	Dhemenegaki
JMA14 NM415	Tomh 12	Tsikniadhes	8/8/2014	0	1.21	1.32	0.5	Sta Nychia
JMA14 NM416	Tomh 12	Tsikniadhes	8/8/2014	40	0.83	1.07	0.24	Dhemenegaki
JMA14 NM417	Tomh 12	Tsikniadhes	8/8/2014	0	0.31	1.03	0.17	Sta Nychia
JMA14 NM418	10407	Tsikniadhes	8/8/2014	0	4.6	0.96	0.31	Sta Nychia
JMA14 NM419	10412	Tsikniadhes	8/8/2014	35	4.16	3.19	0.96	Dhemenegaki
JMA14 NM420	10412β	Tsikniadhes	8/8/2014	0	1.85	1.28	0.34	Dhemenegaki
JMA14 NM421	Tomh 13	Tsikniadhes	8/8/2014	0	2.77	1.23	0.5	Sta Nychia
JMA14 NM422	Tomh 17	Tsikniadhes	8/8/2014	0	2.38	1.13	0.24	Sta Nychia
JMA14 NM423	Tomh 17	Tsikniadhes	8/8/2014	0	4.15	1.1	0.44	Sta Nychia
JMA14 NM424	Tomh 22	Tsikniadhes	8/8/2014	50	3.02	1.15	0.71	Sta Nychia
JMA14 NM425	Tomh 23	Tsikniadhes	8/8/2014	0	1.69	2.7	0.41	Sta Nychia
JMA14 NM426	Tomh 23	Tsikniadhes	8/8/2014	0	1.48	1.33	0.38	Sta Nychia
JMA14 NM427	Tomh 23	Tsikniadhes	8/8/2014	5	2.35	2.4	0.39	Sta Nychia
JMA14 NM428	10413α	Tsikniadhes	8/8/2014	0	2.64	1.6	0.37	Sta Nychia
JMA14 NM429	10413β	Tsikniadhes	8/8/2014	0	1.59	2.24	0.81	Dhemenegaki
JMA14 NM430	Tomh 23	Tsikniadhes	8/8/2014	0	1.13	1.99	0.72	Dhemenegaki
JMA14 NM431	Tomh 23	Tsikniadhes	8/8/2014	0	0.97	1.46	0.16	Sta Nychia
JMA14 NM432	Tomh 23	Tsikniadhes	8/8/2014	80	2.29	1.7	0.62	Dhemenegaki
JMA14 NM433	Tomh 23	Tsikniadhes	8/8/2014	0	1.32	1.44	0.35	Sta Nychia
JMA14 NM434	???	Tsikniadhes	8/8/2014	10	3.48	3.02	0.52	Dhemenegaki
JMA14 NM435	???	Tsikniadhes	8/8/2014	20	0.87	0.52	0.11	Dhemenegaki
JMA14 NM436	???	Tsikniadhes	8/8/2014	25	2.69	2.61	0.78	Dhemenegaki
JMA14 NM437	???	Tsikniadhes	8/8/2014	75	2.01	1.47	0.28	Dhemenegaki
JMA14 NM438	???	Tsikniadhes	8/8/2014	5	2.04	2.33	0.31	Dhemenegaki
JMA14 NM439	???	Tsikniadhes	8/8/2014	0	4.42	3.02	1.27	Sta Nychia
JMA14 NM440	???	Tsikniadhes	8/8/2014	0	4.09	2.48	0.43	Dhemenegaki

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JMA14 NM441	???	Tsikniadhes	8/8/2014	100	3.38	1.81	0.64	Sta Nychia
JMA14 NM442	???	Tsikniadhes	8/8/2014	40	3.46	1.39	0.47	Sta Nychia
JMA14 NM443	10414	Tsikniadhes	8/8/2014	0	3.77	1	0.25	Sta Nychia
JMA14 NM444	???	Tsikniadhes	8/8/2014	15	3.15	1.58	0.42	Sta Nychia
JMA14 NM445	Tomh 8/11	Tsikniadhes	8/8/2014	0	2.13	2.23	0.27	Sta Nychia
JMA14 NM446	???	Tsikniadhes	8/8/2014	0	2.29	0.91	0.24	Sta Nychia
JMA14 NM447	???	Tsikniadhes	8/8/2014	20	2.32	1.14	0.29	Sta Nychia
JMA14 NM448	8099	Tzabaris	9/8/2014	0	3.6	1.33	0.29	Sta Nychia
JMA14 NM449	8100	Tzabaris	9/8/2014	0	3.46	1.36	0.42	Sta Nychia
JMA14 NM450	8101-1	Tzabaris	9/8/2014	0	9.09	1.07	0.24	Sta Nychia
JMA14 NM451	8101-2	Tzabaris	9/8/2014	0	4.46	0.75	0.23	Sta Nychia
JMA14 NM452	8101-3	Tzabaris	9/8/2014	0	3.66	0.93	0.25	Sta Nychia
JMA14 NM453	8101-4	Tzabaris	9/8/2014	0	2.69	1.49	0.51	Sta Nychia
JMA14 NM454	8101-5	Tzabaris	9/8/2014	0	3.41	2.91	0.72	Sta Nychia
JMA14 NM455	8102	Tzabaris	9/8/2014	0	4.31	4.61	1.06	Sta Nychia
JMA14 NM456	8103	Tzabaris	9/8/2014	0	8.17	1.26	0.29	Sta Nychia
JMA14 NM457	8104	Tzabaris	9/8/2014	0	5.78	0.96	0.92	Sta Nychia
JMA14 NM458	8105	Tzabaris	9/8/2014	0	4.9	1.22	0.34	Sta Nychia
JMA14 NM459	8106	Tzabaris	9/8/2014	0	4.55	1.22	0.29	Sta Nychia
JMA14 NM460	8107	Tzabaris	9/8/2014	0	4.82	1.38	0.38	Sta Nychia
JMA14 NM461	8108	Tzabaris	9/8/2014	0	4.42	1.03	0.27	Sta Nychia
JMA14 NM462	8109	Tzabaris	9/8/2014	0	4.12	1.54	0.34	Sta Nychia
JMA14 NM463	8110	Tzabaris	9/8/2014	0	3.84	1.22	0.31	Sta Nychia
JMA14 NM464	8111	Tzabaris	9/8/2014	0	3.89	1.31	0.38	Sta Nychia
JMA14 NM465	8112	Tzabaris	9/8/2014	0	3.62	1.31	0.37	Dhemenegaki
JMA14 NM466	8113	Tzabaris	9/8/2014	0	3.57	1.06	0.24	Sta Nychia
JMA14 NM467	8114	Tzabaris	9/8/2014	0	3.4	1.11	0.29	Sta Nychia
JMA14 NM468	8115	Tzabaris	9/8/2014	0	3.27	1.28	0.29	Sta Nychia
JMA14 NM469	8116	Tzabaris	9/8/2014	0	3.02	1.11	0.2	Sta Nychia
JMA14 NM470	8117	Tzabaris	9/8/2014	0	3.11	1.09	0.25	Sta Nychia
JMA14 NM471	8118	Tzabaris	9/8/2014	0	3.01	1.2	0.29	Sta Nychia
JMA14 NM472	8119	Tzabaris	9/8/2014	0	3.09	0.91	0.28	Sta Nychia

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JMA14 NM473	8120	Tzabaris	9/8/2014	0	2.78	1.48	0.36	Sta Nychia
JMA14 NM474	8121	Tzabaris	9/8/2014	0	3.42	1.05	0.3	Sta Nychia
JMA14 NM475	8122	Tzabaris	9/8/2014	0	3.27	1.11	0.29	Sta Nychia
JMA14 NM476	8123	Tzabaris	9/8/2014	0	2.92	1.46	0.43	Sta Nychia
JMA14 NM477	8124	Tzabaris	9/8/2014	0	2.81	1.08	0.24	Sta Nychia
JMA14 NM478	8125	Tzabaris	9/8/2014	0	2.56	1.15	0.26	Sta Nychia
JMA14 NM479	8126	Tzabaris	9/8/2014	0	2.37	1.36	0.27	Sta Nychia
JMA14 NM480	8127	Tzabaris	9/8/2014	0	2.42	1.46	0.6	Sta Nychia
JMA14 NM481	8128	Tzabaris	9/8/2014	0	2.42	0.99	0.37	Sta Nychia
JMA14 NM482	8129	Tzabaris	9/8/2014	0	2.36	1.15	0.34	Sta Nychia
JMA14 NM483	8130	Tzabaris	9/8/2014	0	2.29	0.92	0.21	Sta Nychia
JMA14 NM484	8131	Tzabaris	9/8/2014	0	2.35	0.93	0.35	Sta Nychia
JMA14 NM485	8132	Tzabaris	9/8/2014	0	2.31	0.92	0.26	Sta Nychia
JMA14 NM486	8133	Tzabaris	9/8/2014	0	2.24	1.25	0.39	Sta Nychia
JMA14 NM487	8134	Tzabaris	9/8/2014	0	2.26	1.49	0.35	Sta Nychia
JMA14 NM488	8135	Tzabaris	9/8/2014	0	2.21	1.14	0.35	Sta Nychia
JMA14 NM489	8136	Tzabaris	9/8/2014	0	1.99	1.11	0.26	Sta Nychia
JMA14 NM490	8137	Tzabaris	9/8/2014	0	2.08	1.09	0.22	Sta Nychia
JMA14 NM491	8138	Tzabaris	9/8/2014	0	2.26	0.91	0.22	Sta Nychia
JMA14 NM492	8139	Tzabaris	9/8/2014	0	2.58	0.92	0.31	Sta Nychia
JMA14 NM493	8140	Tzabaris	9/8/2014	0	2.65	0.89	0.26	Sta Nychia
JMA14 NM494	8141	Tzabaris	9/8/2014	0	1.99	1.09	0.26	Sta Nychia
JMA14 NM495	8142	Tzabaris	9/8/2014	0	2.17	0.86	0.21	Sta Nychia
JMA14 NM496	8143	Tzabaris	9/8/2014	0	2.1	1.33	0.29	Sta Nychia
JMA14 NM497	8144	Tzabaris	9/8/2014	0	2.16	0.89	0.2	Sta Nychia
JMA14 NM498	8145	Tzabaris	9/8/2014	0	1.83	1.21	0.35	Sta Nychia
JMA14 NM499	8146	Tzabaris	9/8/2014	0	1.98	1.1	0.42	Sta Nychia
JMA14 NM500	8147	Tzabaris	9/8/2014	0	1.99	0.81	0.23	Sta Nychia
JMA14 NM501	8148	Tzabaris	9/8/2014	0	1.51	1.09	0.24	Sta Nychia
JMA14 NM502	8149	Tzabaris	9/8/2014	0	1.21	0.8	0.21	Sta Nychia
JMA14 NM503	8150	Tzabaris	9/8/2014	0	2.01	3.25	1.17	Sta Nychia
JMA14 NM504	8151	Tzabaris	9/8/2014	0	2.84	1.16	1.52	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM505	8152	Tzabaris	9/8/2014	20	1.64	2.18	0.6	Dhemenegaki
JMA14 NM506	8153	Tzabaris	9/8/2014	0	2.53	1.29	0.47	Sta Nychia
JMA14 NM507	8154	Tzabaris	9/8/2014	0	1.1	1.72	0.8	Sta Nychia
JMA14 NM508	8155	Tzabaris	9/8/2014	-	-	-	-	Dhemenegaki
JMA14 NM509	8156	Tzabaris	9/8/2014	0	1.39	1.29	0.41	Sta Nychia
JMA14 NM510	8157	Tzabaris	9/8/2014	0	1.09	1.37	0.46	Sta Nychia
JMA14 NM511	8158	Tzabaris	9/8/2014	60	1.36	1.09	0.49	Dhemenegaki
JMA14 NM512	8159 (core)	Tzabaris	9/8/2014	0	7.03	3.39	3.26	Sta Nychia
JMA14 NM513	8261	Skopelitou	9/8/2014	0	3.98	1.44	0.4	Sta Nychia
JMA14 NM514	8262	Skopelitou	9/8/2014	0	3.92	1.55	0.31	Sta Nychia
JMA14 NM515	8263	Skopelitou	9/8/2014	0	3.9	1.22	0.21	Sta Nychia
JMA14 NM516	8264	Skopelitou	9/8/2014	0	2.32	1.01	0.28	Sta Nychia
JMA14 NM517	8265	Skopelitou	9/8/2014	0	2.16	1.29	0.26	Sta Nychia
JMA14 NM518	8266	Skopelitou	9/8/2014	0	1.93	1.25	0.46	Dhemenegaki
JMA14 NM519	8267	Skopelitou	9/8/2014	0	3.1	3.18	0.74	Sta Nychia
JMA14 NM520	5832, 5934	Aplomata	11/8/2014	0	15.65	1.51	0.35	Sta Nychia
JMA14 NM521	5833	Aplomata	11/8/2014	0	15.15	1.69	0.39	Sta Nychia
JMA14 NM522	5834	Aplomata	11/8/2014	0	12.03	1.41	0.43	Sta Nychia
JMA14 NM523	5935; 5936	Aplomata	11/8/2014	0	13.19	2.01	0.45	Sta Nychia
JMA14 NM524	5937	Aplomata	11/8/2014	0	3.09	1.44	0.37	Sta Nychia
JMA14 NM525	?	Aplomata	11/8/2014	0	2.6	1.19	0.19	Sta Nychia
JMA14 NM526	5938	Aplomata	11/8/2014	0	5.22	1.02	0.24	Sta Nychia
JMA14 NM527	10146α	Aplomata	11/8/2014	0	2.3	1.01	0.32	Sta Nychia
JMA14 NM528	10146β	Aplomata	11/8/2014	0	1.35	0.93	0.23	Sta Nychia
JMA14 NM529	5848	Aplomata	11/8/2014	0	8.31	1.06	0.32	Sta Nychia
JMA14 NM530	5849	Aplomata	11/8/2014	0	6.78	1.09	0.34	Sta Nychia
JMA14 NM531	5831 (core w/ red and blue)	Aplomata	11/8/2014	0	11.21	4.41	4.06	Sta Nychia
JMA14 NM532	5850	Aplomata	11/8/2014	0	13.64	1.61	0.39	Sta Nychia
JMA14 NM533	5912	Aplomata	11/8/2014	0	21.01	1.72	0.4	Sta Nychia
JMA14 NM534	5913	Aplomata	11/8/2014	0	13.27	1.52	0.47	Sta Nychia
JMA14 NM535	5914	Aplomata	11/8/2014	0	12.4	1.61	0.37	Sta Nychia
JMA14 NM536	5915	Aplomata	11/8/2014	0	13.36	1.21	0.42	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM537	5916	Aplomata	11/8/2014	0	13.21	1.54	0.44	Sta Nychia
JMA14 NM538	5917	Aplomata	11/8/2014	0	12.16	1.28	0.35	Sta Nychia
JMA14 NM539	5918	Aplomata	11/8/2014	0	13.52	1.52	0.32	Sta Nychia
JMA14 NM540	5919; 5921	Aplomata	11/8/2014	0	17.45	1.38	0.4	Sta Nychia
JMA14 NM541	5920; 5925	Aplomata	11/8/2014	0	13.52	1.32	0.35	Sta Nychia
JMA14 NM542	5901	Aplomata	11/8/2014	0	7.52	1.08	0.26	Sta Nychia
JMA14 NM543	5902	Aplomata	11/8/2014	0	6.71	0.91	0.31	Sta Nychia
JMA14 NM544	5904	Aplomata	11/8/2014	0	5.86	1.06	0.31	Sta Nychia
JMA14 NM545	5905	Aplomata	11/8/2014	0	6.01	0.92	0.32	Sta Nychia
JMA14 NM546	5856	Aplomata	11/8/2014	0	8.17	1.29	0.37	Sta Nychia
JMA14 NM547	5851	Aplomata	11/8/2014	0	4.86	1.29	0.29	Sta Nychia
JMA14 NM548	5932	Aplomata	11/8/2014	0	2.93	1.17	0.32	Sta Nychia
JMA14 NM549	5903	Aplomata	11/8/2014	0	5.91	1.22	0.31	Sta Nychia
JMA14 NM550	5906	Aplomata	11/8/2014	0	5.34	0.93	0.32	Sta Nychia
JMA14 NM551	5911	Aplomata	11/8/2014	0	6.65	1.26	0.34	Sta Nychia
JMA14 NM552	5922	Aplomata	11/8/2014	0	5.98	1.17	0.25	Sta Nychia
JMA14 NM553	5929	Aplomata	11/8/2014	0	3.22	1.85	0.56	Sta Nychia
JMA14 NM554	5926; 5927	Aplomata	11/8/2014	0	5.71	1.6	0.47	Sta Nychia
JMA14 NM555	5907	Aplomata	11/8/2014	0	4.86	1.12	0.37	Sta Nychia
JMA14 NM556	5855	Aplomata	11/8/2014	0	2.82	1.47	0.42	Sta Nychia
JMA14 NM557	5853	Aplomata	11/8/2014	0	2.72	1.37	0.41	Sta Nychia
JMA14 NM558	5931	Aplomata	11/8/2014	0	3.71	1.28	0.23	Sta Nychia
JMA14 NM559	5908	Aplomata	11/8/2014	0	4.43	1.18	0.34	Sta Nychia
JMA14 NM560	5909	Aplomata	11/8/2014	0	5.31	1.06	0.28	Sta Nychia
JMA14 NM561	5910	Aplomata	11/8/2014	0	3.26	1.03	0.29	Sta Nychia
JMA14 NM562	5923	Aplomata	11/8/2014	0	4.49	1.36	0.38	Sta Nychia
JMA14 NM563	5930	Aplomata	11/8/2014	0	3.45	1.1	0.25	Sta Nychia
JMA14 NM564	5852	Aplomata	11/8/2014	0	4.31	1.11	0.32	Sta Nychia
JMA14 NM565	5854	Aplomata	11/8/2014	0	4.5	0.93	0.22	Sta Nychia
JMA14 NM566	5933	Aplomata	11/8/2014	0	2.46	1.36	0.43	Sta Nychia
JMA14 NM567	592	Aplomata	11/8/2014	0	3.69	1.72	0.68	Sta Nychia
JMA14 NM568	10108	Aplomata	11/8/2014	0	10.64	1.41	0.37	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM569	10105	Aplomata	11/8/2014	0	12.11	1.04	0.3	Sta Nychia
JMA14 NM570	10122	Aplomata	11/8/2014	0	8.92	1.34	0.29	Sta Nychia
JMA14 NM571	10123	Aplomata	11/8/2014	0	7.67	1.08	0.31	Sta Nychia
JMA14 NM572	10124	Aplomata	11/8/2014	0	8.24	1.24	0.32	Sta Nychia
JMA14 NM573	10125	Aplomata	12/8/2014	0	8.73	1.23	0.76	Sta Nychia
JMA14 NM574	10126	Aplomata	12/8/2014	0	8.89	1.3	0.32	Sta Nychia
JMA14 NM575	10127	Aplomata	12/8/2014	0	7.25	1.13	0.32	Sta Nychia
JMA14 NM576	10128	Aplomata	12/8/2014	0	5.86	1.34	0.39	Sta Nychia
JMA14 NM577	10129	Aplomata	12/8/2014	0	6.57	1.09	0.27	Sta Nychia
JMA14 NM578	10130	Aplomata	12/8/2014	0	5.26	1.43	0.27	Sta Nychia
JMA14 NM579	10131	Aplomata	12/8/2014	0	5.3	1.26	0.26	Sta Nychia
JMA14 NM580	10132α	Aplomata	12/8/2014	0	3.43	0.93	0.23	Sta Nychia
JMA14 NM581	10132β	Aplomata	12/8/2014	0	2.9	0.6	0.18	Sta Nychia
JMA14 NM582	10132γ	Aplomata	12/8/2014	0	0.84	0.85	0.19	Sta Nychia
JMA14 NM583	10132δ	Aplomata	12/8/2014	0	1.33	0.73	0.21	Sta Nychia
JMA14 NM584	10148	Aplomata	12/8/2014	0	6.77	1.03	0.25	Sta Nychia
JMA14 NM585	10149	Aplomata	12/8/2014	0	6.42	1.12	0.29	Sta Nychia
JMA14 NM586	10150	Aplomata	12/8/2014	0	6.39	1.02	0.28	Sta Nychia
JMA14 NM587	10151	Aplomata	12/8/2014	0	5.22	0.97	0.32	Sta Nychia
JMA14 NM588	10152	Aplomata	12/8/2014	0	5.19	0.88	0.24	Sta Nychia
JMA14 NM589	10153	Aplomata	12/8/2014	0	6.61	1.51	0.32	Sta Nychia
JMA14 NM590	10154	Aplomata	12/8/2014	0	3.39	1.12	0.26	Sta Nychia
JMA14 NM591	10155	Aplomata	12/8/2014	0	2.91	0.98	0.28	Sta Nychia
JMA14 NM592	10156	Aplomata	12/8/2014	0	2.19	1.1	0.29	Sta Nychia
JMA14 NM593	10158 (10)	Aplomata	12/8/2014	0	2.03	1.08	0.28	Sta Nychia
JMA14 NM594	10159α	Aplomata	12/8/2014	0	1.53	0.99	0.21	Sta Nychia
JMA14 NM595	10159β	Aplomata	12/8/2014	0	1.53	1.07	0.31	Sta Nychia
JMA14 NM596	10157	Aplomata	12/8/2014	0	4.12	1.2	0.27	Sta Nychia
JMA14 NM597	10156	Aplomata	12/8/2014	0	4.26	0.99	0.21	Sta Nychia
JMA14 NM598	10159γ	Aplomata	12/8/2014	0	3.11	0.81	0.26	Sta Nychia
JMA14 NM599	10159δ	Aplomata	12/8/2014	0	2.33	1.33	0.27	Sta Nychia
JMA14 NM600	10159ε	Aplomata	12/8/2014	0	2.16	1.26	0.29	Sta Nychia

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JMA14 NM601	10159στ	Aplomata	12/8/2014	0	2.35	1.04	0.28	Sta Nychia
JMA14 NM602	10159ζ	Aplomata	12/8/2014	0	1.99	0.98	0.3	Sta Nychia
JMA14 NM603	10159η	Aplomata	12/8/2014	0	1.67	broken	0.2	Sta Nychia
JMA14 NM604	10159θ	Aplomata	12/8/2014	0	1.11	0.77	0.16	Sta Nychia
JMA14 NM605	10159 ι	Aplomata	12/8/2014	0	2.97	0.67	0.16	Sta Nychia
JMA14 NM606	10159 (24)	Aplomata	12/8/2014	0	2.72	1	1.22	Sta Nychia
JMA14 NM607	10159ςα	Aplomata	12/8/2014	0	3.06	0.93	0.26	Sta Nychia
JMA14 NM608	10159ςβ	Aplomata	12/8/2014	0	3.21	0.87	0.19	Sta Nychia
JMA14 NM609	10159ςδ	Aplomata	12/8/2014	0	2.54	1.3	0.57	Sta Nychia
JMA14 NM610	10147α	Aplomata	12/8/2014	0	2.53	0.87	0.22	Sta Nychia
JMA14 NM611	10147β	Aplomata	12/8/2014	0	3.82	0.95	0.52	Sta Nychia
JMA14 NM612	10147γ	Aplomata	12/8/2014	0	1.97	1.44	0.18	Dhemenegaki
JMA14 NM613	10147δ	Aplomata	12/8/2014	10	1.47	1.24	0.16	Sta Nychia
JMA14 NM614	10137	Aplomata	12/8/2014	0	5.35	1.27	0.27	Sta Nychia
JMA14 NM615	10138	Aplomata	12/8/2014	0	11.38	1.62	0.43	Sta Nychia
JMA14 NM616	10139	Aplomata	12/8/2014	0	5.76	1.47	0.44	Sta Nychia
JMA14 NM617	10140	Aplomata	12/8/2014	0	11.04	1.15	0.34	Sta Nychia
JMA14 NM618	10142	Aplomata	12/8/2014	0	4.11	1.11	0.34	Sta Nychia
JMA14 NM619	10143	Aplomata	12/8/2014	0	3.8	0.87	0.24	Sta Nychia
JMA14 NM620	10145α	Aplomata	12/8/2014	0	2.71	0.91	0.27	Sta Nychia
JMA14 NM621	10145β	Aplomata	12/8/2014	0	2.38	0.99	0.21	Sta Nychia
JMA14 NM622	10145γ	Aplomata	12/8/2014	0	1.55	0.81	0.25	Sta Nychia
JMA14 NM623	10141	Aplomata	12/8/2014	0	2.46	1.08	0.31	Sta Nychia
JMA14 NM624	10145δ	Aplomata	12/8/2014	0	1.98	1.29	0.37	Sta Nychia
JMA14 NM625	10145ε	Aplomata	12/8/2014	0	0.93	1.06	0.3	Sta Nychia
JMA14 NM626	10145ζ	Aplomata	12/8/2014	0	1.31	0.79	0.2	Sta Nychia
JMA14 NM627	10145στ	Aplomata	12/8/2014	0	0.93	1.15	0.33	Sta Nychia
JMA14 NM628	10144	Aplomata	12/8/2014	10	3.07	2.22	0.66	Sta Nychia
JMA14 NM629	10104	Aplomata	12/8/2014	0	17.65	1.6	0.37	Sta Nychia
JMA14 NM630	10106	Aplomata	12/8/2014	0	13.05	1.21	0.22	Sta Nychia
JMA14 NM631	10103	Aplomata	12/8/2014	0	17.44	1.51	0.44	Sta Nychia
JMA14 NM632	10118	Aplomata	12/8/2014	0	12.78	1.19	0.32	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM633	10111	Aplomata	12/8/2014	0	14.83	1.21	0.37	Sta Nychia
JMA14 NM634	10112	Aplomata	12/8/2014	0	9.45	1.22	0.36	Sta Nychia
JMA14 NM635	10113	Aplomata	12/8/2014	0	7.51	1.44	0.34	Sta Nychia
JMA14 NM636	10114	Aplomata	12/8/2014	0	15.33	1.36	0.37	Sta Nychia
JMA14 NM637	10115	Aplomata	12/8/2014	0	7.95	1.32	0.36	Sta Nychia
JMA14 NM638	10116	Aplomata	12/8/2014	0	13.86	1.33	0.37	Sta Nychia
JMA14 NM639	10117/10137	Aplomata	12/8/2014	0	11.77	1.29	0.36	Sta Nychia
JMA14 NM640	10119	Aplomata	12/8/2014	0	3.15	1.21	0.31	Sta Nychia
JMA14 NM641	10120	Aplomata	12/8/2014	0	9.82	1.43	0.25	Sta Nychia
JMA14 NM642	10121α	Aplomata	12/8/2014	0	3.77	1.43	0.29	Sta Nychia
JMA14 NM643	10121β	Aplomata	12/8/2014	0	3.35	1.11	0.54	Sta Nychia
JMA14 NM644	10121γ	Aplomata	12/8/2014	0	4.37	1.07	0.24	Sta Nychia
JMA14 NM645	10133	Aplomata	12/8/2014	0	6.14	1.4	0.31	Sta Nychia
JMA14 NM646	10134	Aplomata	12/8/2014	0	7.12	0.98	0.28	Sta Nychia
JMA14 NM647	10135α	Aplomata	12/8/2014	0	2.56	0.91	0.24	Sta Nychia
JMA14 NM648	10135β	Aplomata	12/8/2014	0	2.05	1.08	0.28	Sta Nychia
JMA14 NM649	10135γ	Aplomata	12/8/2014	0	2.38	0.74	0.16	Sta Nychia
JMA14 NM650	10135δ	Aplomata	12/8/2014	0	1.12	0.73	0.2	Sta Nychia
JMA14 NM651	10136	Aplomata	12/8/2014	70	3.28	2.21	1.12	Sta Nychia
JMA14 NM652	None yet (1971α) (core)	Aplomata	12/8/2014	0	5.2	1.91	1.31	Sta Nychia
JMA14 NM653	None yet (1971β)	Aplomata	12/8/2014	0	4.91	1.24	0.37	Sta Nychia
JMA14 NM654	None yet (1971χ)	Aplomata	12/8/2014	0	5.36	1.4	0.32	Sta Nychia
JMA14 NM655	None yet (1971δ)	Aplomata	12/8/2014	0	3.31	1.57	0.44	Sta Nychia
JMA14 NM656	None yet (1971ε)	Aplomata	12/8/2014	0	4.53	1.7	0.28	Sta Nychia
JMA14 NM657	None yet (1971ϕ)	Aplomata	12/8/2014	0	3.42	1.5	0.37	Sta Nychia
JMA14 NM658	None yet (1971γ)	Aplomata	12/8/2014	0	2.36	1.23	0.36	Sta Nychia
JMA14 NM659	None yet (1971η)	Aplomata	12/8/2014	0	2.53	1.04	0.24	Sta Nychia
JMA14 NM660	None yet (1971 ι)	Aplomata	12/8/2014	0	1.99	1.04	0.3	Sta Nychia
JMA14 NM661	None yet (1971φ)	Aplomata	12/8/2014	0	3.5	1.16	0.31	Sta Nychia
JMA14 NM662	A 1007 (α) (1971?)	Aplomata	12/8/2014	0	5.73	1.99	0.37	Dhemenegaki
JMA14 NM663	A 1007 (β) (1971?)	Aplomata	12/8/2014	0	3.91	1.37	0.32	Sta Nychia
JMA14 NM664	A 1007 (χ) (1971?)	Aplomata	12/8/2014	0	5.49	1.38	0.42	Dhemenegaki

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JMA14 NM665	A 1007 (δ) (1971?)	Aplomata	12/8/2014	0	4.39	1.02	0.29	Sta Nychia
JMA14 NM666	A 1007 (ε) (1971?)	Aplomata	12/8/2014	0	4.85	1.27	0.36	Sta Nychia
JMA14 NM667	A 1007 (ϕ) (1971?)	Aplomata	12/8/2014	0	2.87	1.14	0.36	Dhemenegaki
JMA14 NM668	A 1007 (γ) (1971?)	Aplomata	12/8/2014	0	3.56	0.99	0.54	Sta Nychia
JMA14 NM669	A 1007 (η) (1971?)	Aplomata	12/8/2014	0	3.81	1.52	0.28	Sta Nychia
JMA14 NM670	Assumed A 1007 (ς) same bag	Aplomata	12/8/2014	0	5.19	2.03	0.3	Sta Nychia
JMA14 NM671	A 1007 (φ) (1971?)	Aplomata	12/8/2014	0	2.78	0.91	0.26	Sta Nychia
JMA14 NM672	A 1007 (κ) (1971?)	Aplomata	12/8/2014	0	3.11	1.29	0.3	Sta Nychia
JMA14 NM673	A 1007 (λ) (1971?)	Aplomata	13/8/2014	0	3.89	0.98	0.24	Dhemenegaki
JMA14 NM674	A 1007 (μ) (1971?)	Aplomata	13/8/2014	0	1.72	0.96	0.3	Sta Nychia
JMA14 NM675	A 1007 (ν) (1971?)	Aplomata	13/8/2014	0	2.38	0.84	0.19	Sta Nychia
JMA14 NM676	A 1007 (ο) (1971?)	Aplomata	13/8/2014	0	1.84	0.91	0.28	Sta Nychia
JMA14 NM677	A 1007 (π) (1971?)	Aplomata	13/8/2014	0	2.93	1.23	0.31	Sta Nychia
JMA14 NM678	A 1007 (θ) (1971?)	Aplomata	13/8/2014	0	2.32	0.9	0.3	Sta Nychia
JMA14 NM679	A 1007 (ρ) (1971?)	Aplomata	13/8/2014	0	2.52	1.24	0.42	Sta Nychia
JMA14 NM680	A 1007 (σ) (1971?)	Aplomata	13/8/2014	0	4.04	1.43	0.52	Sta Nychia
JMA14 NM681	A 1007 (τ) (1971?)	Aplomata	13/8/2014	0	3.38	1.22	0.45	Dhemenegaki
JMA14 NM682	Assumed A 1007 (υ) same bag	Aplomata	13/8/2014	0	3.73	1.24	0.79	Sta Nychia
JMA14 NM683	A 1007 (ω) (1971?)	Aplomata	13/8/2014	0	4.01	1.34	0.61	Sta Nychia
JMA14 NM684	Assumed A 1007 (ω) same bag	Aplomata	13/8/2014	0	1.11	2.16	0.38	Dhemenegaki
JMA14 NM685	10107	Aplomata	11/8/2014	0	12.61	1.47	0.41	Sta Nychia
JMA14 NM686	10160	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM687	10161	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM688	10162	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM689	10163	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM690	10164	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM691	10165	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM692	10166	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM693	10167	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM694	10168	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM695	10169	Aplomata	14/8/2014	-	-	-	-	Sta Nychia

Item ID	Museum ID	Site	Date of Analysis	Cortex	Length	Width	Thick	Source
JMA14 NM696	10170	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM697	10171α	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM698	10171β	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM699	10171γ	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM700	10171δ	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM701	10171ε	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM702	10171στ	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM703	10171ε	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM704	10171η	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM705	10171θ	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM706	10171ι	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM707	10171ια	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM708	10171ιβ	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM709	10171ιγ	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM710	10172α	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM711	10172β	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM712	10172γ	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM713	10172δ	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM714	10172ε	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM715	10173	Aplomata	14/8/2014	-	-	-	-	Sta Nychia
JMA14 NM716	5366 (core w/ red)	Aplomata	14/8/2014	-	-	-	-	Sta Nychia

APPENDIX B

DATABASE OF ALL CALIBRATED ELEMENTAL VALUES

Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
JMA14 NM1	562	696	609	10002	4	6	8	45	16	23	11	107	97	19	109	12
JMA14 NM2	741	361	422	10144	4	6	7	39	15	24	10	115	99	17	101	8
JMA14 NM3	688	453	493	8992	4	6	8	23	14	24	10	110	98	18	99	10
JMA14 NM4	644	460	457	10162	5	6	7	40	15	21	11	117	98	16	105	11
JMA14 NM5	653	396	674	9634	4	7	7	50	16	24	11	119	92	16	106	9
JMA14 NM6	687	645	538	11856	4	6	7	45	16	25	9	102	123	18	112	8
JMA14 NM7	679	796	513	13172	6	6	9	34	15	24	13	112	122	19	123	8
JMA14 NM8	614	766	635	11616	5	6	9	29	16	23	8	126	101	19	103	8
JMA14 NM9	772	1173	471	15724	7	6	11	44	16	27	7	116	118	13	110	9
JMA14 NM10	673	427	510	9345	4	6	7	36	15	22	10	114	93	17	102	8
JMA14 NM11	690	352	450	10154	4	7	8	51	17	23	11	117	99	15	101	10
JMA14 NM12	602	501	704	9519	4	6	7	54	16	27	12	124	99	18	103	10
JMA14 NM13	627	598	569	9615	4	6	8	33	15	26	11	115	110	19	107	12
JMA14 NM14	617	550	538	9700	4	6	7	38	15	21	13	120	100	19	112	8
JMA14 NM15	687	521	556	13752	6	6	9	41	16	23	9	109	116	15	109	8
JMA14 NM16	650	488	498	9989	4	6	7	44	16	25	11	111	101	18	105	9
JMA14 NM17	712	384	394	9634	4	6	8	36	17	23	10	117	99	18	98	8
JMA14 NM18	683	384	625	10887	5	6	8	39	15	26	15	120	103	17	107	9
JMA14 NM19	892	1398	571	12522	7	7	13	68	18	20	11	115	98	20	100	7
JMA14 NM20	738	356	623	11234	5	6	9	36	16	21	9	131	110	17	106	8
JMA14 NM21	647	556	539	9639	4	6	7	37	15	27	12	118	95	17	105	9
JMA14 NM22	672	437	523	9817	4	6	7	46	16	23	11	115	98	17	104	9
JMA14 NM23	660	601	367	9357	4	6	7	46	16	23	10	111	100	19	109	9
JMA14 NM24	751	306	289	9289	4	6	8	32	15	23	12	109	97	18	107	11
JMA14 NM25	707	534	582	9853	4	6	8	44	16	20	9	116	93	16	102	8
JMA14 NM26	760	1222	624	10006	4	6	8	49	17	24	11	116	97	22	106	10
JMA14 NM27	663	850	441	10198	4	6	8	42	18	23	10	119	104	17	104	10
JMA14 NM28	628	327	622	10588	4	6	7	31	15	24	10	130	113	16	112	11
JMA14 NM29	670	440	571	10204	4	6	7	42	15	24	11	119	102	19	110	10
JMA14 NM30	786	383	395	9368	4	6	7	29	15	23	10	115	101	16	98	9
JMA14 NM31	752	461	351	9962	4	6	8	23	16	23	12	116	103	16	103	9

Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
JMA14 NM32	673	567	435	10508	4	6	7	26	15	23	11	122	104	15	99	10
JMA14 NM33	752	379	491	10891	4	7	8	55	17	25	10	121	109	18	105	8
JMA14 NM34	675	407	444	10209	4	6	8	31	15	21	10	121	110	17	108	10
JMA14 NM35	629	400	480	9562	4	6	7	43	16	26	13	120	106	18	110	9
JMA14 NM36	708	469	401	11121	5	6	8	37	16	23	11	130	106	19	112	9
JMA14 NM37	668	396	436	9797	4	6	7	33	15	23	9	118	101	19	110	7
JMA14 NM38	675	502	445	11167	5	6	8	39	16	25	8	130	108	19	111	10
JMA14 NM39	637	559	514	10103	4	6	7	40	15	25	15	117	105	20	111	10
JMA14 NM40	689	784	535	11914	5	6	8	47	15	20	11	95	112	21	112	9
JMA14 NM41	704	463	371	9716	4	7	8	61	19	24	9	122	102	17	98	8
JMA14 NM42	733	277	548	9835	4	6	7	43	16	20	8	121	104	19	106	8
JMA14 NM43	683	498	521	10142	4	6	8	29	15	22	11	120	101	17	114	9
JMA14 NM44	731	1065	559	8214	4	7	8	39	16	20	8	101	90	20	94	10
JMA14 NM45	704	406	348	11267	5	7	10	53	17	25	10	127	102	19	95	9
JMA14 NM46	634	739	451	9747	4	6	8	25	15	18	11	112	94	17	98	7
JMA14 NM47	687	393	648	11698	5	7	8	51	16	24	11	126	115	20	114	9
JMA14 NM48	620	557	616	11255	5	7	9	54	17	24	13	138	102	17	109	9
JMA14 NM49	690	604	546	11570	5	6	7	47	15	23	11	111	111	18	113	7
JMA14 NM50	698	370	401	9427	4	6	8	43	16	27	11	113	94	16	97	9
JMA14 NM51	787	363	483	10187	5	6	7	39	15	23	11	118	108	18	105	8
JMA14 NM52	719	740	579	12267	5	6	9	45	16	22	12	104	123	19	105	7
JMA14 NM53	676	654	611	12670	5	7	8	56	17	26	8	118	121	16	115	10
JMA14 NM54	692	615	498	10176	5	7	8	51	16	21	12	112	93	21	97	9
JMA14 NM55	660	582	649	13175	6	6	10	51	18	22	10	112	118	16	111	9
JMA14 NM56	701	548	459	12042	5	6	8	45	16	26	9	110	120	18	115	9
JMA14 NM57	801	325	627	9874	4	6	8	33	16	22	8	123	102	20	110	9
JMA14 NM58	622	610	498	8862	4	7	8	51	16	25	10	114	94	19	97	9
JMA14 NM59	620	618	531	9524	4	6	7	41	16	25	12	112	103	19	107	10
JMA14 NM60	681	485	378	10024	4	6	7	35	15	21	14	119	104	20	107	10
JMA14 NM61	634	556	493	10409	4	6	7	40	15	22	11	120	103	20	112	8
JMA14 NM62	703	438	540	10157	4	6	7	41	15	24	10	123	105	18	101	8
JMA14 NM63	681	444	480	9924	4	6	8	40	16	20	9	124	106	19	112	10
JMA14 NM64	669	397	490	10695	4	6	7	53	16	23	13	124	109	15	112	9
JMA14 NM65	685	413	587	10867	4	6	7	44	16	23	9	125	108	23	112	10
JMA14 NM66	826	389	516	10087	4	6	7	31	16	25	8	123	105	18	102	8
JMA14 NM67	699	345	515	9568	4	7	6	47	15	24	11	117	92	16	102	8
JMA14 NM72	652	630	412	9402	4	6	7	31	15	23	9	114	104	18	103	9
JMA14 NM68	847	286	509	13773	4	6	8	40	15	24	12	113	100	18	106	9
JMA14 NM69	762	453	409	9468	4	6	7	36	16	27	10	110	106	18	110	9
JMA14 NM70	682	518	536	12391	4	6	7	42	15	23	9	115	121	19	116	10
JMA14 NM71	790	313	623	11336	5	7	8	48	15	23	12	126	112	18	113	7

Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
JMA14 NM73	697	399	485	10170	4	6	7	47	16	24	12	119	101	16	111	10
JMA14 NM74	684	440	572	10100	4	6	7	37	15	21	10	123	108	16	105	9
JMA14 NM75	610	610	520	9503	4	6	7	41	16	25	14	121	100	15	109	8
JMA14 NM76	711	473	479	10349	4	6	8	44	16	25	13	121	106	17	112	9
JMA14 NM77	601	492	420	9847	5	6	8	39	15	24	13	112	107	19	102	8
JMA14 NM78	702	398	469	9785	4	7	7	56	16	22	10	108	101	18	102	8
JMA14 NM79	729	385	435	10733	4	6	8	36	16	22	11	120	108	16	105	8
JMA14 NM80	867	172	562	9786	4	6	6	38	15	24	10	108	98	20	107	9
JMA14 NM81	695	418	434	9429	4	6	7	28	14	23	11	114	106	17	101	9
JMA14 NM82	738	412	445	9651	4	6	8	42	16	22	10	114	95	20	107	9
JMA14 NM83	615	551	452	10012	4	6	8	40	16	26	12	121	104	16	107	9
JMA14 NM84	767	388	294	11010	4	6	8	41	16	25	11	121	104	18	105	10
JMA14 NM85	679	423	498	13347	4	6	7	39	15	24	14	130	113	15	109	10
JMA14 NM86	676	433	411	10241	4	6	7	41	15	22	10	121	105	18	106	10
JMA14 NM87	730	446	517	10871	4	6	8	39	17	24	11	121	103	18	106	8
JMA14 NM88	702	345	539	10001	4	6	8	36	16	22	11	118	100	15	111	9
JMA14 NM89	726	398	483	11123	4	7	6	56	16	25	10	111	105	19	104	8
JMA14 NM90	687	380	499	9719	4	6	7	38	15	21	11	116	101	16	103	10
JMA14 NM91	681	451	483	10636	4	6	7	31	15	21	9	127	109	19	110	10
JMA14 NM92	747	555	472	12292	5	6	8	46	17	23	12	108	124	18	112	8
JMA14 NM93	683	574	341	11367	5	6	8	26	14	19	10	101	108	19	110	8
JMA14 NM94	640	519	408	9871	4	6	7	33	14	21	12	113	96	21	106	9
JMA14 NM95	735	496	506	10123	4	6	7	41	15	25	13	128	106	18	114	10
JMA14 NM96	780	338	445	9633	4	6	7	36	15	24	11	110	99	17	106	8
JMA14 NM97	790	546	425	11235	5	6	8	44	15	20	7	97	111	20	104	8
JMA14 NM98	757	334	443	9325	4	6	7	39	15	21	10	121	103	18	98	8
JMA14 NM99	686	482	395	12535	5	6	8	37	16	21	11	116	125	16	113	7
JMA14 NM101	732	594	399	11446	5	6	8	35	15	23	10	102	119	20	111	9
JMA14 NM102	633	508	547	10254	4	6	7	47	16	24	9	121	106	17	106	11
JMA14 NM103	705	572	433	12150	5	6	7	31	14	24	12	110	115	19	122	9
JMA14 NM104	669	517	576	10106	4	6	7	31	15	25	13	121	103	20	106	11
JMA14 NM105	727	444	523	9927	4	6	7	44	15	24	10	118	106	17	106	12
JMA14 NM106	773	352	529	11896	5	6	8	37	16	22	10	130	106	16	105	10
JMA14 NM107	732	509	481	12277	5	6	7	42	15	20	10	107	130	17	112	10
JMA14 NM108	698	414	538	9827	4	6	8	30	17	22	12	121	105	19	113	11
JMA14 NM109	693	293	370	9552	4	6	8	41	16	23	9	118	104	19	107	9
JMA14 NM110	689	411	537	9803	4	6	7	42	16	25	9	119	97	16	111	10
JMA14 NM111	721	506	546	12441	5	6	7	40	15	23	12	105	122	19	121	8
JMA14 NM112	755	529	538	12668	5	6	7	37	15	22	9	113	124	18	114	9
JMA14 NM113	733	392	511	10005	4	6	7	37	15	24	11	121	109	19	108	9
JMA14 NM114	675	406	425	9503	3	6	7	37	16	26	11	116	100	16	104	11

Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
JMA14 NM115	719	446	540	10104	4	6	8	36	16	24	9	123	107	17	102	10
JMA14 NM116	679	452	508	9615	4	6	7	37	15	25	12	113	98	19	110	10
JMA14 NM117	735	322	532	10273	4	6	8	39	15	21	11	129	103	16	111	8
JMA14 NM118	677	488	480	9529	4	6	7	40	15	23	9	110	101	17	101	9
JMA14 NM119	618	395	510	9644	4	6	8	34	17	24	13	121	104	15	110	10
JMA14 NM120	741	314	461	11006	4	6	7	47	16	24	9	130	105	16	104	6
JMA14 NM121	737	488	604	9792	3	6	7	32	16	24	11	119	108	17	108	11
JMA14 NM122	700	388	368	9746	4	6	7	38	16	21	13	118	105	19	104	9
JMA14 NM123	701	439	562	9959	4	6	8	30	15	25	14	114	102	16	105	9
JMA14 NM124	740	189	374	10654	4	6	8	36	16	22	10	118	100	17	106	9
JMA14 NM125	682	380	483	10682	4	6	8	41	16	24	10	128	107	15	107	9
JMA14 NM126	637	481	419	9717	4	6	8	43	17	24	9	118	100	16	104	8
JMA14 NM127	746	223	528	9846	4	7	8	50	16	21	10	111	99	21	108	9
JMA14 NM128	694	368	444	10351	5	6	8	42	16	22	12	119	96	17	106	9
JMA14 NM129	681	438	506	10300	4	6	7	45	16	25	12	123	104	18	109	10
JMA14 NM130	708	485	307	9277	4	6	8	42	17	20	10	108	90	16	93	8
JMA14 NM131	588	632	455	11243	5	6	7	53	16	26	14	124	106	20	113	12
JMA14 NM132	713	508	416	10130	4	6	7	43	15	22	10	116	96	16	106	9
JMA14 NM133	671	466	643	11508	5	6	7	42	16	25	11	116	108	20	110	9
JMA14 NM134	791	217	468	10380	4	6	8	18	15	22	10	124	105	19	104	9
JMA14 NM135	697	386	450	9672	4	6	6	34	15	25	11	115	104	17	110	8
JMA14 NM136	758	376	499	9948	4	6	7	27	14	24	9	120	106	19	112	10
JMA14 NM137	658	462	426	9857	4	6	7	36	17	22	10	118	106	20	104	8
JMA14 NM138	705	331	424	10616	5	6	8	33	15	26	11	135	106	14	107	7
JMA14 NM139	675	387	367	9349	4	6	7	40	15	21	9	116	98	17	112	7
JMA14 NM140	742	374	507	9999	4	6	7	40	15	23	9	111	101	20	112	9
JMA14 NM141	774	353	471	10567	5	6	9	33	16	20	8	118	106	18	98	7
JMA14 NM142	740	322	465	11414	5	7	9	60	18	24	7	131	103	16	109	8
JMA14 NM143	749	401	480	9712	4	6	7	33	15	22	13	113	99	19	111	9
JMA14 NM145	680	370	518	9589	4	6	8	41	17	24	12	124	96	16	105	10
JMA14 NM146	660	372	442	9616	4	6	7	38	15	22	11	122	101	16	106	9
JMA14 NM147	648	400	295	10274	5	7	8	47	16	21	10	125	98	15	97	9
JMA14 NM148	852	306	555	12690	5	6	8	40	15	24	9	120	102	16	104	7
JMA14 NM149	755	352	329	11035	5	7	10	49	17	21	11	121	105	16	101	10
JMA14 NM150	704	360	437	10257	5	6	9	43	15	22	12	119	105	19	99	10
JMA14 NM151	671	343	487	10274	4	6	8	36	15	23	10	118	95	20	98	7
JMA14 NM152	639	492	484	9344	4	6	8	45	16	25	11	110	96	20	108	11
JMA14 NM153	629	500	628	10706	5	6	7	39	15	23	13	124	107	17	107	9
JMA14 NM154	651	366	429	9253	4	6	7	39	15	24	11	124	101	17	107	9
JMA14 NM155	675	335	427	9518	4	6	7	36	15	24	11	118	100	19	109	10
JMA14 NM156	661	449	466	9751	4	6	7	33	15	24	13	116	105	17	105	11

Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
JMA14 NM157	676	361	456	9202	4	6	8	40	16	21	11	115	97	18	107	9
JMA14 NM158	646	401	472	9506	4	6	7	33	15	22	12	107	100	20	105	9
JMA14 NM159	677	455	337	9288	4	6	7	36	15	22	12	104	99	22	100	8
JMA14 NM160	669	396	427	9296	4	6	8	39	16	26	13	116	94	17	101	7
JMA14 NM161	687	352	603	9677	4	6	7	46	16	27	11	121	104	17	112	12
JMA14 NM162	705	387	379	9131	4	6	7	30	16	23	14	114	99	18	105	10
JMA14 NM163	639	352	514	10789	5	6	7	48	16	24	11	122	103	19	106	9
JMA14 NM164	630	463	527	9561	4	6	8	36	16	25	12	110	103	20	104	10
JMA14 NM165	766	340	486	9784	4	6	7	35	16	24	11	120	103	18	109	9
JMA14 NM166	716	322	394	9599	4	6	7	46	16	22	9	117	93	22	104	9
JMA14 NM167	670	454	600	9565	4	6	7	42	15	24	11	112	96	20	111	7
JMA14 NM168	662	575	485	12297	5	6	8	31	15	27	11	113	120	18	123	9
JMA14 NM169	656	549	466	9424	4	6	7	34	15	22	10	111	91	18	102	8
JMA14 NM170	702	601	598	12236	5	6	9	32	17	23	12	112	117	16	115	9
JMA14 NM171	685	366	398	11803	5	6	7	40	15	24	12	104	110	18	107	10
JMA14 NM172	651	469	508	9528	4	6	8	35	16	24	12	119	97	17	112	11
JMA14 NM173	705	384	532	10148	5	6	8	30	15	21	10	118	108	20	106	10
JMA14 NM174	684	496	445	10014	4	6	7	38	15	24	13	119	100	18	110	9
JMA14 NM175	712	392	396	9594	4	6	7	42	16	22	12	121	98	16	107	8
JMA14 NM176	671	541	594	9759	4	6	6	27	14	25	10	120	103	17	110	9
JMA14 NM177	683	473	459	9739	4	6	9	47	17	27	13	120	101	17	103	10
JMA14 NM178	723	308	480	10413	5	7	8	53	16	23	11	122	112	15	105	9
JMA14 NM179	677	477	563	10033	4	6	7	27	15	23	14	117	101	18	107	9
JMA14 NM180	660	348	470	11314	4	6	7	35	15	24	12	125	101	17	113	9
JMA14 NM181	662	542	583	9781	4	6	7	29	14	20	8	118	107	16	109	10
JMA14 NM182	711	376	495	9996	4	7	7	48	16	25	9	127	105	14	103	9
JMA14 NM183	678	404	591	9418	4	6	7	33	15	24	11	125	99	15	102	11
JMA14 NM184	676	521	476	9853	4	7	7	51	16	25	11	124	110	15	113	10
JMA14 NM185	821	287	370	9620	4	6	7	40	15	25	12	119	108	16	104	9
JMA14 NM186	645	507	457	9933	4	6	7	39	15	23	11	120	103	17	107	8
JMA14 NM187	774	534	475	10781	5	7	7	59	16	25	11	134	113	14	105	9
JMA14 NM188	731	353	614	10936	5	6	8	38	15	25	11	130	110	17	114	10
JMA14 NM189	745	387	422	10660	4	7	8	48	16	24	11	114	103	19	107	8
JMA14 NM190	692	489	442	9195	4	6	7	39	15	26	11	114	99	21	108	9
JMA14 NM191	777	320	417	10022	4	6	7	45	16	26	12	111	104	20	111	8
JMA14 NM192	692	404	458	10042	4	7	7	45	16	24	12	124	100	16	108	9
JMA14 NM193	771	235	345	9759	4	6	7	42	16	23	10	114	99	18	95	8
JMA14 NM194	715	341	493	10524	4	6	7	37	16	23	9	122	110	17	110	9
JMA14 NM195	794	295	452	10879	4	6	7	25	14	24	13	124	103	15	107	9
JMA14 NM196	829	228	383	9802	4	6	9	36	17	20	12	108	99	20	103	8
JMA14 NM197	717	486	476	9940	4	6	7	32	16	24	11	126	98	15	111	9

Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
JMA14 NM198	780	385	532	10511	4	6	8	48	16	22	8	121	108	18	99	7
JMA14 NM199	772	274	508	10361	4	6	7	31	15	23	12	126	102	19	105	9
JMA14 NM200	699	346	503	10672	4	6	7	37	15	22	12	124	106	19	105	9
JMA14 NM201	847	232	604	10069	4	6	7	43	16	24	8	125	107	21	109	8
JMA14 NM202	723	357	478	10974	4	6	7	35	15	23	12	123	112	16	110	10
JMA14 NM203	763	211	545	10477	4	6	7	35	15	23	12	124	106	19	108	9
JMA14 NM204	742	360	536	10796	4	6	7	45	15	24	12	127	106	20	106	10
JMA14 NM205	683	525	525	10770	5	7	9	62	17	24	13	131	105	15	103	9
JMA14 NM206	782	362	541	10571	4	6	7	35	15	23	9	121	97	21	107	9
JMA14 NM207	669	416	507	11894	5	6	9	50	16	24	12	133	104	19	108	7
JMA14 NM208	714	481	413	9405	4	6	7	40	15	22	10	125	109	18	108	8
JMA14 NM209	772	294	531	10801	5	7	9	57	17	25	11	116	112	21	106	7
JMA14 NM210	759	378	520	10937	5	6	8	41	15	21	8	121	105	21	109	5
JMA14 NM211	736	430	564	12318	5	6	8	41	15	21	10	116	103	17	107	8
JMA14 NM212	752	359	399	9781	4	6	7	38	16	23	10	113	97	16	105	11
JMA14 NM213	704	506	498	9870	5	6	8	44	16	22	11	120	97	15	102	10
JMA14 NM214	776	387	485	10231	4	6	8	35	15	26	11	119	99	19	110	10
JMA14 NM215	702	320	555	9903	4	6	8	34	16	25	11	124	109	18	111	10
JMA14 NM216	753	481	463	9772	4	6	8	32	15	24	11	118	103	19	98	9
JMA14 NM217	669	401	514	9924	4	6	7	37	15	23	9	121	105	17	103	10
JMA14 NM218	731	449	377	10538	5	6	7	37	15	23	11	123	112	18	106	8
JMA14 NM219	706	337	405	9365	4	6	7	41	15	23	10	118	102	19	102	8
JMA14 NM220	636	629	459	8987	4	6	8	45	17	21	10	113	92	17	100	9
JMA14 NM221	672	460	552	10812	4	7	8	52	17	26	11	120	103	19	107	10
JMA14 NM222	756	295	497	9590	4	6	8	34	16	24	13	117	103	19	114	10
JMA14 NM223	787	226	473	10358	4	6	7	49	16	23	11	126	98	16	106	8
JMA14 NM224	676	285	564	10423	4	7	7	51	16	25	10	122	99	17	113	8
JMA14 NM225	624	556	425	9179	4	6	7	46	16	20	9	121	94	15	101	11
JMA14 NM226	711	404	455	10155	4	6	7	38	16	20	10	117	104	18	107	8
JMA14 NM227	702	504	557	10110	4	6	8	41	16	26	11	132	111	19	108	9
JMA14 NM228	626	341	531	10980	4	6	8	46	17	24	10	126	99	17	105	10
JMA14 NM229	720	593	643	12185	5	7	8	55	16	26	12	115	121	21	123	9
JMA14 NM230	754	464	447	12234	5	6	9	31	15	24	10	116	115	17	117	8
JMA14 NM231	709	350	360	9315	4	6	8	35	17	22	9	119	94	16	99	8
JMA14 NM232	663	457	399	10294	4	6	7	27	15	23	9	117	102	18	104	11
JMA14 NM233	748	281	497	9496	4	6	7	24	14	21	8	115	103	17	99	8
JMA14 NM234	673	476	502	9806	4	6	7	39	15	25	14	122	109	15	109	11
JMA14 NM235	761	314	496	9653	3	6	7	33	15	21	12	117	103	18	108	8
JMA14 NM236	634	487	579	10011	4	6	7	43	16	25	10	122	102	18	105	8
JMA14 NM237	694	374	487	9722	4	6	7	40	15	18	10	115	104	19	107	10
JMA14 NM238	670	412	394	9817	5	6	9	37	16	26	9	113	102	18	105	9

Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
JMA14 NM239	762	409	493	12181	5	6	9	38	15	20	8	108	113	18	110	8
JMA14 NM240	679	359	500	10093	4	6	7	37	15	22	12	120	97	20	104	10
JMA14 NM241	672	433	464	9773	4	6	7	39	16	25	10	117	103	19	103	8
JMA14 NM242	693	394	412	10288	4	7	8	50	16	22	10	118	96	16	99	6
JMA14 NM243	727	382	478	9962	4	6	8	35	15	22	11	119	98	19	106	9
JMA14 NM244	656	550	553	12347	5	6	8	43	15	24	12	113	122	19	124	9
JMA14 NM245	725	389	430	9399	4	6	7	35	15	21	13	116	99	19	102	10
JMA14 NM246	631	504	435	9557	4	7	7	50	16	22	9	113	98	18	104	10
JMA14 NM247	723	480	504	12545	5	6	8	49	16	25	9	114	116	17	111	8
JMA14 NM248	736	450	492	9626	4	6	7	32	15	26	13	118	112	20	103	11
JMA14 NM249	729	411	495	9632	4	6	7	28	15	22	10	116	105	17	108	8
JMA14 NM250	717	380	367	9479	4	6	8	32	15	24	10	116	103	19	99	10
JMA14 NM251	675	405	470	10607	4	7	7	55	16	26	12	120	103	19	103	8
JMA14 NM252	763	340	445	9847	4	6	8	27	15	24	10	123	110	17	103	9
JMA14 NM253	724	411	644	13043	5	6	8	47	16	26	9	107	126	19	108	8
JMA14 NM254	675	492	592	9733	4	6	8	25	17	21	8	119	108	18	106	9
JMA14 NM255	684	477	519	9945	4	6	7	39	15	24	12	114	113	19	110	9
JMA14 NM256	674	393	472	9343	4	6	8	36	16	23	11	114	100	16	102	10
JMA14 NM257	651	419	441	10197	4	6	6	50	16	25	10	124	105	16	100	9
JMA14 NM258	681	360	472	10945	5	7	9	54	18	25	12	122	104	17	100	8
JMA14 NM259	677	520	540	9497	4	7	8	45	16	25	11	119	100	18	107	9
JMA14 NM260	773	315	362	9661	4	6	8	32	17	23	9	113	101	18	102	9
JMA14 NM261	636	526	551	9854	4	6	8	40	15	20	11	114	106	17	112	10
JMA14 NM262	737	344	367	9916	4	6	7	39	16	24	12	118	99	15	106	9
JMA14 NM263	694	332	447	10050	5	6	8	29	15	25	9	117	94	18	104	9
JMA14 NM264	583	599	647	9589	4	6	7	35	15	24	10	116	98	18	105	9
JMA14 NM265	719	750	529	11886	5	6	7	36	15	22	9	106	105	18	113	8
JMA14 NM266	661	783	562	14132	5	7	8	64	17	26	9	106	118	18	122	8
JMA14 NM267	692	599	443	12762	5	6	8	52	16	22	10	113	117	18	118	8
JMA14 NM268	684	515	532	10473	4	6	7	33	15	23	11	113	112	19	110	9
JMA14 NM269	661	384	508	9775	4	6	7	45	16	26	11	132	110	16	104	10
JMA14 NM270	677	504	521	10482	4	7	7	52	16	24	12	117	107	20	110	10
JMA14 NM271	750	386	485	10416	4	6	7	32	15	25	10	124	107	18	105	9
JMA14 NM272	621	648	562	9807	4	6	7	47	16	27	14	119	102	19	111	11
JMA14 NM273	666	396	459	10177	5	7	8	49	16	24	13	123	100	15	101	10
JMA14 NM274	649	591	440	11920	5	6	9	35	16	24	15	115	110	19	115	6
JMA14 NM275	647	490	359	12192	5	6	8	51	16	25	9	125	100	16	102	10
JMA14 NM276	777	252	567	9888	4	6	7	32	15	21	10	130	100	18	100	8
JMA14 NM277	731	433	463	10185	5	6	8	42	16	21	12	128	114	16	108	10
JMA14 NM278	777	291	502	9826	4	6	7	42	15	23	9	117	108	18	116	9
JMA14 NM279	803	355	520	10845	5	6	9	37	15	19	8	118	109	17	106	10

Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
JMA14 NM280	780	245	467	10348	5	6	8	24	15	23	10	124	104	14	104	9
JMA14 NM281	690	406	428	10089	4	6	7	30	15	23	11	120	100	18	103	9
JMA14 NM282	798	318	355	11008	5	7	8	62	17	24	9	123	105	15	100	8
JMA14 NM283	801	322	533	10009	5	7	8	46	16	20	9	121	103	15	102	9
JMA14 NM284	741	368	544	9709	4	6	8	37	15	23	9	118	98	16	107	9
JMA14 NM285	730	329	430	11455	5	6	9	41	17	23	11	130	110	15	107	10
JMA14 NM286	656	660	582	8985	4	6	8	35	15	22	12	106	98	19	97	9
JMA14 NM287	654	429	484	8170	4	7	8	40	16	19	10	102	83	14	105	8
JMA14 NM288	590	538	548	9804	4	6	7	32	15	22	12	121	107	16	116	10
JMA14 NM289	777	496	607	12376	5	6	9	42	16	21	11	107	116	18	118	8
JMA14 NM290	651	280	350	9458	4	6	7	39	16	22	12	115	96	18	105	11
JMA14 NM291	759	303	599	9526	4	6	7	34	15	26	12	119	102	18	110	10
JMA14 NM292	800	446	483	12639	6	6	10	51	18	26	10	108	121	14	116	8
JMA14 NM293	777	343	342	10128	4	6	8	29	17	20	9	124	98	17	104	8
JMA14 NM294	650	447	414	10749	4	6	8	47	16	22	10	128	109	18	102	8
JMA14 NM295	654	406	433	8065	4	6	8	39	15	25	11	102	92	15	94	9
JMA14 NM296	657	516	582	11313	5	6	8	31	15	22	12	109	104	18	109	9
JMA14 NM297	725	519	522	11395	5	7	11	59	17	30	13	118	109	19	111	9
JMA14 NM298	707	345	568	9999	4	6	9	33	18	21	9	122	98	17	106	9
JMA14 NM299	674	492	532	10178	4	6	7	32	15	27	13	122	108	21	112	9
JMA14 NM300	581	479	528	9404	4	6	7	50	16	27	11	109	100	20	97	8
JMA14 NM301	697	451	582	9502	4	6	7	38	15	23	10	113	101	18	105	10
JMA14 NM302	743	278	535	9577	4	6	7	50	16	24	10	117	93	18	102	10
JMA14 NM303	662	367	522	9727	4	6	8	37	16	24	11	114	96	18	104	9
JMA14 NM304	621	499	552	10164	4	6	7	34	16	22	12	119	100	20	108	11
JMA14 NM305	800	291	452	8678	4	6	7	37	15	24	12	108	93	19	97	10
JMA14 NM306	747	342	416	9951	4	6	7	37	16	26	12	110	107	17	108	10
JMA14 NM307	701	447	454	10478	4	6	7	51	16	27	14	126	106	16	112	10
JMA14 NM308	781	224	642	10005	4	7	8	60	18	23	9	113	99	17	103	9
JMA14 NM309	729	394	535	10689	5	7	9	54	18	22	10	123	103	15	102	9
JMA14 NM310	720	346	482	10683	5	6	7	38	15	25	10	126	110	17	107	9
JMA14 NM311	751	294	513	10055	4	6	7	37	15	21	10	122	101	18	111	9
JMA14 NM312	676	450	499	10054	4	6	7	43	15	23	10	121	101	17	108	8
JMA14 NM313	784	244	445	11103	5	7	8	51	15	18	9	121	104	18	99	8
JMA14 NM314	835	335	593	10164	5	6	7	38	15	20	8	123	106	16	108	10
JMA14 NM315	618	487	444	9944	4	6	8	42	15	26	12	120	103	17	109	10
JMA14 NM316	684	358	555	11343	5	7	9	64	18	23	11	137	111	16	108	9
JMA14 NM317	726	497	503	12768	5	6	8	45	16	25	9	113	122	18	117	10
JMA14 NM318	684	422	379	10333	4	6	8	46	18	22	10	122	101	17	110	8
JMA14 NM319	475	636	452	9110	5	7	9	55	16	25	14	126	57	16	87	13
JMA14 NM320	602	411	488	9438	4	6	7	37	15	25	12	117	96	17	106	10

Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
JMA14 NM321	693	488	586	9971	4	6	7	35	15	25	12	120	97	18	105	8
JMA14 NM322	737	375	578	10006	4	6	7	40	18	23	12	122	101	18	106	9
JMA14 NM323	664	436	522	9710	4	7	7	51	16	25	11	115	101	19	110	9
JMA14 NM324	699	374	486	10100	4	6	8	29	15	22	9	125	101	14	108	11
JMA14 NM325	724	472	527	10043	4	6	7	43	15	26	9	116	110	18	109	9
JMA14 NM326	804	319	639	9821	4	6	7	37	15	22	11	123	96	20	106	10
JMA14 NM327	704	335	427	9576	4	7	8	52	18	20	12	127	100	14	103	8
JMA14 NM328	706	439	394	9616	4	7	7	50	17	23	9	124	103	17	104	8
JMA14 NM329	771	274	478	11213	5	7	8	52	17	25	10	129	107	15	104	9
JMA14 NM330	695	398	479	10166	4	6	7	30	15	23	11	123	107	16	102	9
JMA14 NM331	707	482	451	10885	5	6	7	44	16	26	13	129	102	16	103	8
JMA14 NM332	685	428	513	10173	4	7	7	48	15	23	11	121	108	16	112	9
JMA14 NM333	682	388	636	10355	4	6	7	24	15	21	9	132	113	19	109	8
JMA14 NM334	687	409	468	10310	4	6	8	42	16	22	11	119	102	17	107	10
JMA14 NM335	717	567	412	14208	5	6	7	43	15	22	11	118	119	20	117	9
JMA14 NM336	344	456	529	7205	3	6	6	46	16	32	16	190	17	20	83	18
JMA14 NM337	731	410	599	9612	4	6	8	42	16	20	10	126	106	19	112	10
JMA14 NM338	692	412	351	9241	4	6	7	27	14	25	11	119	101	18	103	10
JMA14 NM339	741	328	407	10550	4	6	7	34	16	25	12	123	112	16	105	10
JMA14 NM340	677	425	535	9864	4	6	7	37	15	24	8	121	99	19	118	10
JMA14 NM341	637	520	620	9471	3	6	7	30	15	22	8	113	93	16	104	9
JMA14 NM342	674	390	446	9720	4	6	7	42	16	23	10	120	102	18	111	8
JMA14 NM343	761	269	373	9640	4	6	7	33	16	25	12	118	105	16	105	9
JMA14 NM344	723	376	431	10216	4	6	6	42	15	24	11	120	100	17	108	10
JMA14 NM345	776	254	528	9601	4	6	7	23	15	20	11	125	102	20	104	9
JMA14 NM346	737	432	490	10751	5	6	8	34	15	22	9	114	114	20	105	8
JMA14 NM347	687	482	760	11851	6	7	9	66	18	27	15	130	119	19	115	9
JMA14 NM348	666	499	499	10318	4	6	7	34	15	22	13	126	107	21	110	10
JMA14 NM349	764	383	501	10591	5	6	8	36	15	24	10	118	103	15	105	8
JMA14 NM350	846	275	310	10419	6	7	10	69	17	26	6	103	91	17	85	6
JMA14 NM351	555	743	482	10080	5	6	11	45	17	23	11	112	94	14	88	8
JMA14 NM352	708	473	637	10569	5	7	9	53	18	22	11	121	104	13	100	8
JMA14 NM353	567	699	553	9859	4	6	7	37	15	26	10	124	103	18	111	9
JMA14 NM354	598	629	529	9341	4	6	8	34	16	26	12	116	100	17	103	11
JMA14 NM355	724	469	465	9801	4	6	8	28	15	21	14	120	103	16	108	10
JMA14 NM356	658	517	414	9547	4	6	8	48	16	27	10	109	99	20	105	8
JMA14 NM357	715	438	480	9702	4	6	8	29	15	22	10	123	96	17	98	9
JMA14 NM358	708	417	511	9651	4	7	6	49	16	27	11	115	102	19	106	10
JMA14 NM359	714	428	688	11750	5	7	8	50	16	25	8	131	113	15	103	9
JMA14 NM360	731	641	553	11417	4	6	7	37	15	23	11	107	111	16	110	8
JMA14 NM361	699	471	427	10699	5	6	8	31	15	25	14	117	112	20	108	9

Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
JMA14 NM362	686	572	386	12026	5	6	7	42	15	23	9	108	111	18	113	7
JMA14 NM363	706	693	463	12097	5	6	8	45	16	24	10	104	118	17	111	7
JMA14 NM364	717	458	507	9786	4	7	7	54	16	24	14	121	107	20	106	9
JMA14 NM365	670	551	605	9976	4	6	7	51	16	28	14	116	103	18	105	11
JMA14 NM366	645	521	500	10344	4	6	7	45	16	23	11	131	108	18	103	7
JMA14 NM367	686	366	604	10214	4	6	7	45	16	22	9	123	104	22	109	8
JMA14 NM368	703	640	484	12794	5	6	7	48	16	25	10	109	117	20	120	12
JMA14 NM369	706	334	425	9661	5	6	7	30	14	21	12	115	99	18	103	9
JMA14 NM370	753	381	413	12705	5	6	9	30	15	23	9	115	116	17	114	9
JMA14 NM371	666	582	565	12664	5	6	8	27	14	23	8	103	119	17	116	9
JMA14 NM372	752	375	412	9761	4	6	7	37	15	23	11	114	100	17	108	8
JMA14 NM373	750	536	575	13220	5	6	8	52	17	21	9	120	126	17	114	9
JMA14 NM374	757	301	537	10346	4	6	7	45	16	26	10	117	107	20	107	9
JMA14 NM375	624	527	513	9699	4	7	8	52	17	24	11	121	105	15	110	9
JMA14 NM376	791	601	626	11982	5	6	8	52	16	25	11	105	129	20	116	9
JMA14 NM377	665	628	501	12764	5	6	8	31	15	25	12	112	111	17	112	9
JMA14 NM378	620	495	545	10043	4	6	7	40	15	27	12	114	106	19	114	10
JMA14 NM379	731	357	451	9842	5	7	7	44	15	22	8	127	106	15	111	9
JMA14 NM380	665	426	512	9970	4	6	8	36	16	24	14	117	103	18	110	9
JMA14 NM381	696	458	346	10918	6	7	9	51	17	21	13	122	95	18	100	8
JMA14 NM382	738	665	447	12032	5	6	7	41	15	23	12	108	110	17	121	9
JMA14 NM383	654	611	633	9877	4	6	7	49	16	27	12	116	101	17	103	10
JMA14 NM384	698	188	-135	1535	1	6	6	25	15	34	3	14	22	10	21	5
JMA14 NM385	703	540	676	9539	4	6	7	50	16	28	13	109	98	19	107	9
JMA14 NM386	626	455	540	8758	4	6	8	43	16	24	11	113	90	18	97	7
JMA14 NM387	632	649	470	13071	5	7	7	59	16	26	12	109	113	19	117	9
JMA14 NM388	707	548	545	9805	4	6	8	52	17	26	11	121	105	20	106	10
JMA14 NM389	643	606	548	12710	5	6	8	33	15	24	9	111	128	19	123	9
JMA14 NM390	611	623	609	9431	4	6	7	46	16	24	11	122	102	17	107	9
JMA14 NM391	619	545	667	9350	4	7	7	45	16	25	11	118	98	16	106	10
JMA14 NM392	628	477	612	9873	4	6	8	50	17	28	11	113	95	20	102	8
JMA14 NM393	614	622	544	9515	4	6	7	33	15	24	11	114	104	19	110	10
JMA14 NM394	700	416	463	12206	5	6	9	28	15	22	10	110	122	15	116	10
JMA14 NM395	763	398	477	12207	5	7	8	56	16	21	8	102	109	15	106	9
JMA14 NM396	649	484	572	9565	4	6	7	29	14	22	13	113	94	19	109	8
JMA14 NM397	660	529	528	12603	5	6	8	54	17	26	12	113	114	20	119	8
JMA14 NM398	644	563	466	11658	5	6	8	38	15	24	11	109	108	17	120	10
JMA14 NM399	704	492	620	9355	4	6	8	39	16	26	10	115	96	20	108	10
JMA14 NM400	664	528	568	9557	4	6	8	46	16	23	11	115	103	19	109	11
JMA14 NM401	675	599	634	12123	5	6	7	41	15	24	11	108	114	17	122	9
JMA14 NM402	724	329	596	11369	5	6	8	55	17	27	10	117	104	17	110	7

Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
JMA14 NM403	600	367	397	9468	4	6	7	37	15	24	12	114	99	20	110	9
JMA14 NM404	641	407	253	9888	4	6	7	44	15	21	9	120	102	15	105	8
JMA14 NM405	761	421	454	9963	4	6	8	43	17	23	11	121	102	20	105	8
JMA14 NM406	655	675	1069	11609	5	6	7	36	16	28	12	122	104	20	108	10
JMA14 NM407	700	753	475	12322	5	6	8	45	16	26	12	110	126	18	112	8
JMA14 NM408	732	379	400	9453	4	6	7	43	16	23	13	110	101	17	105	9
JMA14 NM409	742	334	516	9635	4	6	7	35	16	22	11	122	102	16	106	8
JMA14 NM410	727	419	532	10136	4	7	8	49	15	21	8	114	98	18	105	8
JMA14 NM411	685	556	536	8997	4	6	7	47	15	24	14	113	98	15	105	9
JMA14 NM412	672	465	462	11888	5	6	8	38	15	23	10	113	107	16	113	10
JMA14 NM413	657	634	515	11648	5	6	7	39	15	25	13	100	108	17	115	9
JMA14 NM414	650	665	448	11912	5	6	8	44	16	25	10	107	112	16	118	8
JMA14 NM415	794	282	467	9595	4	6	7	35	15	24	11	113	100	17	112	9
JMA14 NM416	688	533	600	13260	6	6	10	35	15	21	8	107	116	15	106	8
JMA14 NM417	660	438	397	9387	4	7	8	53	16	22	9	115	93	15	100	7
JMA14 NM418	732	385	478	9794	4	6	6	37	15	25	10	123	107	17	106	9
JMA14 NM419	649	771	661	12566	5	6	8	42	15	22	13	109	121	20	123	12
JMA14 NM420	829	393	620	12836	5	6	8	31	14	24	11	115	123	17	120	8
JMA14 NM421	646	510	480	9655	4	6	8	39	16	23	9	119	103	18	108	10
JMA14 NM422	606	350	598	9465	4	6	7	37	16	23	11	121	102	16	106	9
JMA14 NM423	623	467	532	9919	4	6	7	52	17	22	12	116	102	19	103	10
JMA14 NM424	645	611	506	9246	4	6	6	41	15	28	13	113	107	19	105	10
JMA14 NM425	707	382	500	10094	4	6	8	41	16	26	14	120	100	17	115	12
JMA14 NM426	797	279	366	9019	4	6	7	38	15	21	12	113	101	19	104	10
JMA14 NM427	669	480	410	9461	4	6	7	40	16	23	8	112	89	15	105	9
JMA14 NM428	640	358	509	9498	4	6	6	51	16	26	11	116	100	17	107	10
JMA14 NM429	692	694	422	12029	5	6	8	52	16	25	12	110	123	18	116	11
JMA14 NM430	654	785	483	12072	5	6	8	44	15	22	10	108	120	18	114	8
JMA14 NM431	609	582	619	10726	5	6	8	35	15	25	10	124	102	18	102	7
JMA14 NM432	670	634	515	12253	5	6	8	30	14	22	8	103	113	17	117	9
JMA14 NM433	715	407	564	9886	4	6	8	42	16	25	7	121	96	17	105	9
JMA14 NM434	692	671	504	11355	5	6	9	40	15	24	10	102	109	19	118	10
JMA14 NM435	832	493	528	16106	8	7	13	69	17	24	11	123	125	17	101	11
JMA14 NM436	710	484	554	12164	4	6	7	48	15	24	11	109	119	18	117	8
JMA14 NM437	734	475	471	11539	4	6	7	44	16	27	8	108	111	17	114	7
JMA14 NM438	753	378	469	12393	5	6	7	27	14	20	8	116	124	16	113	9
JMA14 NM439	616	581	771	10252	4	6	6	31	15	25	12	125	105	18	108	11
JMA14 NM440	741	696	456	12395	5	6	7	36	15	23	11	107	116	19	115	9
JMA14 NM441	780	393	530	9929	5	6	8	41	15	26	12	120	103	19	105	10
JMA14 NM442	677	435	507	9298	4	6	7	36	15	24	9	118	97	18	103	10
JMA14 NM443	674	400	415	10036	4	7	8	48	16	23	14	118	97	21	106	10

Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
JMA14 NM444	762	402	445	8977	4	6	8	45	16	24	12	111	94	17	93	7
JMA14 NM445	844	203	507	9637	4	6	7	46	15	23	10	120	96	16	108	9
JMA14 NM446	705	313	433	9933	4	6	7	38	15	22	13	127	108	17	107	8
JMA14 NM447	682	400	399	9527	4	6	7	41	16	24	10	117	96	18	106	8
JMA14 NM448	671	491	552	10110	4	6	7	31	15	23	10	121	105	18	110	10
JMA14 NM449	693	560	491	9348	4	6	7	36	15	27	12	115	106	16	107	8
JMA14 NM450	773	330	466	9766	4	6	6	34	15	23	11	117	98	19	109	9
JMA14 NM451	682	558	424	10335	4	6	7	43	15	25	10	118	105	20	110	10
JMA14 NM452	714	337	548	10619	4	6	8	38	16	28	13	121	103	18	103	9
JMA14 NM453	734	518	526	9549	4	6	7	46	15	24	12	120	108	19	107	9
JMA14 NM454	655	484	568	9509	4	6	6	45	15	24	12	117	104	19	106	10
JMA14 NM455	687	515	478	9226	4	6	7	44	16	25	12	106	97	21	101	8
JMA14 NM456	650	517	414	9683	4	6	7	40	16	22	12	124	101	20	108	9
JMA14 NM457	778	266	496	9872	4	6	7	24	15	21	12	118	108	18	102	8
JMA14 NM458	665	455	459	9797	4	6	6	37	15	29	10	117	104	17	108	8
JMA14 NM459	552	638	647	10040	4	6	7	48	16	27	10	124	106	16	111	10
JMA14 NM460	643	322	467	9615	4	6	7	45	16	24	11	121	100	17	108	9
JMA14 NM461	804	355	581	10220	4	6	7	40	15	24	11	117	104	21	109	9
JMA14 NM462	696	352	521	9604	4	6	8	33	14	21	13	116	105	16	105	11
JMA14 NM463	654	507	468	9659	4	6	7	33	15	25	12	116	100	19	102	9
JMA14 NM464	707	433	391	9743	4	6	8	34	16	23	9	119	109	19	105	10
JMA14 NM465	699	747	478	12588	4	6	7	44	15	24	11	114	125	22	121	9
JMA14 NM466	794	324	469	10271	4	6	7	42	15	22	12	125	107	14	103	8
JMA14 NM467	717	469	439	10037	4	6	8	41	16	25	13	115	103	17	112	10
JMA14 NM468	658	360	448	9829	4	6	6	31	14	21	13	122	102	17	108	9
JMA14 NM469	732	405	486	10344	4	7	6	55	16	25	14	125	111	19	110	8
JMA14 NM470	619	396	383	9769	4	6	7	30	15	24	14	120	102	16	108	8
JMA14 NM471	687	437	520	9966	4	6	7	43	15	22	13	127	103	18	107	11
JMA14 NM472	705	345	494	10111	4	6	7	41	16	23	12	119	105	18	106	10
JMA14 NM473	749	502	527	9956	4	6	8	46	16	22	11	114	106	19	110	11
JMA14 NM474	693	270	561	10196	4	6	8	42	16	22	10	120	102	18	110	9
JMA14 NM475	737	461	466	10104	4	6	7	43	16	21	10	119	99	15	99	7
JMA14 NM476	762	351	546	10573	4	6	7	25	15	22	12	121	108	19	114	10
JMA14 NM477	710	402	595	10503	4	6	8	33	16	21	11	123	101	18	106	9
JMA14 NM478	715	302	486	9629	4	6	7	30	14	19	11	119	105	16	104	9
JMA14 NM479	712	453	403	11267	4	6	8	35	16	23	10	118	98	16	109	9
JMA14 NM480	704	420	572	8998	4	6	7	42	16	25	11	115	97	19	105	8
JMA14 NM481	702	453	417	9781	4	6	8	35	17	22	12	113	105	17	107	8
JMA14 NM482	736	445	410	9613	4	6	8	43	17	24	11	113	100	18	107	10
JMA14 NM483	699	426	351	10629	5	7	8	53	16	23	13	125	103	20	103	9
JMA14 NM484	626	457	459	9304	4	6	7	33	16	24	8	117	96	18	108	8

Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
JMA14 NM485	761	304	324	9783	4	6	7	29	14	21	16	118	104	18	102	9
JMA14 NM486	620	638	624	9999	4	6	7	40	15	25	11	125	104	16	107	11
JMA14 NM487	719	373	585	9853	4	7	7	47	15	21	13	116	105	21	109	10
JMA14 NM488	723	274	552	9630	4	7	7	54	17	24	11	123	100	19	102	9
JMA14 NM489	744	408	488	9466	4	6	7	44	16	22	9	112	102	19	103	8
JMA14 NM490	749	400	308	9915	4	6	8	36	15	23	14	118	98	18	108	11
JMA14 NM491	785	354	459	9965	4	6	7	42	16	26	9	116	100	14	101	9
JMA14 NM492	645	534	406	9669	4	6	8	38	15	22	11	121	105	18	100	9
JMA14 NM493	748	407	471	9610	4	6	7	46	16	24	10	119	103	17	101	10
JMA14 NM494	711	316	404	10020	4	6	8	34	15	25	12	121	107	18	105	9
JMA14 NM495	796	209	343	9641	4	6	8	42	17	24	10	109	100	19	109	10
JMA14 NM496	663	599	378	9721	4	6	7	48	16	24	14	116	103	19	114	9
JMA14 NM497	788	257	528	11063	4	6	8	40	16	23	16	130	98	19	105	9
JMA14 NM498	681	363	547	9340	4	6	7	45	16	25	11	113	89	17	109	11
JMA14 NM499	699	454	459	11403	5	6	7	36	15	24	10	120	96	14	103	10
JMA14 NM500	772	364	416	9622	4	6	7	44	15	22	9	117	102	22	105	5
JMA14 NM501	737	300	472	9451	4	6	7	44	16	25	11	123	95	18	108	9
JMA14 NM502	682	514	466	9658	4	6	6	37	15	22	10	110	96	19	106	9
JMA14 NM503	678	464	435	8152	4	7	8	60	17	24	11	98	84	17	95	9
JMA14 NM504	660	471	599	9153	4	6	7	35	14	21	13	121	101	19	109	8
JMA14 NM505	659	698	596	12487	5	6	8	44	16	27	12	114	120	19	120	9
JMA14 NM506	585	519	565	9843	4	6	8	45	16	25	9	116	97	14	109	11
JMA14 NM507	648	622	571	9431	4	6	7	48	16	24	9	113	92	18	106	9
JMA14 NM508	692	706	523	12256	5	6	9	35	16	24	10	111	119	17	118	9
JMA14 NM509	629	578	497	9587	4	6	7	27	14	23	10	116	104	16	102	10
JMA14 NM510	692	456	400	9990	4	6	7	44	16	23	9	117	104	19	105	8
JMA14 NM511	734	1151	552	15198	6	6	9	50	16	23	9	117	119	17	119	7
JMA14 NM512	705	499	652	9805	4	6	8	39	16	29	12	112	108	23	110	9
JMA14 NM513	653	513	473	10050	4	6	7	43	16	27	9	124	109	18	110	11
JMA14 NM514	620	559	393	9632	4	6	8	39	16	22	11	121	106	19	108	10
JMA14 NM515	676	410	418	9679	4	6	7	31	14	22	11	118	111	20	112	9
JMA14 NM516	763	448	521	10082	4	6	8	41	15	23	10	117	105	16	108	10
JMA14 NM517	603	475	491	9586	4	6	7	45	16	24	10	119	99	17	110	9
JMA14 NM518	685	490	636	12736	5	6	8	47	16	23	10	112	124	19	125	8
JMA14 NM519	712	357	612	9436	4	6	8	46	16	25	12	116	105	14	107	9
JMA14 NM520	667	565	521	9125	4	6	7	39	15	25	11	111	98	18	99	8
JMA14 NM521	745	386	471	9629	4	6	7	32	15	23	10	120	101	17	106	11
JMA14 NM522	633	534	482	9223	4	6	7	32	15	25	11	110	95	16	100	8
JMA14 NM523	684	510	534	9537	4	6	7	39	15	24	12	114	110	18	109	10
JMA14 NM524	700	527	478	9324	4	6	8	39	16	29	13	111	101	19	105	11
JMA14 NM525	709	365	392	9381	4	6	8	33	15	21	13	115	95	17	105	8

Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
JMA14 NM526	737	417	446	9951	5	6	11	40	16	23	11	113	100	18	104	8
JMA14 NM527	722	373	479	9868	4	6	8	38	16	23	12	113	99	18	104	8
JMA14 NM528	744	419	513	9726	4	6	8	34	15	23	11	121	103	18	100	10
JMA14 NM529	718	294	435	9983	4	6	7	32	15	25	12	122	112	19	105	12
JMA14 NM530	663	506	453	10018	4	6	7	44	16	24	10	116	105	17	106	9
JMA14 NM531	641	537	520	9572	4	6	7	50	16	26	12	115	96	17	104	9
JMA14 NM532	646	401	458	9512	4	6	7	40	15	24	13	120	101	17	106	7
JMA14 NM533	616	508	464	9587	4	6	7	46	16	24	13	124	105	15	109	9
JMA14 NM534	617	503	532	10193	4	6	7	40	15	26	14	115	101	19	109	11
JMA14 NM535	669	465	394	9293	4	6	8	38	15	26	10	120	104	20	111	11
JMA14 NM536	612	566	542	10029	4	7	7	56	16	22	9	125	105	19	114	8
JMA14 NM537	684	501	610	9725	4	6	8	49	16	22	9	128	102	15	107	10
JMA14 NM538	672	377	400	9620	4	6	7	33	15	21	11	119	101	19	107	9
JMA14 NM539	756	421	477	9687	4	6	7	34	15	22	9	119	105	18	107	9
JMA14 NM540	672	401	489	9553	4	6	7	37	15	24	11	124	113	16	108	10
JMA14 NM541	734	455	552	9405	4	6	7	44	17	22	11	108	100	19	106	10
JMA14 NM542	699	378	509	9738	4	6	7	36	15	24	10	118	99	18	112	9
JMA14 NM543	709	374	371	9901	4	6	8	44	16	25	11	113	108	18	99	10
JMA14 NM544	707	503	488	10126	4	7	7	49	16	24	12	111	96	21	103	8
JMA14 NM545	757	314	436	10167	4	6	8	39	16	27	13	116	102	18	105	9
JMA14 NM546	715	598	453	9709	4	7	8	54	16	26	11	113	99	18	106	9
JMA14 NM547	696	394	380	9741	4	6	7	50	16	26	9	123	105	17	103	10
JMA14 NM548	642	417	340	9617	4	7	8	67	18	27	12	110	95	20	99	10
JMA14 NM549	705	357	531	10015	4	6	6	47	15	23	9	125	101	15	105	9
JMA14 NM550	682	376	419	9481	4	6	7	38	15	21	8	117	88	19	96	10
JMA14 NM551	799	328	540	9423	4	6	8	46	17	22	11	116	97	17	102	6
JMA14 NM552	637	465	461	9792	4	6	7	39	15	22	11	123	100	17	112	10
JMA14 NM553	650	606	521	9481	4	6	8	34	15	25	12	118	104	18	103	8
JMA14 NM554	652	455	646	9791	4	6	7	33	15	25	12	114	95	17	111	10
JMA14 NM555	627	524	637	9566	4	6	7	32	14	23	11	113	98	15	101	9
JMA14 NM556	693	452	526	9615	4	6	8	45	18	23	13	114	100	18	107	9
JMA14 NM557	677	593	584	9821	4	7	7	58	16	27	12	122	100	18	114	9
JMA14 NM558	773	426	656	10947	4	6	8	44	16	25	14	125	111	16	118	10
JMA14 NM559	715	387	576	10286	4	7	6	52	16	26	11	120	105	16	104	9
JMA14 NM560	758	384	447	9997	4	6	7	39	16	23	12	117	101	19	99	8
JMA14 NM561	780	376	523	10078	4	6	7	38	16	24	10	116	104	18	105	8
JMA14 NM562	637	514	551	9980	4	6	7	44	16	27	12	123	102	16	107	11
JMA14 NM563	713	434	503	10107	4	6	8	42	16	22	11	127	105	18	104	10
JMA14 NM564	706	384	535	9828	4	7	7	57	16	23	10	115	101	16	103	9
JMA14 NM565	653	477	372	9317	4	6	7	40	16	24	12	119	98	19	105	9
JMA14 NM566	670	476	379	9086	4	6	7	32	16	23	10	106	99	19	105	8

Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
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Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
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JMA14 NM612	772	384	394	11922	5	6	9	43	16	23	9	107	127	17	110	9
JMA14 NM613	707	328	421	8959	4	6	8	34	16	23	10	108	91	18	96	8
JMA14 NM614	673	374	533	9938	4	6	7	27	14	22	8	120	101	18	106	11
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JMA14 NM619	688	341	542	9412	4	7	8	60	18	21	10	114	100	17	101	9
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JMA14 NM621	738	284	458	9867	4	6	8	38	15	22	12	121	102	16	104	9
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Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
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Analysis ID	Ba	Ti	Mn	Fe	Co	Ni	Cu	Zn	Ga	Pb	Th	Rb	Sr	Y	Zr	Nb
JMA14 NM690	743	496	514	9342	4	7	7	48	16	25	10	114	95	19	107	9
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JMA14 NM714	709	390	409	10254	4	6	7	36	15	27	13	129	106	14	108	9
JMA14 NM715	644	710	526	9489	4	6	7	33	15	24	12	118	106	18	111	10
JMA14 NM716	686	528	607	9316	4	6	7	36	15	24	10	114	104	17	107	8

APPENDIX C

PERMISSIONS FOR REPRINTED FIGURES

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People (2)

Emma
eaj31@cam.ac.uk

Show details

Jessica Morgan <jamorgan1@mail.usf.edu>   May 26
to info

Hello,

I am a Masters student at the University of South Florida, and am looking to get permission to use a map from a volume that was published by McDonald Institute Monographs (specifically Figure 23.1 from Tristan Carter's chapter in *Horizons: A Colloquium on the Prehistory of the Cyclades*, edited by G. Gavalas, C. Renfrew, J. Doole and N. Brodie, (pp. 225-235)) for use in my master's thesis.

Is there a specific form or type of request I should fill out and send in for this? Thank you!

Best,

...

Emma <eaj31@cam.ac.uk>   May 28 (12 days ago)
to me

Dear Jessica,

Thank you for your enquiry. As this volume was published in 2008 ie post an embargo period, we would be happy for you to use this map, subject to you obtaining consent from the author Tristan Carter.

According to the this link, he is based at McMaster University, see below, and his email address is: stringy@mcmaster.ca

http://mcmaster.academia.edu/TristanCarter/Papers

With best wishes,

Emma

...

RE: Photo Permission Inbox x

Tristan Carter
stringy@mcmaster.ca
Show details

Carter, Tristan 12:07 PM (8 hours ago)
to me

certainly

in haste

stringy

From: Jessica Morgan [jamorgan1@mail.usf.edu]
Sent: Monday, June 08, 2015 5:57 PM
To: Tristan Carter
Subject: Photo Permission

Dear Dr. Carter,

Would it be alright if I used the map of EC Melos shown in your 2008 publication *The Consumption of Obsidian in the Early Bronze Age Cyclades* (Figure 23.1 on page 229) in my thesis? Since it was published post-embargo, the publishers sent me your way to get your consent to use it.

Hope all is well,
-Jess Morgan

Permissions for Figures 12 and 13:

Permission to Replicate Content School/Thesis x

permissions
permissions@aaanet.org
Show details

Jessica Morgan <jamorgan1@mail.usf.edu> May 26
to permissions

Hello,

I am a Master's student at the University of South Florida, and am looking to get permission to use two figures from an AAA publication in my master's thesis, Obsidian Source Selection in the Early Bronze Age Cyclades, which I expect to complete this coming August.

The figures each come from Tristan Carter's contribution (The theatrics of technology: Consuming obsidian in the Early Cycladic burial arena) in the 2007 volume *Rethinking Craft Specialization in Complex Societies: Analyses of the Social Meaning of Production*, edited by R. Flad and Z. Hruby, pp. 88-107.

The figures I would like to reuse are Figures 6.3 and 6.8, on pages 93 and 97, respectively.

My contact information is as follows:
Address: 4375 Clair Court, Gulf Breeze FL, 32563
Phone: (850)-375-6005

Best,

...

Permissions May 28 (12 days ago)
to me

Jessica Morgan
4375 Clair Court
Gulf Breeze FL 32563

Dear Ms. Morgan:

Thank you for your request to reprint two drawings from Tristan Carter's *"The Theatrics of Technology: Consuming Obsidian in the Early Cycladic Burial Arena"* as published in *Archeological Papers of the American Anthropological Association,* Volume 17, Issue 1,Pages 88-107, January 2007.

The drawings are as follows:
From Page 93, Figure 6.3. Obsidian blades and a core from Tomb 56, Panaghia, Paros
From Page 97, Figure 6.8. Selection of obsidian from the surface of the cemetery at Tsikniadhes, Naxos

The artist for both of these figures is *Marina Mili´c.* The artist retains the rights to these drawings; therefore, you must contact the artist for permission to use them.

To locate the artist, it may be easiest for you to contact the author of the article. The best way to find either the artist or the author is through an internet search.

Let me know if I can help further.

Regards,
Susan Norris
Permissions Assistant
American Anthropological Association

Figure Permissions Inbox x

Marina Milic
milicmarina@gmail.c...
Show details

Jessica Morgan <jamorgan1@mail.usf Jun 8 (1 day ago)
to milicmarina

Dear Marina,

I am a masters student at the University of South Florida, and would like to use a couple of images that you drew in my thesis on EBA Cycladic obsidian sourcing. The figures are each from Tristan Carter's *The Theatrics of Technology: Consuming Obsidian in the Early Cycladic Burial Arena* from 2007, and specifically are Figures 6.3 (page 93) and Figure 6.8 (Page 97). Would it be alright for me to include these images?

Best,

...

Marina Milic 3:24 AM (17 hours ago)
to me

Dear Jessica,

That is not a problem, you can use the images, just if you could credit them "after Milic in Carter...".

Best,

Marina

...

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Title: PXRF characterisation of obsidian from central Anatolia, the Aegean and central Europe
Author: Marina Milić
Publication: Journal of Archaeological Science
Publisher: Elsevier
Date: January 2014

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