BEYOND BEADS: A LIFE HISTORY STUDY OF ORNAMENTS FROM THE FIFA CEMETERY, JORDAN

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ABSTRACT

BEYOND BEADS: A LIFE HISTORY STUDY OF ORNAMENTS FROM THE FIFA CEMETERY, JORDAN

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Burials at the Early Bronze Age IA (c. 3700-3400) cemetery of Fifa, Jordan included a variety of grave goods including beads. These were made of glazed steatite or carnelian. This thesis utilizes use-wear analysis, SEM-EDS, XRD, and a database of 5th and 4th millennium BCE beads in order to build life-histories for Fifa's beads. Beyond focusing on how the beads were manufactured, where they were produced, how they travelled to the Fifa cemetery, and how they were used at the cemetery, the symbolic and contextual meanings of both types of beads are also explored. I argue that Fifa's glazed steatite beads were manufactured in Upper Egypt while its carnelian beads were produced in Northwest Arabia. Their exchange facilitated economic and social connections. Both types of beads were likely used for their protective qualities with glazed steatite also potentially assisting in the successful reincarnation of deceased subadults.

Keywords: Beads, Levantine Archaeology, Use-wear analysis, Jordan, Mortuary Archaeology, Life History, Chalcolithic, Early Bronze Age, Predynastic Egypt, Grave Goods, Dead Sea, Glazed Steatite, Carnelian, Tayma.

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First and foremost, my co-supervisors, Laure Dubreuil and Lisa Janz, have been tireless mentors over the past two years. From the moment I arrived in Canada, both Laure and Lisa helped me to feel immediately welcome. When it came to choosing the topic of my research, both encouraged me to find my own way and to pursue my research passions. In our first year together, I benefitted greatly from their instruction and from our critical discussions together related to use-wear, the archaeology of beads, and mortuary archaeology. As this thesis came together, Laure and Lisa took the time to carefully read over many drafts offering crucial comments that have undoubtedly improved the final product. Thank you both.

If my advisors encouraged me to pursue my research passion, Meredith Chesson is responsible for making it possible. When we reached out to Dr. Chesson, she welcomed the possibility of conducting a master’s thesis on material excavated by the Expedition to the Dead Sea Plain and suggested that these beads could be the focus of the thesis. That suggestion has paid many dividends. Beyond that, I am immensely grateful for her help in ensuring that I was able to access the assemblage from Fifa in Pittsburgh, for her detailed responses to my occasional queries, and for her willingness to serve as my external examiner.

Various other professors and staff at Trent have been instrumental in crafting this thesis. Thanks are due to Rodney Fitzsimons for his joining my committee and for his comments on my thesis, to Jean-François Koprivnjak for his assistance and advice in conducting glazing experiments, and to Kate Dougherty for our productive conversations related to the experiments conducted for this thesis and all other things archaeometric.

Several individuals in Pittsburgh are responsible for making my research visit there possible and ultimately extremely productive. Without Jennifer Christmas' efforts to ensure I could access the Fifa bead assemblage, this work would not have been possible. Amy Covell, Deborah Harding, and Gretchen Anderson meanwhile welcomed me daily to the Carnegie Annex. All three of them made it possible for me to reach my research goals and more broadly helped to make my stay in Pittsburgh a very enjoyable one. Lastly, I am endlessly appreciative to Dr. Travis Olds. Travis was kind enough to set considerable time aside to conduct both XRD and SEM-EDS analyses on Fifa's glazed steatite beads. This work is much stronger as a result of his involvement.

I am fortunate to have been able to draw on the advice and assistance of several scholars over the past two years. To single a few out, thanks are due to Dr. Daniella Bar-Yosef Mayer for her help in looking at the shells excavated at Fifa between 1989/90. In addition, I would like to thank Geoffrey Ludvik for taking the time to discuss Early Bronze Age carnelian beads with me. I would lastly like to extend particular thanks to Max Haibt for sending me his master's dissertation, which ultimately formed the basis for my argument concerning the provenance of Fifa's carnelian beads as well as to Nadia Ben-Marzouk who sent me her thought-provoking PhD thesis, which helped to propel several arguments made here. In addition, I would also like to thank Morag Kersel, Alex Joffe, and Eliot Braun for their help and advice.

It goes without saying that I am endlessly appreciative of my family. They have always supported my scholarly pursuits and have always offered their interest. My friends in Peterborough, from Trent and elsewhere, have also been vital to my success. I will miss our conversations and their company.

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Chapter 1: Introduction

1.1 In Small Things Forgotten

James Deetz (1977) coined the memorable phrase 'small things forgotten' to refer to pieces of material culture that have a great deal to say about the historical record, but which are underutilized for reconstructing life in the past. While Deetz used the phrase to refer to the vital role played by material culture in augmenting documentary evidence, in many ways, the phrase works well for referring to the archaeology of beads in southwest Asia. In the first place, beads are quite literally small things and possibly the smallest material culture category regularly recovered by archaeologists. For example, one variety of bead examined for this thesis, has an average diameter of only 2 mm. As a result, if one excavates without an extensive sifting regime, it is very likely that beads may be uncovered and discarded without the excavator realizing it (Baysal 2019: 5).

In some ways, beads have historically also been 'forgotten.' Though assemblages of beads have been published from across the Levant from a very early date (Macalister 1912: 104-115; Duncan 1930), their lack of utility for sequence dating meant that these objects received far less attention than pottery or chipped stone (Baysal 2019: 2). Thus, while catalogs of beads were often included in publications, until the beginning of the 21st century, devoted studies focused on beads that used them as a fulcrum for investigating life in the prehistoric past have been rare in the archaeology of the Levant, and southwest Asia at large.[1]

[1] One exception to this is the work of Horace C. Beck who pioneered the use of optical microscopy for the study of archaeological assemblages of beads (Beck 1934b). Beck studied beads from British excavations across a wide area including Egypt, Mesopotamia, India, and the Levant where he examined the assemblage from Starkey's excavations at Lachish (Tufnell 1958: 73-74).

Beads though, very much like Deetz' forgotten things, provide an important and somewhat unique lens for understanding several aspects of the past and the lives of ancient persons. In the first place and perhaps most obviously, beads may provide a sense of ancient aesthetics through their use as jewelry. Even then though, beads may be far more than just 'pretty things.' As worn ornaments, beads may be used as communicative devices that signal group affiliation or the status or social role of the person who wears them (Kuhn and Stiner 2007; Wiessner 1984). Examples are known where beads have been used as a form of currency and as a result, they might provide significant insight into ancient economic life (Gamble 2020). At the same time, beads may also be worn for symbolic, magical, or religious purposes wherein they may take on a supernatural role or are understood to possess inherent magical properties or identities of their own (Miller 2009; Popper-Giveon et al. 2015). Beads then, with caution, may also be used as windows into ancient person's understandings of the physical world, their places within that world, and possibly even their religious beliefs.

Beyond their active use as personal ornaments, other stages in the journeys taken by beads prior to their final deposition are equally invaluable for shedding light on the ancient past. While the study of manufacture may be valuable in its own right, the study of how beads were made within their broader social context can be used to understand the organization of craft production in ancient societies (Kenoyer et al. 1994; Wright et al. 2008). In addition, on account of their small size and social significance, from a very early period, beads have been exchanged over distances, both vast and local (Baysal 2019: 13; Bar-Yosef Mayer 2019: 82-84; d'Errico et al. 2009). As beads were exchanged, they facilitated connections between people who would, in turn, exchange other objects and ideas (Dobres 2000). As a result of the broad geographic ranges of their exchange, beads are amongst the best proxies for understanding relationships, both at the personal level, between individuals, but also between broader societies. The goal of this thesis will be to interrogate the many roles played by the beads of the Early Bronze Age IA (EB IA) (c. 3700-3400 BCE) cemetery at Fifa, Jordan.

1.2 The Fifa Cemetery and its Beads

The Fifa cemetery is one of three large burial grounds established on the southeastern Dead Sea Plain during the southern Levantine EB IA (c. 3700-3400). While the Bâb adh-Dhrâʿ cemetery is by far the most extensively studied of the Dead Sea Plain's three cemeteries, the research conclusions from that site are thought to, in many ways, also apply to the other two cemeteries in the region. As no contemporary permanent settlements have yet been identified from the Dead Sea Plain, the people who buried their dead at these cemeteries are thought to have travelled to them before conducting their funerary rites and departing (Chesson and Schaub 2007). Burials at the Dead Sea Plain's cemeteries operated according to a set body of rules that determined what type of tomb should be employed, how the dead should be deposited, and what grave goods were acceptable to place within a tomb. Whereas pottery vessels are found in almost every burial, additional grave goods included basalt bowls, stone maceheads, clay figurines, shell bracelets, and beads (Chesson 2001). Of these, beads have received the least attention, being published only in catalog form (Wilkinson 1989) without further study devoted to their origins and particular uses. As we do not know where those who travelled to Fifa lived, the in-depth study of their grave goods is just as vital for understanding their lifeways as it is for understanding their deathways. This thesis will attempt to situate the use of Fifa's beads within broader understandings of the burial practices, funerary rites, and the lives of the people who buried their deceased kin at Fifa (Bentley 1987).

1.3 Life Histories, Fifa's Beads, and Some Methods

Though the aesthetic, communicative, and symbolic roles of beads could be the subject of their own study, each aspect, whether material procurement, manufacture, exchange, and use are all inextricably linked to the complete narrative of each bead. Equally linked are the ancient peoples who made, used, moved, and thought about each object. Through their choices, whether conscious or unconscious, they imparted pieces of themselves and their culturally constituted values that became inseparable parts of each bead's narrative (Appadurai 1986: 34). As a result, in order to be understood holistically, objects and technologies must be considered contextually as socially and symbolically charged things in a constant state of active engagement with the people who imparted meaning, value, and action onto them (Dobres 2000: 32; Hodder 1987).

The life history approach captures this understanding of objects by conceptualizing them as having social lives that can be studied and ordered into a narrative akin to a biography (Appadurai 1986; Kopytoff 1986). The goal of this thesis, broadly, is to create life histories for the different types of beads found in the EB IA (c. 3700-3400) cemetery of Fifa, Jordan. Although some level of normativity is to be expected in the lives of beads made from the same materials that found their way to the site over the course of its use, a key focus of this thesis is also on variability.

Several techniques and methods are employed in this thesis to assess bead's life histories. Most prominent among them is use-wear analysis, which utilizes different scales of observation in order to find diagnostic traces on an object that might indicate, amongst other things, how it was manufactured or used (Dubreuil et al. 2015). This analytical technique has, in recent years, become increasingly utilized for unravelling bead life histories (Cristiani and Boric 2012; Groman-Yaroslovski and Bar-Yosef Mayer 2015; Van Gijn 2017). Use-wear analysis is complemented by SEM-EDS analysis which can be used to examine elemental compositions and to better understand the distribution of elements throughout an object. Beads were also measured to search for morphometric variability. Lastly, a database was created that recorded the materials, numbers, shapes, sites, and contexts of beads that dated to the same period as Fifa as well as the previous archaeological period. This should allow Fifa's beads to be placed within their broader archaeological context and to explore their possible origins and routes of exchange. By combining these techniques, it should be possible to present fuller life histories for the ornaments found in Fifa's tombs.

1.4 The Significance of Variability

In order to explore variability within the bead assemblage, a sizable sample of ornaments were selected from different tombs at Fifa. These are studied both on their own terms, but also directly in comparison with beads from other tombs. As each tomb is thought to belong to a different kinship group (Bentley 1987), the study of variable life histories may also provide a window into the different lived experiences of members of those groups. This is especially valuable as at present, the actual locations where those who buried their families at Fifa lived is unknown, with it being entirely possible that different kinship groups occupied different areas before assembling at the cemetery. As a result, the detailed study of the objects found at Fifa might provide valuable clues into the variable lifeways of the kinship groups who shared the site.

Dependent on its type, variability might, amongst other things, indicate that different kinship groups had access to separate production sources, who produced beads of different size using variable techniques (Ludvik 2018: 746). This could be used to suggest that kinship groups were independently responsible for acquiring their own beads rather than acquiring them from a member of their society who was specifically involved in exchange (Harrison 1993). Differences in bead assemblages could also indicate that smaller groups within the broader community lived in different regions and as a result had access to specific objects or workshops that were not accessed by other groups. Alternatively, variation within an assemblage might indicate that different producers within a production context made their beads differently, or that those producers varied their production methods dependent on who their beads were intended for.

Variability could also reflect differences in ornamental or even ritual practice between kinship groups. Even if the beads found in the different tombs are of the same type or made in the same ways, it is entirely possible that different kinship groups wore them in different ways, used them for a different amount of time, or gave them a variable role in the funerary process. Such variability could suggest a degree of ritual autonomy and group differentiation at a site whose overwhelming ethos is thought to have emphasized a strict body of rules governing how tombs should be built, how burials should be conducted, and what types of objects were acceptable to place with the deceased (Chesson 2001).

1.5 Terminology:

The study of beads is greatly assisted by the existence of a standardized terminology for their sizes, shapes, and parts (Beck 1928). Throughout this thesis, this standardized terminology is maintained to refer to different parts of beads' bodies (fig. 1.1). Several important definitions are taken from Beck with slight alterations made for the purpose of clarity and listed below (table 1.1).

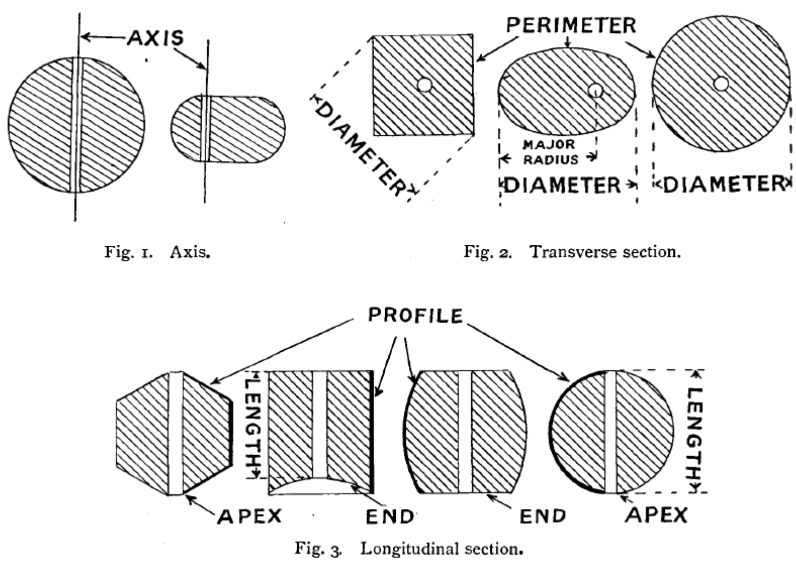


Figure 1.1 Diagram of terminology used in this thesis to refer to different parts of beads (Beck 1928: 3).

Axis	The axis of a bead is an imaginary line through the center of the perforation
Transverse Section	The transverse section is that section at right angles to the axis which has the largest area.
Longitudinal Section	The section that follows the orientation of the perforation.
End	The flat surface at the end of a perforation.
Profile	The line bordering the longitudinal section joining the two ends.
Perimeter	The perimeter is the line or lines bordering the transverse section
Length	The distance between the two ends of a bead.
Diameter	The maximum width of the transverse section.

*Table 1. 1 **Definitions** used by Beck to refer to various parts of a bead.*

In order to classify beads by size, Beck's terminology divides up group of beads according to the ratio of their lengths and diameters (table 1.2). It also provides a standardized terminology for referring to various types of perforation a bead may have (fig. 1.2).

Disc Bead	Length less than 1/3 Diameter
Short Bead	Length more than 1/3 and less than 9/10 Diameter
Standard Bead	Length more than 9/10 and less than $1^{1/10}$ Diameter
Long Bead	Length more than $1^{1/10}$ Diameter

Table 1. 2 ***Definitions*** *used by Beck to refer to bead's sizes.*

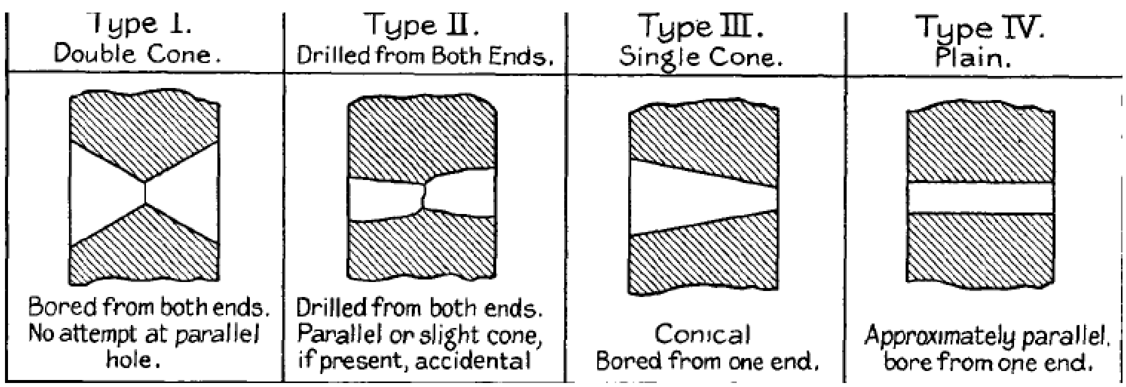


Figure 1. 2 Perforation types (Beck 1928: Pl IV).

1.6 Overview

This thesis attempts to reconstruct the life histories of the bead assemblages found in tombs at the EB IA cemetery of Fifa in Jordan. Chapter 2 presents the archaeological background to the Chalcolithic and EB IA. Subsequently, it addresses the history of research and current archaeological consensus on the cemeteries of the Dead Sea Plain, the group to which the Fifa cemetery belongs. The bead assemblages from these cemeteries are examined before the specific contexts of Fifa's beads are presented. Lastly, carnelian and glazed steatite beads, the two primary types found in the cemetery are introduced.

Chapter 3 details the various research methods employed in this thesis. These include, use-wear analysis, SEM-EDS, XRD, archaeological experiments involving the creation and glazing of beads, and the formation of a database. In each instance, the exact methodology used for each is presented along with a rationale for the technique's use and a brief discussion of prior research on beads using the same techniques.

Chapter 4 details the results of the archaeological experiments conducted for this thesis. These focused on steatite and glazed steatite beads as the production of carnelian beads has been detailed in several ethnographic studies (Kenoyer et al. 1994; Roux et. al 1995). A series of steatite beads were created using a variety of materials for sawing, grinding, and perforation. After these beads were examined for use-wear associated with their manufacture, they were worn over the course of several months to observe any changes. Subsequently, a group of beads were glazed using two techniques that would have been available in the 4th millennium. These beads were also examined for use-wear after manufacture and after they were worn for a period of time.

Chapter 5 includes the collated archaeological results from the bead assemblage at Fifa. This section attempts, as best as possible to present these results without extensive interpretation. Initially, the mineralogical identity of some of Fifa's beads are identified through XRD analysis. Use-wear analysis is then presented independently for the glazed steatite beads found in three different tombs at Fifa. The SEM-EDS results from this type of bead are then discussed with particular emphasis placed on the potentially variable chemical composition of beads' glazes from different tombs.

The use-wear results of carnelian beads and shell ornaments are reviewed afterwards Lastly, the chapter turns to a discussion of the carnelian and glazed steatite beads that could be identified in 5th and 4th millennium archaeological contexts across the Levant. Particular attention is given to arguing for the reidentification of several groups of previously published beads as glazed steatite. In general, beads made of this material have, until recently been misidentified, typically as faience (Bar-Yosef Mayer et al. 2004: 495) These reidentifications are vital for the database built for this thesis to reach its full potential as a tool for understanding context and exchange.

Chapter 6 argues for several different life histories for ornaments found at Fifa. These life histories consider stages of manufacture, exchange, use and deposition. In order to understand these various stages, evidence is largely drawn from the archaeometric analyses conducted on Fifa's beads complemented by comparative research on ornaments and evidence for manufacture found at other sites. In addition, the significance of variability observed within Fifa's bead assemblage is discussed. The discussions of carnelian and steatite beads are both concluded by interrogating their historical, cultural, and ideological significances in order to better understand how these factors played a role in the physical lives of these objects and in how they were viewed by the people responsible for their creation, movement, and use.

Lastly, chapter 7 reviews the major findings of this thesis, briefly reviewing the life histories argued for in chapter 6 and discussing the overall utility of the various archaeometric techniques utilized. In addition, the chapter reviews several directions for future study.

It is hoped that this study demonstrates that while beads have typically been 'small things forgotten', by interrogating their lives through several archeometric techniques combined with the life history approach, it will be possible to draw out their complex lives and meanings, as well as their relationships with the people who made, used, moved, thought about, and eventually buried their deceased kin with them.

Chapter 2: Background

2.1 Introduction:

This chapter provides the archaeological background to both the bead assemblage found in the Fifa cemetery and the individuals who possibly made, moved, thought about, and used them. The chapter begins with a discussion of the southern Levantine Chalcolithic period, the time when one type of bead thought to be found at Fifa, glazed steatite beads, first came into use and likely acquired several of their symbolic meanings. I then move to the transition to the EB IA, and the EB IA itself. In order to better situate the discussion of funerary practices at Fifa, I discuss EB IA burial practices as a whole, before reviewing a series of burial structures found in the Sinai Peninsula that may reflect both social and economic links between the Levant and Egypt during the 4th Millennium BCE. From there, I discuss the three cemeteries of the Dead Sea Plain with special emphasis on Bâb adh-Dhrâʿ, the best studied of the three. After introducing the Fifa cemetery, I present the specific contexts beads were found in. Particular emphasis is placed on tomb architecture, the number of individuals found in the grave, the other grave goods, and where exactly the beads were found in each tomb. Lastly, I provide a technological and historical background to the production and use of carnelian and glazed steatite beads.

2.2 The Late Chalcolithic Period in the southern Levant

The southern Levantine Late Chalcolithic (hence Chalcolithic) (c. 4500 – 3700 BCE) was a time of considerable social, ideological, and spiritual change. During the period, several grave goods found at Fifa also first came into use and likely developed some of their symbolic associations. For the period’s sedentary village dwellers, subsistence practices revolved around the cultivation of cereals and legumes complemented by the raising of sheep, goat, and cattle (Rowan and Golden 2009: 23). These basic subsistence activities were supplemented by the raising and harvesting of tree crops including olives, used for making oil (Rowan 2014: 226). Arid zones meanwhile were occupied by mobile pastoralist groups that relied on herding and the exploitation of secondary products (Rosen 2017: 139-140).

Craft production intensified with evidence for craft specialization (Kerner 2010) and technological expertise in the production of copper (Golden 2010), basalt bowls (Chasan et al. 2019), and tabular scrapers, (Manclossi and Rosen 2021). These were traded on a mostly intraregional basis assisted by domesticated donkeys (Bourke 2002; Grigson 2012). While interregional trade took place between the Levant and regions such as Anatolia and Egypt, archaeological evidence suggests that exchange was limited to a select corpus of goods raw materials and intermittent (Bar-Yosef Mayer 2002a; Braun 2011a: 105-107). It is however possible that a wider range of organic materials that have not preserved archaeologically were exchanged.

Perhaps the period’s most distinctive feature is its rich spiritual culture preserved in its wealth of art and iconography including large wall murals (Drabsch 2015), human and animal figurines made of ivory, granite, and clay (Alon and Levy 1989: 185-196), ceramic ossuaries (Shalem et al. 2013: 69-238), and distinct copper paraphernalia (Bar-Adon 1980). These were found at a variety of sanctuaries and cemeteries that formed key loci in the daily lives and worldly understandings of the southern Levant’s inhabitants (Lovell 2010). While some difference seem to have existed in the religious practices of different communities, it is thought that persons living in the Levant during the Chalcolithic shared a broader cosmological understanding (Rowan and Ilan 2007). It has been argued that this understanding was based on a body of beliefs centered on the life cycle, including birth, life, death, and reincarnation (Ilan and Rowan 2012: 105-106; Ilan and Rowan 2019).

While copper objects and their ritual uses have long been a focus of Chalcolithic scholarship (Ilan and Sebanne 1989), only recently have scholars begun to discuss the ritualization of copper production, the symbolic meanings of copper as a raw material, and the possibility that copper producers were themselves ritual specialists and practitioners (Amzallag 2019; Gošić and Gilead 2015a, b). The recent work of Ben-Marzouk (2020) has gone the farthest in theorizing the meanings inherent to Chalcolithic copper objects and copper production. Beginning with Bar-Yosef Mayer and Porat's (2008) argument that Late Natufian greenstone ornaments were considered apotropaic and symbolized health and fertility, Ben-Marzouk (2020: 69) argues that copper bearing minerals such as malachite were also valued for their pharmacological qualities.

The symbolic role of these minerals is hypothesized to have expanded with the onset of extractive metallurgy in the Chalcolithic period when, Ben-Marzouk argues, the multiple steps associated with transforming raw copper ore into completed and eventually recycled objects were understood to reflect the human life cycle (Ben-Marzouk 2020: 151-163). As a result, the smiths who produced copper objects may have been ritualists understood to possess similar power in ensuring their communities also successfully moved through the life cycle safely and were eventually reincarnated (Ben-Marzouk 2020: 185). These broader associations are especially significant for understanding the specific inclusion of glazed steatite beads, which were glazed using copper, in funerary assemblages and foundation deposits throughout the Chalcolithic and EB I.

During the Chalcolithic, the inhabitants of the southern Levant utilized several different burial forms. The most distinctive of these was ossuary burial, where select remains, primarily long bones and skulls, were placed inside of ceramic ossuaries that often featured anthropomorphic or zoomorphic traits (fig. 2.1). Numerous cemeteries that utilized this form of burial have been uncovered in caves located throughout the Levantine coastal plain (e.g., Goren and Fabian 2002; Perrot and Ladiray 1980), in the northern and central highlands (e.g., Gopher and Tsuk 1996), and in the northern Galilee (Shalem et al. 2013). Some scholars argue that Chalcolithic peoples used ossuaries to facilitate the successful reincarnation of the deceased buried inside of them (Ilan and Rowan 2019).

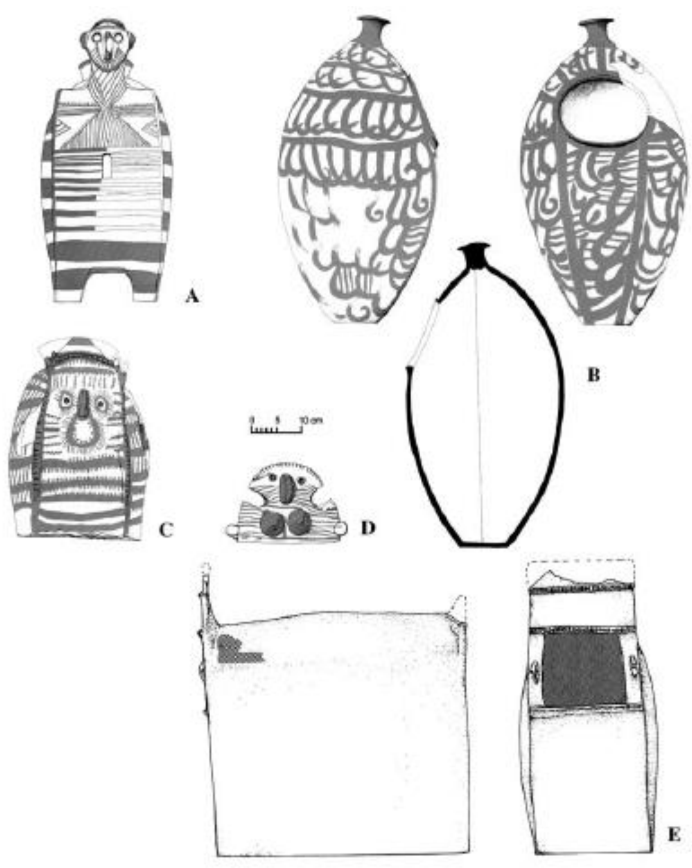


Figure 2. 1 Chalcolithic ceramic ossuaries from sites across the southern Levant (Reproduced from Rowan and Golden 2009: 53)

2.3 From the Chalcolithic – Early Bronze Age IA

The transition between the Chalcolithic and EB IA is especially vital to understanding the new social, ideological, and religious landscape occupied by the groups who buried their dead in the cemeteries of the Dead Sea Plain. Between 4000 and 3700 BCE, without exception, every single prominent Chalcolithic economic and religious center was abandoned (Braun et al. 2013). Settlement patterns shifted profoundly with one analysis concluding that 75% of Chalcolithic sites were abandoned by EB I, with only 25% either continuing, or being reoccupied after a short period of abandonment (Joffe 1993: 46). There is little evidence for the continued use of Chalcolithic burial grounds, with most burial caves and cemeteries experiencing a hiatus until EB IB (e.g., Davidovich 2012; Golani et al. 2018; Smithline 2001; van den Brink 2011)

Perhaps the most discussed difference between the Chalcolithic and the succeeding EB I is the total disappearance of most of the symbolic and ritualized forms of material culture that characterized the Chalcolithic including ossuaries, murals, and stone and ivory carved figurines (Braun 1989: 22; Yekutieli 2014). Copper, which had previously been reserved for ritual objects, began to be used exclusively for crafting utilitarian items (Amzallag 2021: 11; Ilan and Sebanne 1989; Segal et al. 2004). Some objects, such as maceheads, that had previously been made out of copper began to be produced using light colored calcite and limestone (Rowan and Levy 2011).

While invasions, warfare, and subsequent population replacements were long offered as the causes of the end of the Levantine Chalcolithic and its elaborate symbolism (Braun 2011b: 160-163), in recent years this view has been considerably nuanced with scholars arguing that the transition took place as a result of internal factors. Joffe (1993;

2022) has argued that environmental destabilization around the end of the 5th millennium impacted regularized subsistence routines and territorial control. This ultimately led to what he refers to as 'ritual failure' with these changes undermining the Chalcolithic understanding of the universe and ultimately, structures of power and authority (Joffe 2022: 84, 91). Also based in religious changes is Yekutieli's (2014) argument for an 'aniconic revolution' wherein Chalcolithic peoples consciously rejected the dominant symbolic visual language that defined the period and deliberately destroyed or damaged specific ritual objects (Yekutieli 2014: 613). Broadly, a consensus is emerging that at the end of the Chalcolithic, individuals consciously turned away from the dominant worldview and ritual structure that had predominated for the prior thousand years in favor of new ideological structures (Amzallag 2022; Yekutieli 2022).

The transition between the Chalcolithic and EB IA was a time of increased connection between the Southern Levant and Lower Egypt (fig. 2.2). Towards the end of the 5th millennium, two sites that demonstrate connections to Egypt, Tell Hujayrat al-Ghuzlan and Tell al-Magass, were founded on the Gulf of Aqaba. Both sites continued to be occupied throughout the transition to the EB IA with Magass abandoned around 3600 and Ghuzlan abandoned around 3500 BCE (Klimscha 2009). These sites were major centers of copper smelting and seem to have acted as trading posts, facilitating the movement of objects and raw materials across the Sinai to Egypt, but also from Egypt, Sinai, and the Red Sea coast to the rest of the Levant (Klimscha 2011; Notroff et al. 2014). In Egypt, two sites in the Nile Delta in particular, Maadi and Buto, show extensive evidence for connections with the Levant with evidence for objects and materials of Levantine origin including pottery, malachite, basalt vessels, copper tools and ingots, flint tools, asphalt, and olive oil (Chłodnicki 2008; Hartung 2013). The early 4th millennium BCE residents of the Nile Valley are generally thought to have maintained few, but occasional, connections with the Levant (Hartung 2014: 109). In chapter 6, I will argue that a greater number of connections likely existed between Nile Valley Pastoralists and mobile Levantine based populations than is generally recognized with members of both groups assisting in the creation of glazed steatite beads.

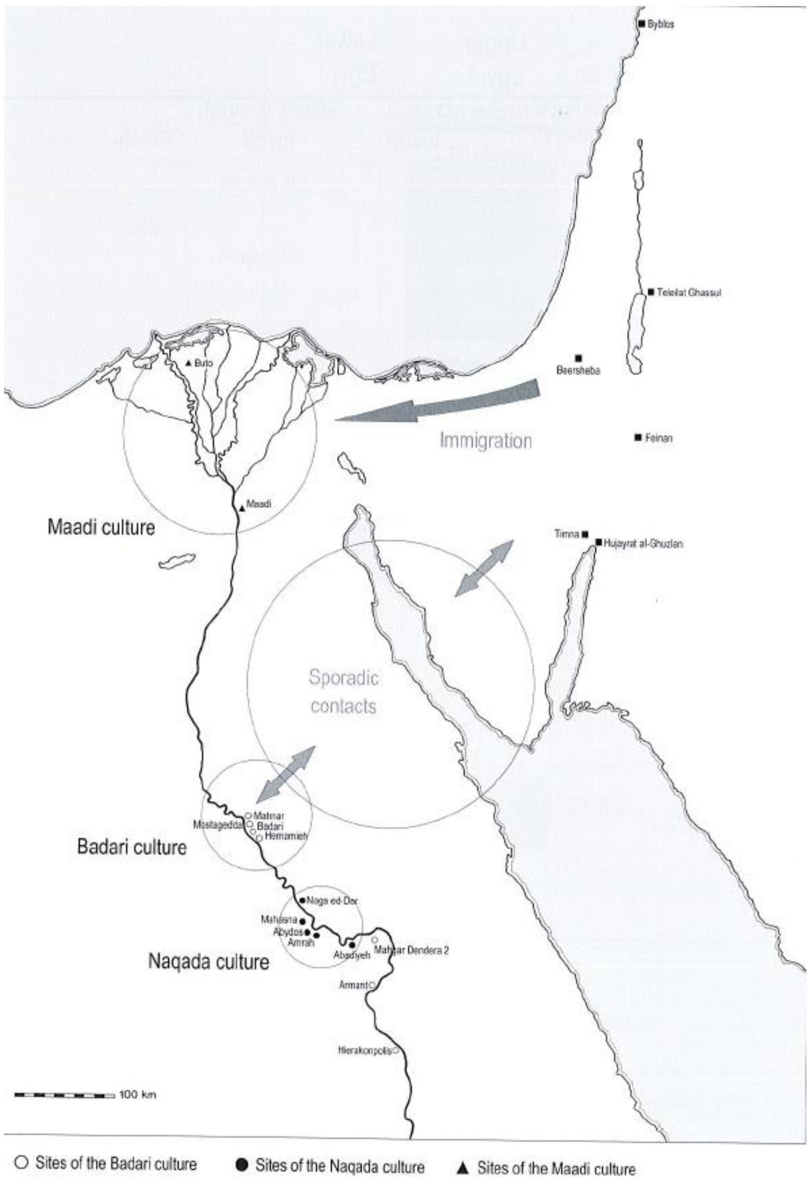


Figure 2. 2 Egypt and Levantine contacts in the 5th and early 4th millennium (Reproduced from Hartung 2014: 118)

2.4 The Early Bronze Age IA

By comparison with the Chalcolithic, EB IA stands out for its lack of centralization, impressive durable art objects, and material evidence for inequality (Philip 2008: 209-210; Yekutieli 2014). Most of the people living in the dry farming zone occupied small, unfortified, and dispersed villages (Greenberg 2019: 29-30; Yekutieli 2001: 663) (fig. 2.3). While the basis of subsistence activities, including farming and animal husbandry changed little, but for the advent of viticulture (Stager 1985), these activities took place on a smaller scale with the primary unit of economic and social life being the individual kinship unit or household (Chesson 2003). It is currently theorized that villages were made up of multiple households that operated in a heterarchical structure, governing through collective decision-making bodies such as councils (Chesson 2003: 86). In this context, an individual's sense of their 'place in the world' was directly tied to their household and its ability to claim pieces of the landscape through transformative activities such as agriculture, terracing, tomb building, and monument construction (Anderson 2015; Philip 2003).

Figure 2. 3 Map of Early Bronze Age I sites (reproduced from Greenberg 2019: 27)

While population density declined in the Mediterranean zone between the Chalcolithic and the EB IA, in recent years, excavation and survey in arid and steppe regions has revealed considerable population growth and increased exploitation of these areas. In the basaltic regions of southern Syria and Northern Jordan, as well as in the northern Jordanian highlands, several large aggregation sites emerged (Betts and Helms 1991; Müller-Neuhof 2020; Nicolle 2012; Nicolle and al-Maqdissi 2006). The residents of these sites seem to have been herders who practiced small-scale agriculture and participated in systems of exchange, such as those involving the movement of specialized flint tools from the desert towards the Mediterranean zone (Bradbury et al. 2014; Müller-Neuhof 2014) (fig. 2.4). It has been theorized that rather than primarily being connected to one site or settlement, the households that occupied and utilized these regions regularly cycled between periods of agglomeration and separation, in effect occupying various sites of different size and purpose at different times of year (Nicolle and Braemer 2012). In this model, the times when the broader community were agglomerated were important to facilitating the exchange of goods and raw materials and creating community cohesion (Nicolle and Braemer 2012: 11-12).

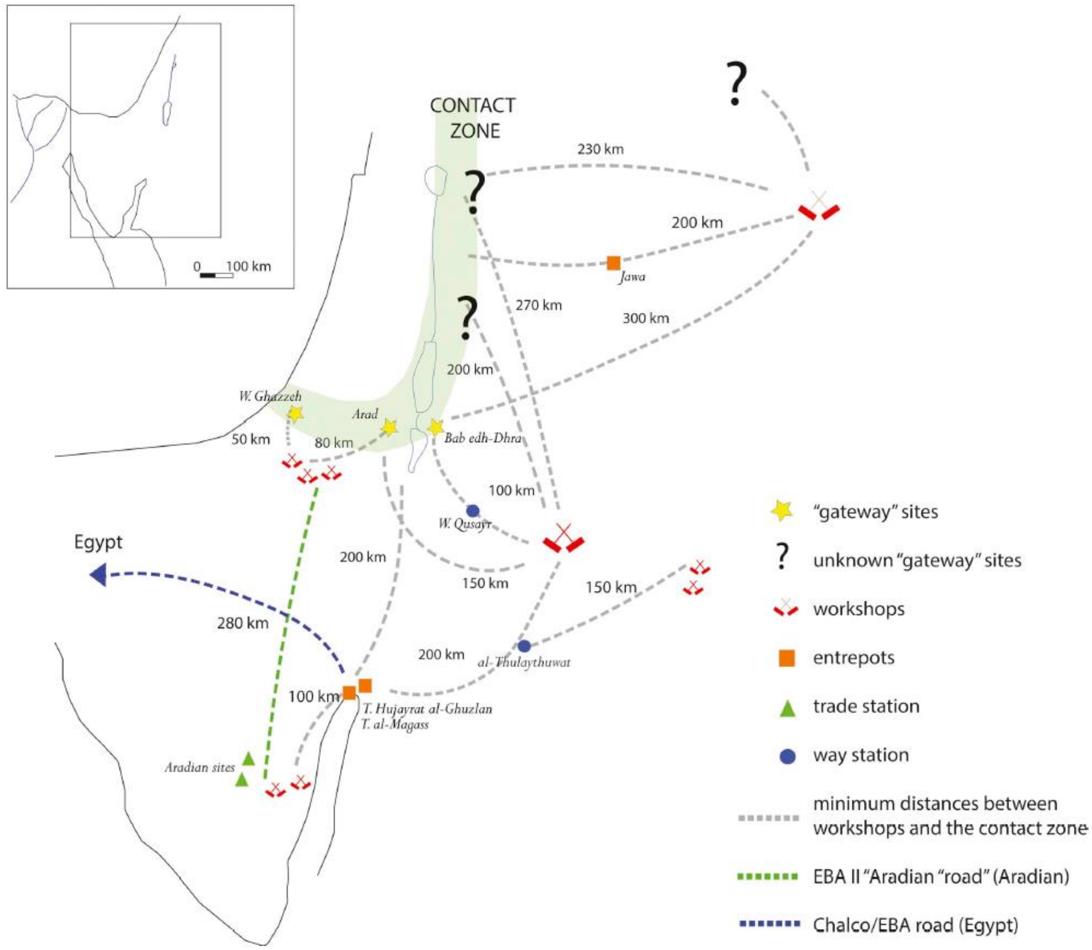


Figure 2. 4 Proposed system for the production and exchange of tabular scrapers in the Early Bronze Age I-II (reproduced from Manclossi and Rosen 2022: 101).

By contrast with the significant changes that took place in the rest of the southern Levant, the 'Timnian' pastoralists of the Negev and Sinai regions are thought to have maintained much of the same material culture, subsistence patterns, and religious traditions that had been prevalent in the 5th millennium (Avner 2018; Rosen 2017: 168-169). These pastoralists played a vital role in the movement of a wide variety of good and materials including flint tools, copper, groundstone tools, and animal products (Abu-Azizeh 2013; Rosen 2017: 179). In all cases, the movement of objects and materials was facilitated by an increased reliance on the domesticated donkey (Kolska Horwitz and Milevski 2019).

In the EB IA, many industries were localized around household or village workshops, with certain villages specializing in different craft activities based on their access to specific resources (Greenberg 2019: 37). While widely distributed ceramic 'wares' created by either itinerant potters or workshops existed in the EB IA, as a result of the prevalent pattern of localized pottery production and interregional variation, EB IA pottery assemblages are highly variable dependent on site or region. This has made the comparison of pottery assemblages difficult, especially for the purposes of creating supra-regional relative chronologies (Braun 2006; Goren and Zuckerman 2000; Philip and Baird 2000: 13-17). Amongst the objects hypothesized to have been created by specialists are tabular scarpers associated with arid zones and pastoralist exchange, lambis shell bracelets, manufactured at Hujayrat al-Ghuzlan (Eichmann et al. 2009: 29), basalt bowls, created from outcrops in the Wadi Kerak and Mujib (Philip and Williams-Thorpe 2001), and copper objects created at sites in the Arabah valley (Adams and Genz 1995; Greenberg 2019: 39).

During EB I, copper mining and ore processing occurred at different sites than smelting. In the Feinan region of Jordan, two villages in particular, Wadi Fidan 4 and Wadi Feinan 100 were associated with the mining and initial processing of copper ore (Adams and Genz 1995; Wright et al. 1998). In addition, ores were also mined and processed in the Timna Valley (Hauptmann et al. 2009). Currently, evidence for copper smelting and tool production is known from the twin Gulf of Aqaba sites, Hujayrat al-Ghuzlan and Tall al-Magass (Pfeiffer 2009), as well as at Ashkelon Afridar, located on the southern coastal plain (Segal et al. 2004).

Beyond their involvement in the local distribution of copper tools, these sites seem to have been intimately connected to exchange with Egypt (fig. 2.5). At Maadi for example, an ingot was found that directly matched up to the size and shape of one found at Hujayrat al-Ghuzlan (Notroff et al. 2014: 263). In addition, the Gulf of Aqaba sites of Hujayrat al-Ghuzlan and Tell al-Magass may have served as trading outposts for the exchange of a variety of other materials between the Levant, Sinai, and Egypt with several types of objects found in those regions also found at these sites (Notroff et al. 2014). While compelling, and despite their coastal locations, at present, no direct evidence for sea trade originating at these sites exist. By comparison, objects such as shell bracelets, that were manufactured at Hujayrat al-Ghuzlan, and are found across central Sinai, suggesting an overland exchange route (Bar-Yosef et al. 1977: 75-76). Comparatively, far fewer imports of Egyptian origin are known at Ashkelon. Its convenient location on the southern coastal plain however, would have made the site an ideal staging point for the movement of copper objects, wine, and olive oil by land or sea, in both cases, following the Northern Sinai coastline (Golani 2014; Oren 1973; Sharvit et al. 2002; Stager 2001).

In conclusion, the EB IA was a time when life coalesced around the household unit. Though the identities of the members of these households were directly connected to their ability to claim particular pieces of land through transformative activities, households also likely practiced some degree of mobility, aggregating and dispersing somewhat regularly. These times of agglomeration were crucial to the exchange of goods. The mobility inherent in the lives of the Levant's EB IA inhabitants facilitated the regular movement of objects by land and possibly by sea. While exchange with Egypt has long been recognized, in recent years, it has become increasingly clear that people and things regularly moved between both regions. In addition, recent research related to the production of tabular scrapers has clarified the role pastoralists played in their production both in the eastern Jordanian desert and Northwest Arabia as well as in their dissemination. This directly relates to the means by which Fifa's exotic beads may have arrived at the site as well as the potential importance of temporary group aggregation for the exchange of such objects.

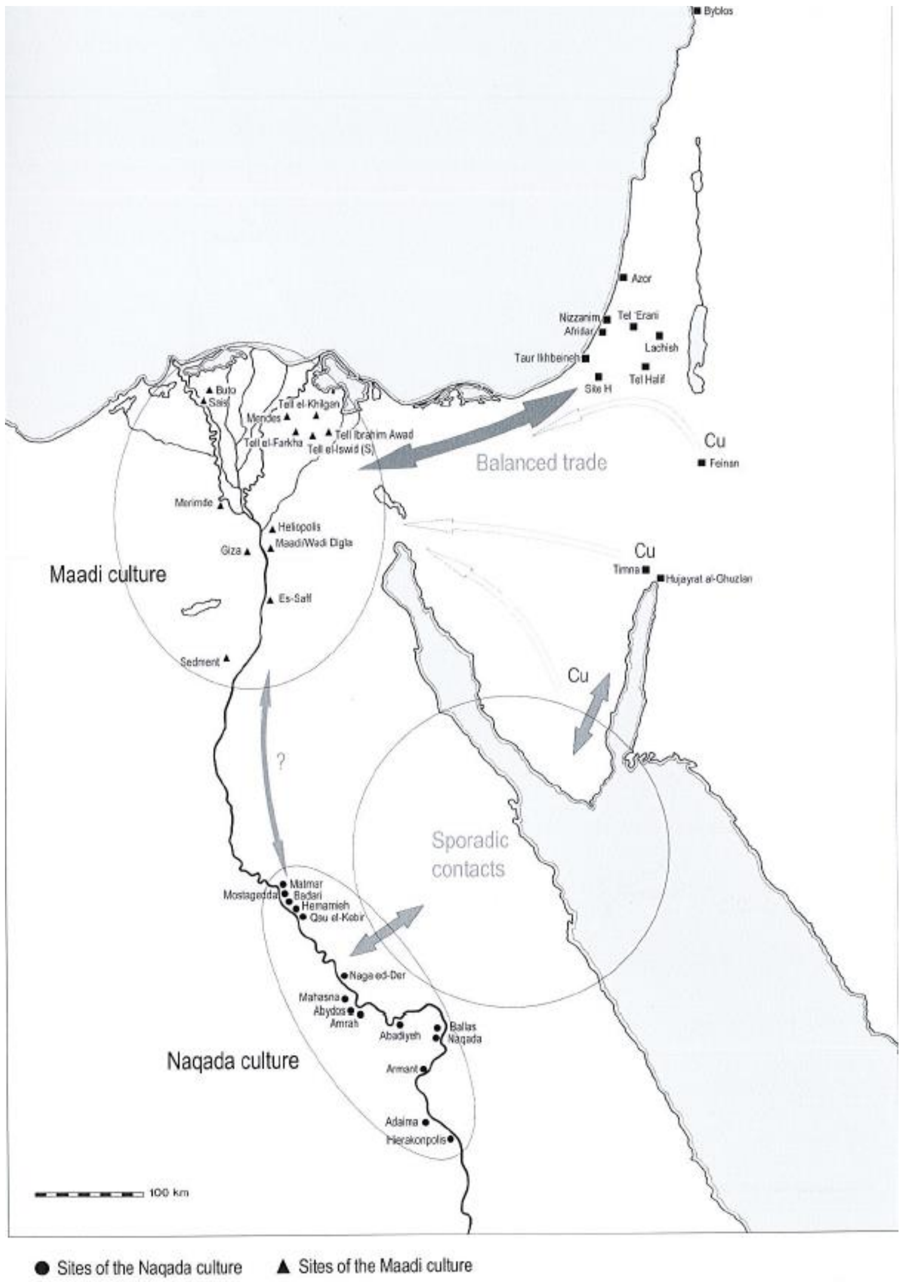


Figure 2. 5 Exchange model between the Levant and Egypt during the Late Naqada I-IIB/EB IA (reproduced from Hartung 2014: 119).

2.5 Early Bronze Age IA Burial Practices

EB IA burials often took place in artificial caves that were either isolated or belonged to larger cemeteries. Burials varied between primary interments, secondary interments, and occasionally cremated remains. In all instances, the dead were accompanied by a select body of grave goods that always included pottery, but could also include items such as jewelry, groundstone bowls, maceheads, and more rarely, metal objects (Ilan 2002: 94-96). With the exception of infant jar burials, which are found in small numbers at a limited number of habitation sites (Braun 2019: 81), EB IA tombs included multiple interments often made successively over time (Ilan 2002: 94). It is important to note that any discussion of burial practices is necessarily complicated by difficulties associated with dating several varieties of built megalithic tombs that are roughly assigned a broader EB I date (e.g., Fraser 2018). The three massive cemeteries of the Dead Sea Plain, Bâb adh-Dhrâʿ', Naq', and Fifa, which dwarf all other known EB I burial grounds, will be discussed separately.

Several isolated burial caves, or caves that were not associated with a settlement at the time of their initial use, date to the EB IA. At Gadot for example, a singular burial cave, dated halfway through the EBIA was uncovered (Greenberg 2001: 81). Though possibly associated with the nearby EB I-II Tel ʻAteret, the cave contained too few burials to represent the site's entire population, and the association of the settlement and burial site is not certain (Greenberg 2001: 92). Similarly, in the Qiryat Haroshet Cemetery, only one of the four excavated tombs can be assigned an early EB IA date, with the rest of the burials belonging to the EB IB (Salmon 2008: 14-16). While this cemetery would come to be the regular burial ground associated with Tel Qashish, its earliest use seems to predate sedentary settlement at the site, which was initiated in the EB IB (Zuckerman 2003: 57).

Isolated EB IA burial caves are also found in the southern Negev desert. Four burials caves were excavated at Ma'aleh Shaharut, one of which was dated to the EB IA based on ceramic parallels with vessels from Bâb adh-Dhrâʿ (Avner 1986: 62; 2018: 41). The excavator also associated this tomb with the Nawami burials of Sinai due to their sharing certain architectural elements (Avner 2002: 141). At present, no site can clearly be associated with this tomb. Another EB IA tomb was excavated in the same general region at Biq'at Nimra (Avner 1991; Sebbane and Avner 1993). Though this tomb may have been associated with a small nearby mining site, possibly in use during the EB I, their association is not certain (Sebbane and Avner 1993: 38).

Beyond the three cemeteries of the Dead Sea Plain, only two additional large cemeteries are known from the EB IA. The first, located around Tell el-Far'ah North included three distinct burial areas which included hundreds of rock-cut tombs, an unknown number of which were first used in the EB IA (de Vaux and Steve 1949; de Miroschedji 1993: 434; 2000: 37). The corpus of grave goods in these tombs largely resemble those found in the Dead Sea Plain's cemeteries, including objects such as: maceheads, basalt bowls, carnelian beads, pottery, and shell bracelets (de Vaux and Steve 1949: 127; de Vaux 1951: 583).

By comparison, the only published evidence for EB IA use of Tell el-Far'ah (North) is a small number of early EB IA Grey Burnished Ware sherds (de Vaux and Steve 1949: fig. 2: 6-7). While difficult to evaluate based on the limited publication of the site's Early Bronze Age remains in preliminary reports, the paucity of EB IA finds from the Tel has led one scholar to speculate that in the early EB IA, the site was used by on a temporary basis by mobile groups before it was fully occupied in the later EB I (de Miroschedji 1993: 434). The same scholar has suggested that the presence of the cemetery was actually the catalyst for permanent settlement at both Tell el-Far'ah (North) as well as several other sites close to EB IA cemeteries (de Miroschedji 2014: 308-309).

Other than the Dead Sea Plain cemetery of Bâb adh-Dhrâʿ, by far, the most extensively excavated and published cemetery with remains dating back to the EB IA is that at Jericho (Garstang 1932; Kenyon 1960; 1965). Jericho's tombs consisted of rock cut chambers with evidence for successive burial events that included the deposition of new remains and grave goods (Kenyon 1960: 23). Ultimately, after several burial events, tombs at the site could include the remains of hundreds of individuals who were most commonly accompanied by grave goods such as pottery and beads and more rarely by, shell bracelets, copper jewelry, and enigmatic incised bone objects (Kenyon 1960: 40; 1965: 3). Most burials at Jericho were secondary with bones placed at the center of the chamber and skulls placed at the outside (Kenyon 1965: 2). In several instances, beads were found together with the skulls, while in a few cases, articulated remains possessed bead bracelets (Kenyon 1965: 11). Like the cemeteries of Bâb adh-Dhrâʿ (see below) and Tell el-Far'ah North, the cemetery at Jericho included spatially distinct clusters of tombs that could have served different groups (Kenyon 1960: 2).

Jericho's excavators have generally interpreted the founding of Jericho's small EB IA settlement as contemporary with the founding of its cemetery (Nigro 2005: 197). It is possible, however, that the initial use of the cemetery predates regular occupation on the Tell. A recent radiocarbon analysis of samples from the site included analyses of samples taken from the tell and tomb A94, which is thought to be the oldest tomb in Jericho's cemetery (Nigro et al. 2019: 9). The calibrated radiocarbon dates from A94 spanned hundreds of years (3705-3309 cal BCE, 3636-3022 cal BCE), but nonetheless included upper bounds (~3700-3600 BCE) that significantly predated the upper bounds of every sample taken from the EB IA Tell (3367-3332 cal BCE) (Nigro et al. 2019: 9). While these upper bounds were dismissed by the excavators as too early based on their dates from the Tell (Nigro et al. 2019: 10), which they used to assign the foundation of EB IA Jericho at 3500 BCE, if EB IA cemeteries were a focal point for later sedentary occupation, as suggested by de Miroschedji (2014: 308-309), the earlier dates would make perfect sense and preserve the general pattern noted here.

This issues relate directly to our understanding of the cemeteries of the Dead Sea Plain for two primary reasons. Firstly, in the past, some scholars have questioned the fact that the people who buried their dead in the cemeteries of the Dead Sea Plain could have come from elsewhere, instead insisting that as of yet unlocated villages were associated with each cemetery (Braun 1991; Ilan 2002: 95; Politis 2021: 107). This review demonstrates that in the EB IA, mobility and aggregation were fundamental aspects of burial practices, not just at the cemeteries of the Dead Sea Plain, including Fifa, but also at most other burial grounds that can be assigned an EB IA date. This is significant as it connects burial practices to Nicolle and Braemer (2012)'s argument that EB IA populations regularly cycled between times of aggregation and separation with times of aggregation providing a key locus for creating community cohesion and facilitating the exchange of objects and information. Secondly, in the past, Jericho tomb A94 has been used by the excavators of Bâb adh-Dhrâʿ, the best investigated of the three cemeteries of the Dead Sea

Plain, to develop a relative chronology that placed the site's earliest use before Tomb A94 (Schaub 1981). Thus, if Stager (1992: 31) is correct that Tomb A94 was first utilized in the mid-EB IA, it would set the initial use of the cemeteries of the Dead Sea Plain into the early EB IA (~3700 BCE).

The relative consistency of grave good assemblages throughout the southern Levant in the EB I is interpreted by some scholars as indicative of regularized mortuary beliefs and practices (Ilan 2002: 94). Broadly, the grave goods found in cemeteries are interpreted as evidence for a belief in an afterlife, with the objects found in tombs perhaps first being used in funerary ceremonies by the living, before their deposition (Greenberg 2019: 40). These ceremonies are thought by some to have included the libation and ingestion of liquids (Greenberg 2019: 52) Some scholars have also suggested that the ceramic vessels in tombs were occasionally refilled as a means of propitiating the deceased (Ilan 2002: 99; Philip 2008: 196). Despite the overall commonalities between sites, certain cemeteries do exhibit particular preferences for certain types of artifacts.

2.6 Linking the Levant and Egypt: the Nawami Burials of the Sinai Peninsula

The Nawami burial grounds of southern and central Sinai have long been used to discuss interrelations between people living in Egypt and the Levant. Beyond this though, they are particularly important to discuss in light of the fact that many Nawamis contained beads made from the same materials as are found in EB I tombs (fig. 2.6). These circular above-ground tombs were built out of stone slabs that could reach around 2 meters in height. At present, 21 Nawami fields are known including over 200 structures (Bar-Yosef et al. 1977; 1986; Currelly 1906). The locations of these burial grounds appear to be highly intentional as they seem to follow a route leading directly from the Wadi Arabah, to southeast Sinai, and eventually into Egypt.

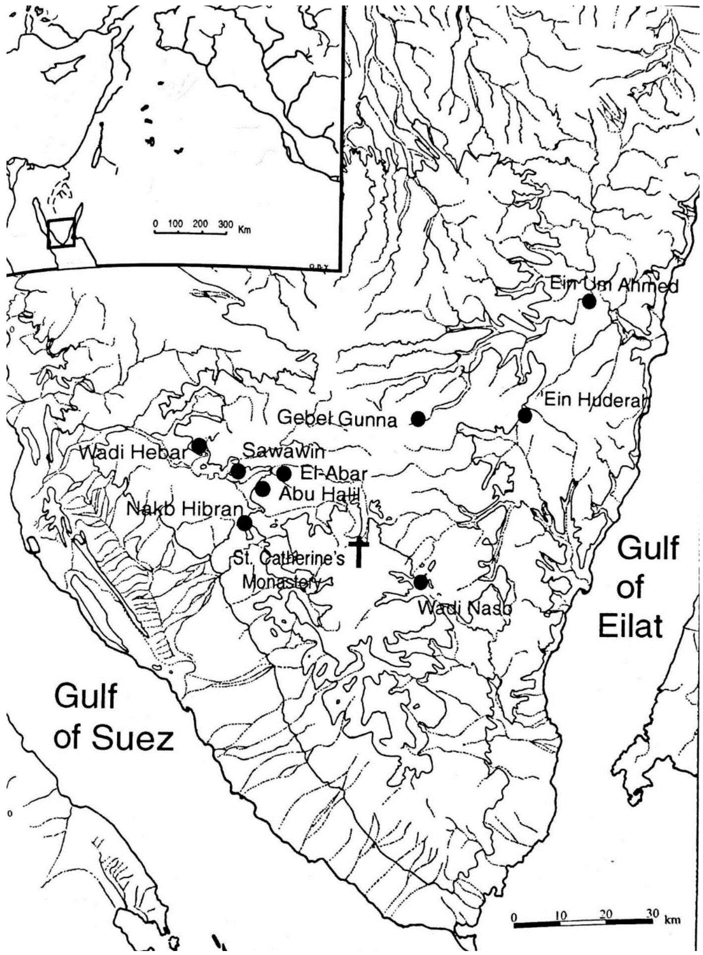


Figure 2. 6 Locations of Nawami Fields (Bar-Yosef Mayer 2011: 187).

As a result of their locations, it has long been suggested that the individuals who used the Nawami burial grounds were active participants in some kind of exchange either as intermediaries across the Peninsula, or as exporters of local products (Bar-Yosef et al. 1983: 57). While most argue that the Nawami builders were pastoralists, who were indigenous to the Sinai Peninsula (Bar-Yosef Mayer 2011; Bar-Yosef et al. 1983: 57-58), it has recently been suggested that the Nawami builders were pastoralists from the Nile Valley who were involved in the mining of Sinai's copper on a seasonal basis (Ben-

Marzouk 2020: 215-216). Nawamis are broadly dated to the 4th millennium BCE due to specific artifact parallels with both Egypt and the Levant, complemented by several radiocarbon dates (Bar-Yosef Mayer 2011: 190; Segal and Carmi 1996: 103).

The connection between these sites and the Levant is attested by the presence of the distinctive lambis shell bracelets found at Chalcolithic and EB I burial grounds throughout the Levant (Bar-Yosef et al. 1977: 75-76), the presence of types of copper objects, such as square sectioned awls that are found and thought to have been produced in the southern Levant (Bar-Yosef et al. 1977: 80; Ilan and Sebbane 1989), and several types of beads found in Levantine EB I burials (Bar-Yosef et al. 1977: 73-75). Connections with Egypt meanwhile are attested through the occasional presence of Naqada I-II (c 3800 – 3325) type juglets, twisted copper wire of the type found in predynastic Egyptian tombs, transverse arrowheads of Egyptian type, and by their westward facing entryways, interpreted by the excavators as being directly connected to ancient Egyptian funerary beliefs (Bar-Yosef Mayer 2011: 190; Bar-Yosef et al. 1983: 56).

Several factors here are of extreme importance. Firstly, while it is clear that the Nawami's builders formed some kind of link between the Levant and predynastic Egypt, it is generally assumed that any trade between the Levant and Nile Valley involved intermediary interaction with settlements in the Nile Delta such as Maadi where so much material of Levantine origin is found (e.g., Savage 2011). If the juglets found in the Nawamis date to between the Naqada I-IIB periods however, (~3800-3450 BCE) they would predate the regular interaction or cultural unification between upper and lower Egypt (Dee et al. 2013; Wengrow 2006: 88-89). This, in addition to a small number of shells from the Red Sea provide evidence for independent, if intermittent, exchange between individuals living in the Nile Valley and the Levant (Hartung 2014: 109). In addition, malachite and copper objects may also have been exchanged on an intermittent basis by these groups (Anfinset 2010: 126, 144-146).

Based on this exchange, the westward orientation of the Nawamis, and a shared emphasis on a select body of grave goods including pottery, beads made of materials such as carnelian and glazed steatite, lambis shell bracelets, and copper objects (Ilan 2002; Stevenson 2007, 2009), Ben-Marzouk (2020: 213-218) argued that the individuals who used the Nawamis as well as people living in the Nile Valley and Levant may have been in regular contact with one another and could have shared some of the same body of religious beliefs, at least around death and burial. These shared traditions contrast with the mortuary practices of the individuals who lived in the Nile Delta who, despite their more regular exchange with the Levant, utilized stark and diminutive graves that rarely contained any objects (Seeher 1993; Stevenson 2016: 438). These ideas are especially important as I will later argue for understanding the presence of glazed steatite beads in restricted early 4th millennium BCE funerary contexts including only the cemeteries of the Dead Sea Plain, Nile Valley tombs, and Nawamis.

2.7.1 The Cemeteries of the Dead Sea Plain

The three EB IA cemeteries of the Dead Sea Plain, Bâb adh-Dhrâʿ, Naq’, and Fifa are the earliest known EB IA sites in the region (Chesson and Schaub 2007: 255) (fig. 2.7). While the area contained a small number Chalcolithic sites, including a group of over 50 burial cairns, tumuli, and grave circles (Clark 1979; Edwards et al. 2004: 193; McCreery 1978), most other Chalcolithic sites were ephemeral and there is no evidence for long-term sedentary occupation (MacDonald 1992: 30, 56).

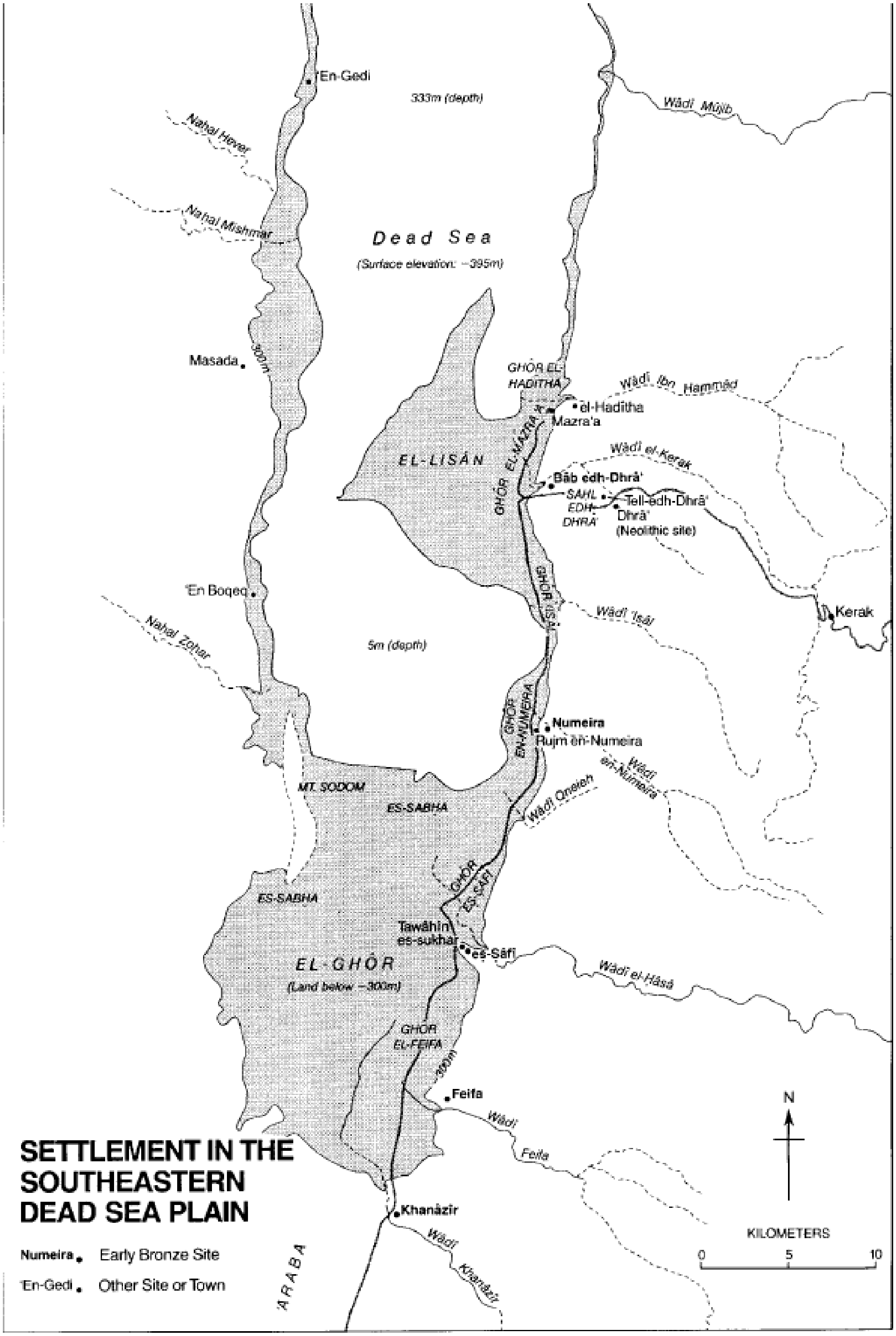


Figure 2.7 The Early Bronze Age Dead Sea Plain (reproduced from Rast and Schaub 2003: 3)

The three cemeteries are linked by a distinctive pottery family (Rast and Schaub 1974), the relative regularity of the types of grave goods found in each (Chesson and Schaub 2007: 255), and a shared body of customs around how and when burials were interred (Chesson 2007). Unfortunately, the distinctive pottery found in the cemeteries has not been found in stratified settlements (Braun 2006) and the radiocarbon dates taken from Bâb adh-Dhrâʿ's tombs during the 1975-81 excavations are far too early for broader EBA radiocarbon chronologies and are therefore not considered secure or reliable (Weinstein 1984: 308; Regev et al. 2012: 546). It is unclear though whether this unreliability may be associated with errors made in the lab or in the field (Regev et al. 2012: 552). As a result, it is unclear when exactly the cemeteries were established. As I have argued however, based on a comparison with Jericho's pottery and radiocarbon dates, it is possible that these cemeteries date to the very early EB IA, an idea shared by some other scholars (Joffe 2022).

The three cemeteries are remarkable for their size, being the largest known EBA necropoleis in terms of both the total number of individuals buried and the number of tombs. According to one estimate, in the EB IA, 56, 263 individuals were buried at Bâb adh-Dhrâʿ in approximately 2,856 shaft tombs. While no population figures have been estimated for the other two cemeteries, both Fifa and Naq' are thought to have contained around 10,000 cist graves (Kersel and Chesson 2013: 161; Schaub 2009: 747-751). In each cemetery, secondary burials predominate. The lack of permanent occupation at any of these sites has led scholars to argue that the individuals who used these cemeteries came from elsewhere to do so. Whether or not they were pastoralists, sedentary village dwellers who travelled to bury their dead, or a combination of the two however is uncertain (Chesson 2016: 45).

Equally, while at one time, it was suggested that the individuals who buried their dead in these cemeteries occupied the nearby Kerak Plateau (Chesson 2001: 101), more recent publications have emphasized that it is entirely uncertain where individuals travelled from in order to bury their dead on the Dead Sea Plain (Chesson 2019: 169). It is likewise uncertain where the primary burials of individuals buried at the cemeteries of the Dead Sea Plain took place. What is known is that the individuals who travelled to these sites seem to have taken up temporary and ephemeral occupation at them, camping for an unknown period of time before departing and returning from whence they came (Rast and Schaub 2003: 68-73). Evidence for this camping is provided by the presence of pottery scatters and horizontally deposited ash layers found to the west of Bâb adh-Dhrâʿ's burial ground (Rast and Schaub 2003: 68-73). During their encampment, the visiting population took advantage of the cemetery's locations at the mouths of wadis, which provided ample water. In addition, the pottery that found its way into tombs was produced from local wadi sand, suggesting that it could have been produced during the period of encampment (Rast and Schaub 2003: 97-100).

The three cemeteries have been excavated and published to varying degrees. The most extensively explored of the three sites is Bâb adh-Dhrâʿ where two projects investigated over one hundred tombs, initially between 1965 and 1967, and later in 1975, 1977, 1979, and 1981. The volume devoted to the first set of tomb excavations focuses on tomb architecture and grave goods (Schaub and Rast 1989), while the second series of excavations are, at present, represented by a volume focused on bioarcheological data (Ortner and Fröhlich 2008) and a series of preliminary reports (Fröhlich and Ortner 1982; Rast and Schaub 1978, 1980, 1981). In addition, several studies have been devoted to discrete groups of artifacts such as pottery excavated in the cemetery (e.g., Beynon et al. 1986).

By contrast, Naq' and Fifa have been much less extensively published. While 144 cist and chamber tombs have been excavated at Naq' (Politis 2021: 109), at present, only preliminary results (Papadopoulos 2001; Politis 1998; Waheeb 1995) and a doctoral dissertation collectively devoted to the cemeteries of the Dead Sea Plain (Nai'mat 2003) are publicly available. Even less has been published on Fifa, where the Expedition to the Dead Sea Plain excavated 15 tombs between 1989 and 1990 (Schaub 1991). Fifty additional tombs were excavated by Mohammad Najjar and the Jordanian Department of Antiquities in 2001 (Najjar 2001) but results from these excavations have not been published. At present, the Expedition to the Dead Sea Plain is in the process of publishing its Fifa excavations, an effort in which this thesis plays small a role.

2.7.2 Bâb adh-Dhrâʿ

In the EB IA, shaft tombs containing secondary burials predominated at Bâb adh-Dhrâʿ (Schaub and Rast 1989) (fig. 2.8). These tombs were dug roughly 2 meters underground and contained between one and five round burial chambers that branched off from their central shaft (Schaub and Rast 1989: 27). While each of these chambers are thought to have been used during separate burial events, during which kinship groups would return to the site (Schaub and Rast 1989: 26, 205), it is unclear whether or not every chamber was excavated at once, or if they were created one at a time in accordance with the need to place new burials (Chesson 2007: 116). In addition, it is uncertain whether or not the families who buried their dead in each tomb were responsible for its construction, or if tomb construction was carried out by a smaller group of specialists. The interpretation of each shaft tomb being used by a specific family group is based on systematic studies of teeth from skulls found in different tombs, which established genetic relatedness between the different individuals buried in different tombs (Bentley 1987; 1991).

The structure of Bâb adh-Dhrâʿ's tombs are extremely regular. In general, a selection of disarticulated long bones of between one and five individuals were placed at the center of each chamber on a woven mat. Skulls, presumably belonging to the same individuals, were placed at the mat's edge. Between 6 and 60 ceramic bowls, jars, and juglets were placed around the edge of the tomb (Schaub and Rast 1989). While pottery vessels predominate, a discrete corpus of additional grave goods were often found in tombs including sunbaked ceramic figurines, beads, limestone maceheads, lambis shell bracelets, and basalt bowls (fig. 2.9). Some additional grave goods such as a wooden staff and bowl were also found, but these are extremely rare (Chesson 2001: 106).

It is perhaps significant that several of these types of grave goods have antecedents in the Chalcolithic period. These include maceheads, basalt bowls, and lambis shell bracelets (Schaub and Rast 1989: 294, 302, 312). The figurines at Bâb adh-Dhrâʿ remain the only known anthropomorphic imagery known from the EB I southern Levant (Ludwig 1989), which Yekutieli (2014) argued underwent an aniconic revolution between the end of the Chalcolithic and the beginning of the EB I. In the past, this has been used to suggest some degree of continuity in Chalcolithic traditions into the EB IA (Schaub and Rast 1989: 554). The implications of this continuity, specifically at these sites, have yet to be fully explored.

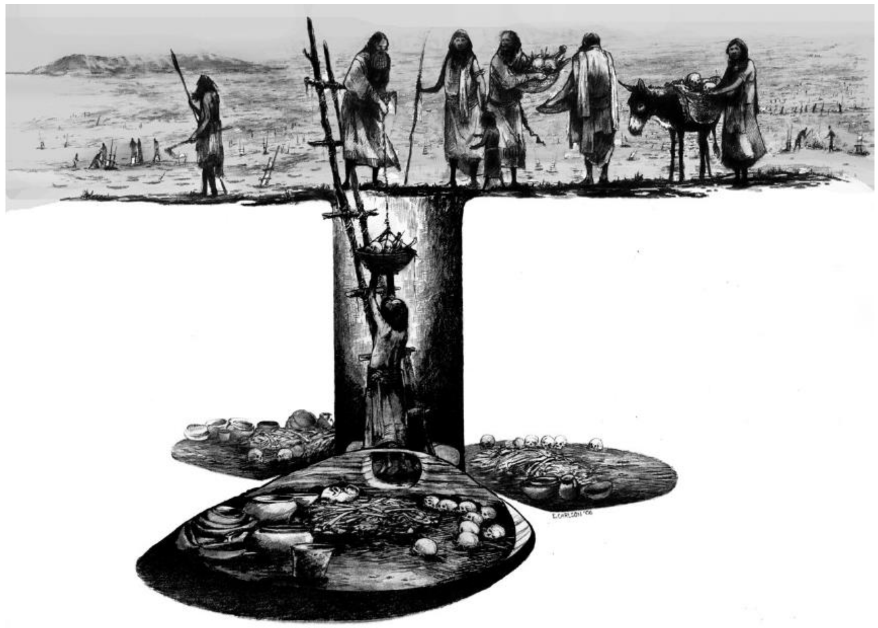


Figure 2.8 Reconstruction of shaft-tomb burial at Bâb adh-Dhrâʿ drawing by E. Carlson.

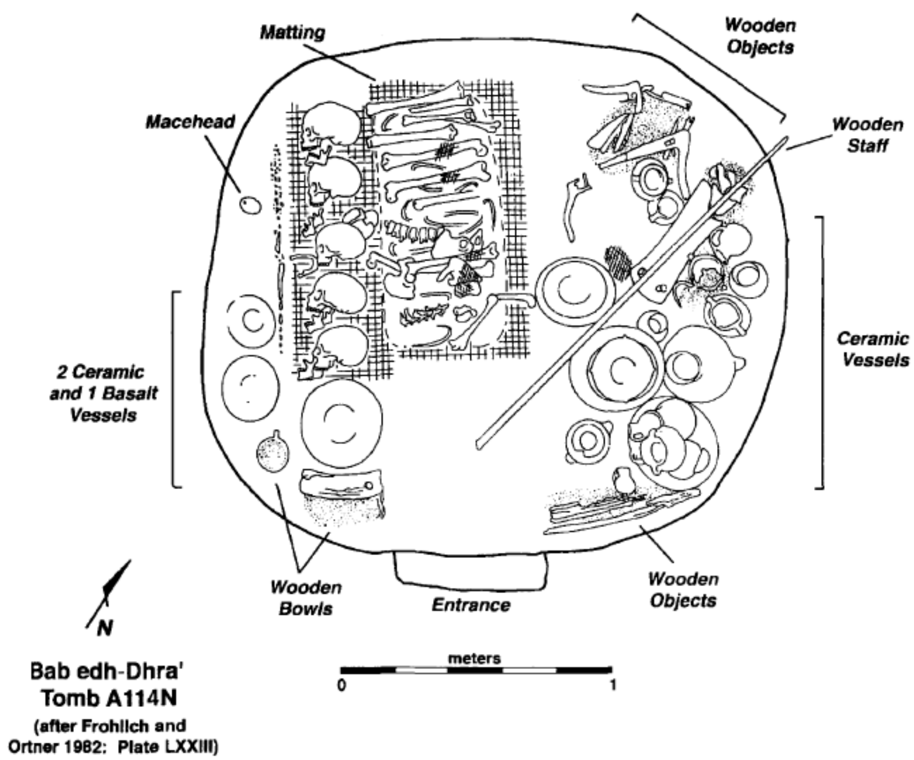


Figure 2.9 Typical Cemetery A Shaft Tomb Burial (Chesson 2001: 103)

The EBIA Bâb adh-Dhrâʿ cemetery has two primary clusters of tombs, referred to as cemetery A and C. While they share the same broader burial site, the tombs and grave gifts in the two cemeteries differ slightly with their tombs differing architecturally and their pottery being typologically distinct (Schaub and Rast 1989: 554-556). These two cemetery areas are thought to have been used by different social groups (Schaub and Rast 1989: 555). The exact nature of the relationship between the users of cemetery A and C is not currently fully understood.

Grave goods came from a variety of sources, some of which are known, and some of which are not. Petrographic study of the pottery from Bâb adh-Dhrâʿ's tombs have established that these were made from local wadi sand making it possible that they were made on site, though this is not necessarily the case (Beynon et al. 1986: 302). Basalt bowls meanwhile have been geochemically established as coming from outcrops in the Wadi Kerak and Mujib (Schaub 2008a; Philip and Williams-Thorpe 2001). While shell bracelets have long been associated with producers linked to the Red Sea, and perhaps the individuals who buried their dead in the Nawamis of Sinai (Schaub and Rast 1989: 310-312), evidence for their manufacture at Hujayrat al-Ghuzlan (Eichmann et al. 2009: 29) suggests that the examples found at Bâb adh-Dhrâʿ were perhaps made at that site. It is presently unknown where the diorite, limestone, chalk, and alabaster maceheads found in the site's tombs came from although the alabaster maceheads may have come from Egypt and the limestone examples could have been made from locally available material (Beebe 1989: 292-293). The beads at Bâb adh-Dhrâʿ are generally thought to be made up of both local and non-local materials (Chesson 2007: 117). The exact composition of these beads are not entirely confirmed and the exact origins of the different varieties of non-local beads have received only limited attention.

Considerable attention has been devoted to understanding inter-tomb variability in terms of numbers and types of grave goods as well as to understanding the individual significances of the different types of grave goods found in the tombs. Early attempts followed a general processual approach (Binford 1971), searching for statistically significant pairings of grave goods with different ages and sexes of skeleton and for inter-grave wealth variations that could be utilized for understanding social structure. While certain grave goods were more or less common at Bâb adh-Dhrâʿ, no clear correlations related to age or sex have been defined (Chesson 2007: 117; Schaub 2008b: 42-43). A key issue is that in most instances, multiple individuals' bones were mixed together in tombs, making it difficult to associate specific objects with particular persons (Schaub 2008b: 42). In addition, while certain objects such as basalt bowls have been defined as "prestige goods" (Schaub 2008a), the high degree of variability in the presence or absence of certain types of grave goods as well as the highly variable number of pots in each tomb has confounded efforts to understand social ranking based on grave goods. This has been used to argue that the population who buried at Bâb adh-Dhrâʿ were unranked and relatively equal (Harrison 2001: 226).

Alternate approaches to understanding the mortuary data from Bâb adh-Dhrâʿ have been put forward over the past twenty years by Meredith S. Chesson. Chesson has argued that the grave goods found at Bâb adh-Dhrâʿ were used by burying families to, "construct, assert, and negotiate group and individual identities in a shared commemorative space (Chesson 2001: 108-109)" and that these identities may have governed differential access to specific craft or prestige goods that may have signaled specific roles within their society (Chesson 2001: 109). In addition, drawing on the seemingly static regularity of burial traditions at the site throughout the EB IA and the regular return of specific kinship groups to specific tombs, she has argued that strong and regularized funerary traditions were important to the constitution and reification of the community's identity (Chesson 2001: 109- 110).

More recently, noting the regularity of burial practices at the site, Chesson has argued that the cemetery at Bâb adh-Dhrâʿ provides a clear example of how burial could be governed by a general body of closely adhered to guidelines, while also including space for slight differentiation (Chesson 2007). Importantly though, this space for differentiation was itself structured by specific provisioning for the inclusion of types of artifacts that were less common overall, but nonetheless appear in multiple tombs (Chesson 2007: 118). Equally valuable to understanding the inclusion or exclusion of certain object types may be the study of the meanings of discrete groups of material culture found in tombs (Chesson and Schaub 2007: 255).

Lastly, focusing on the emotional aspects of death and burial in the EB IA Chesson has argued that burying one's family members at Bâb adh-Dhrâʿ involved a web of anxiety inducing obligations imposed on the living by the dead (Chesson 2016: 45). These included the careful and almost obsessive curation of the deceased's bones until the time of their final deposition at Bâb adh-Dhrâʿ as well as the attention to detail involved in ensuring that the dead were provided with very particular types of tombs and grave goods (Chesson 2016: 43, 57-59). For example, a great amount of time and effort were paid to collecting, curating, and depositing the tiny bones of fetuses and neonates buried at Bâb adh-Dhrâʿ

which made up some 27% of the individuals found in the site's tombs (Frolich et al. 2008: 234-235; Chesson 2016: 58). Paleodemographic data has also borne out the regularity of death and the generally short lifespans of the people who buried their dead at Bâb adh-Dhrâʿ with 59% of the represented individuals at the cemetery not reaching adulthood (Frolich et al. 2008: 234).

2.7.3 Fifa and Naq'

The other two EB IA cemeteries of the Dead Sea Plain have much in common with Bâb adh-Dhrâʿ, and even more in common with one another. As at Bâb adh-Dhrâʿ, burials at the two sites were typically secondary and disarticulated. As no settlement sites were found near Fifa or Naq' either, it is also thought that the individuals who buried their dead at these cemeteries travelled from elsewhere, over the course of several hundred years, in order to do so (Rast and Schaub 1974; Schaub 2009). Generally, burials included between one and six individuals (Schaub 2009: 748). It is unclear whether they were all buried at the same time, or, if families would return to the exact same tombs at a later time, burying newly deceased kin. It is equally unclear how long each site was used for during the EB IA and if they were all contemporary.

Though slight differences exist in the funerary assemblages found at each site - for example, each has pottery that is slightly typologically distinct and not found at other sites (Rast and Schaub 1974) - by in large, the dead at Naq' and Fifa were buried with the same general body of grave goods found in Bâb adh-Dhrâʿ's tombs including pottery, basalt bowls, beads, shell bracelets, and maceheads (Chesson and Schaub 2007: 255) (fig. 2.10). These overall similarities are generally taken as evidence that the different groups who used the three cemeteries belonged to related, but slightly different groups. It is unclear however if the distinctions were related to ethnicity, separate lineages, different villages of origin, different regional origins for those burying at each, or even if they were in use at different times (Chesson and Schaub 2007: 255).

Figure 2.10 Pottery from Fifa tomb 8 and lambis shell bracelet from tomb 1. Images reproduced from the ACOR Photo Archive

The primary difference between Fifa and Naq’ and Bâb adh-Dhrâʿ relates to how tombs were constructed. Whereas Bâb adh-Dhrâʿ’s tombs are, with a single exception, shaft tombs, cist tombs were used at the other two sites (fig. 2.11). These tombs were roughly apsidal or oval in shape and dug into the ground. These tombs are classified into two separate groups. The first have walls entirely made up of river cobbles (fig. 2.12a), while the latter have walls made of vertically placed stone slabs topped by a small number of river cobble courses (Schaub 1991: 261-262) (fig. 2.12b). In all cases, tombs were covered with long rectangular slabs. At present, the exact significance of the two different tomb styles is unclear. In the past, the presence of an EB IB assemblage in a cobble lined cist tomb was used to suggest that slab-lined tombs were of an earlier date, perhaps contemporary or even earlier than Bâb adh-Dhrâʿ’s shaft tombs (Nai’mat 2003: 62; Schaub 1991: 262). This, however, is difficult to substantiate based on the small sample size available and a lack of reliable chronometric dates. Alternatively, other scholars have suggested that the two different tomb styles might be related to social distinctions (Braun 2021: 130-131). The use of cist tombs as opposed to shaft tombs at Naq' and Fifa has been explained as a result of the different soil makeup found at Bâb adh-Dhrâʿ by comparison with the other two sites (Nai'mat 2003: 80-81). The presence of a single cist tomb at Bâb adh-Dhrâʿ (Rast and Schaub 1989: 37-38) however, could suggest a social, rather than geologically determined reason for the uses of the two different tomb types.

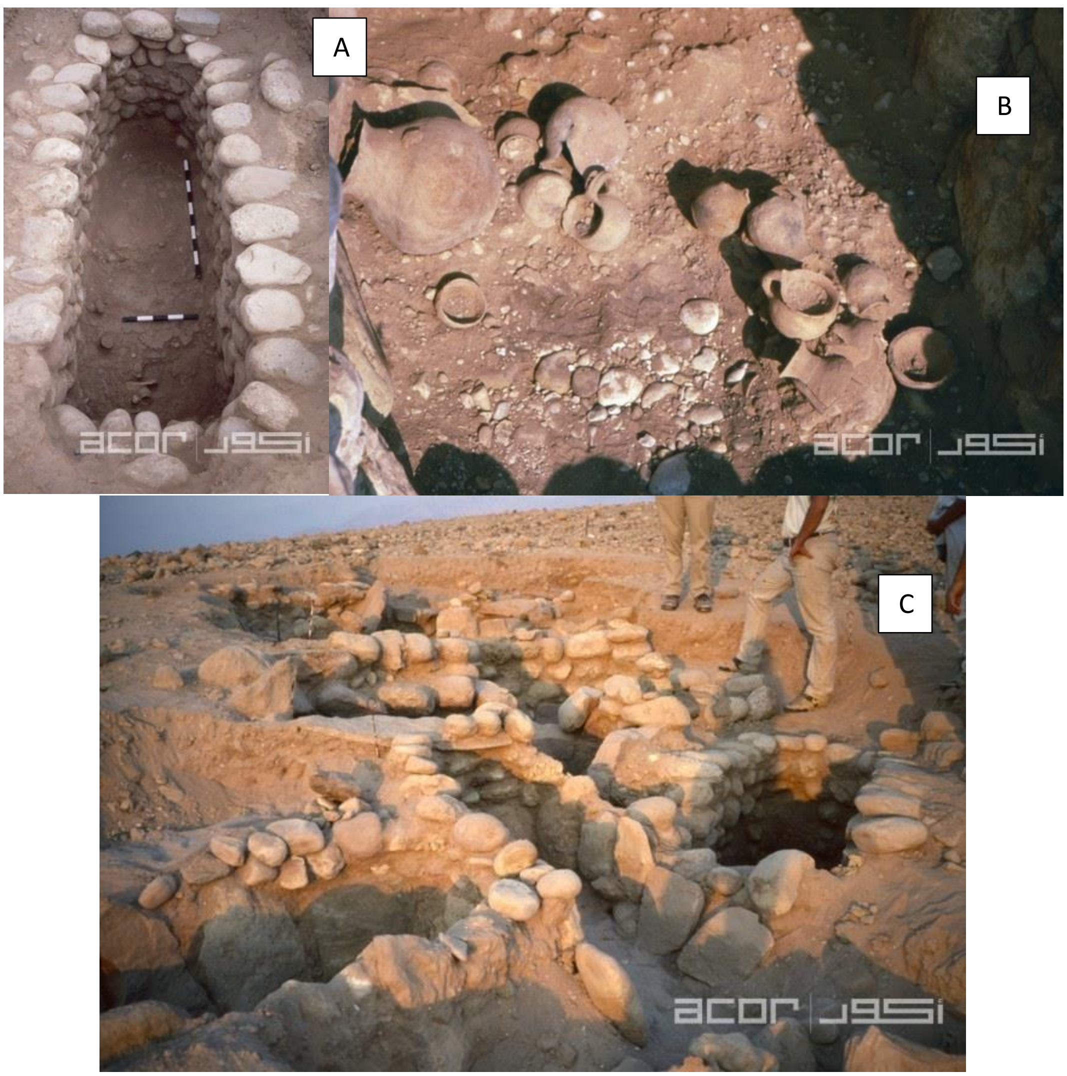


Figure 2. 11 A. Cist tomb 20, an example of a typical cist tomb at Fifa. B. Typical finds in Fifa cist tombs. C. Group of abutting Early Bronze Age IA Cist tombs. (Images Reproduced from the ACOR Photo Archive). Figure 2.8 provides a comparative example of a shaft tomb.

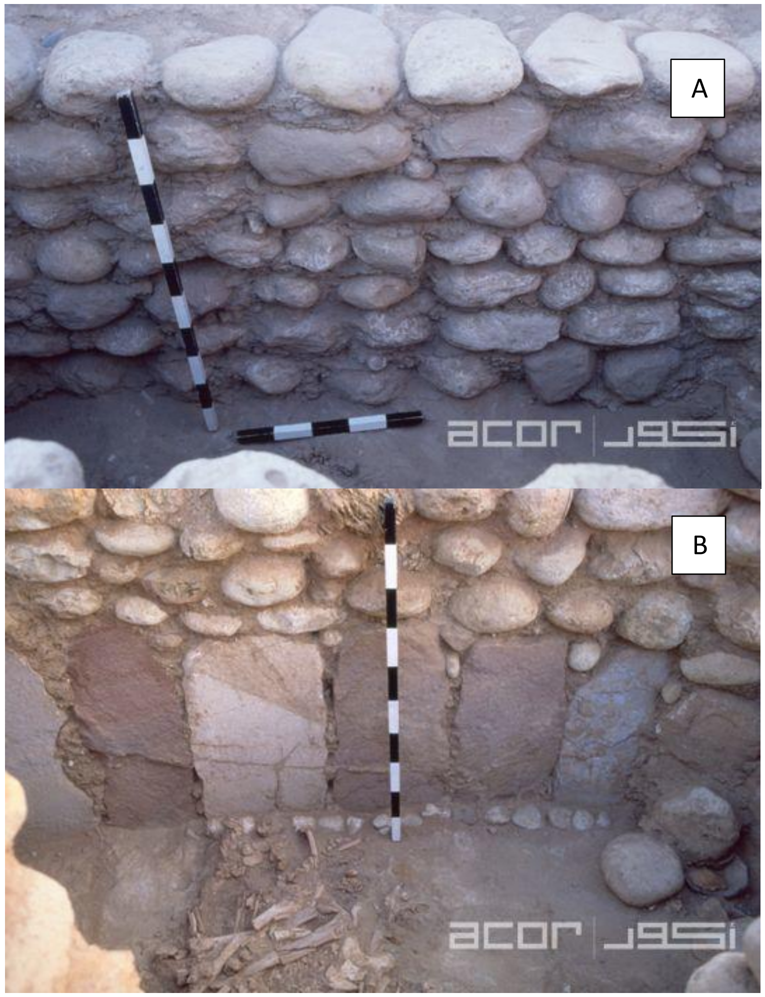


Figure 2.12 Cist tombs of both types from Fifa A. Tomb 20, with river cobble walls. B. Tomb 1, with walls built of vertical slabs and river cobbles (Images reproduced from the ACOR Photo Archive).

2.8 The Bead Assemblages of the Dead Sea Plain's Cemeteries

2.8.1 The Bead Assemblages of Bâb adh-Dhrâʿ and Naq' in Brief

Not a great deal is known about the bead assemblage from Naq'. Beads were however somewhat rare at that cemetery, appearing in only 14 of the 116 (12%) excavated cist tombs at the site. These were generally found embedded in the floors of tombs and are thought to have been made out of several materials including carnelian, bone, and glazed steatite (Braun 2021: 138; Nai'mat 2003: 96-97). In addition, several bone pendants were found at the site. The size of the bead assemblage is currently unpublished.

By comparison, much more is known about the bead assemblage from Bâb adh-Dhrâʿ where beads were found in 35 out of 129 (27%) EB IA tomb chambers (Schaub and Rast 1989: 184; Schaub 2008b: 28-29). According to their original publication (Wilkinson 1989), these beads were made out of green/white faience, clear green calcite, malachite, carnelian, hematite, and clear calcite (Wilkinson 1989: 310). The assemblage may also have included ostrich eggshell and lapis lazuli. It is equally important to note that several locally available materials, such as limestone, were not present. This exclusion is notable as the material was used to make the maceheads found in the cemetery but was apparently not utilized for making ornaments.

While only limited information is currently available about the bead assemblage excavated at Bâb adh-Dhrâʿ between 1975 and 1981, according to the excavators, the beads recovered from those seasons included carnelian and bone, but also, crucially to this study, talc beads that were found in large groups (Schaub 2008b: 42). The absence of reliable data on the beads from the 1977-1981 excavations is unfortunate as extensive and reliable bioarchaeological data is available from those excavations (Ortner and Frolich 2008). When, in the future, the beads from these excavations are published, it will be possible to evaluate whether particular types of beads can be associated with particular ages or sexes of skeletons.

At Bâb adh-Dhrâʿ, beads were placed in tombs in two specific ways which varied according to whether the beads were found in Cemetery A or Cemetery C (table 2.1). Within cemetery A, beads were typically placed in jars (Wilkinson 1989: 303-306) (fig.

2.13). In two instances however, beads were mixed with the bones of the deceased (Wilkinson 1989: 302). Beads were often found in multiple chambers jutting off from the same central shaft. As the use of these chambers is understood to represent discrete burial events, perhaps lasting several hundred years (Chesson 2001: 105), the reappearance of beads in multiple chambers of one shaft tomb could suggest that particular kinship groups either had a predilection for their inclusion, had access to them, or that some social mechanism saw to it that multiple generations were able to include beads in their tomb chambers.

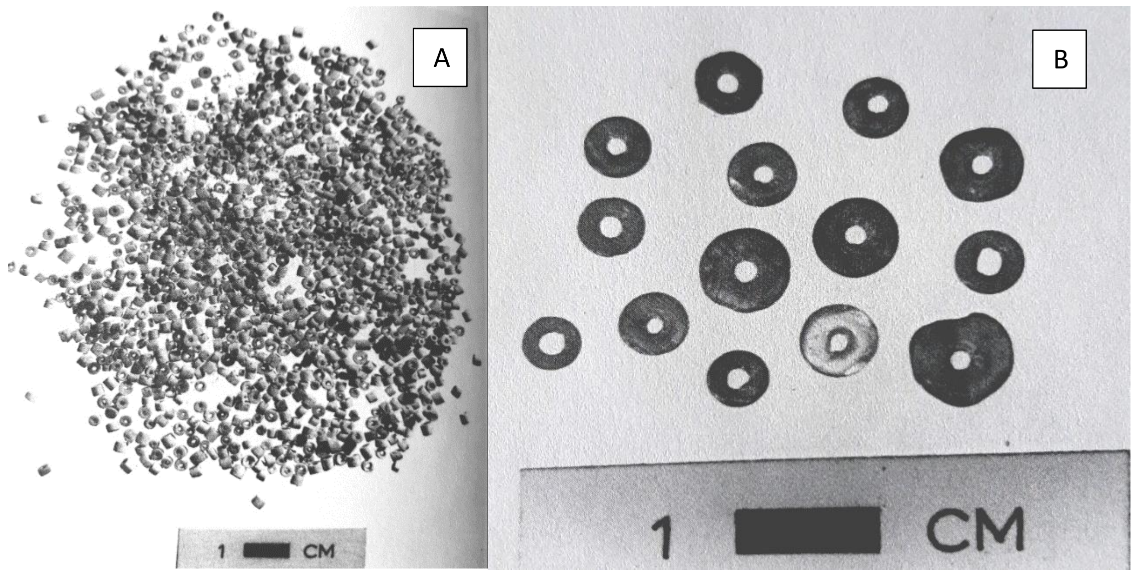


Figure 2. 13 A. Very small, short cylinder beads from Tomb A 72S Pot 9. B. Carnelian beads from tomb A 10 (Reproduced from Wilkinson 1989: 303, 306).

Significant patterning exists when multiple generations incorporated bead assemblages into their tombs. In all instances when multiple chambers in a shaft tomb contained beads, beads were placed the same way in each chamber (Wilkinson 1989: 303-306) (table 2.2). As a result, it seems that for the families in cemetery A who incorporated beads into their tombs over multiple generations, specific, intra-family, traditions existed that dictated exactly how beads were be placed.

Cemetery	Percentage of Tombs with Beads	Conventional Style of Bead Placement	Bead Materials:
A	20%	Beads placed in Jars	Bone, Calcite, Carnelian, Faience[2], Hematite, ?Lapis Lazuli?, Malachite, ?Ostrich Eggshell?, Shell
C	60%	Beads placed on bones of the deceased.	Bone, Carnelian, Malachite, Shell, Unidentified Stone

Table 2.1 **Summary of beads in Cemeteries A and C**

Tomb	Bead Location
A 68 North	Beads in one Jar
A 68 East	Beads in one Jar
A 71 West	Beads in one Jar
A 71 North	Beads in one Jar
A 72 South	Beads in two Jars
A 72 Northwest	Beads in two Jars
A 76 West	Beads on tomb floor[3]
A 76 East	Beads on tomb floor
C 1	Bone Pile
C 3	Neck of Articulated Burial
C 5	Bone Pile
C 6	Beads in vessel of cemetery A type.

Table 2.2 **Contexts of beads from Cemetery A and C.**

By comparison, Cemetery C's bead assemblage is with a single exception found on or around the bones of the deceased (Wilkinson 1989: 306-308) (fig. 2.14). The one exception was observed in a tomb where beads were placed in a Cemetery A style pot (Schaub and Rast 1989: 202; Wilkinson 1989: 308). The beads from cemetery C were generally larger than those found in Cemetery A (Wilkinson 1989: 308). In addition, several bead shapes and materials were found in Cemetery C tombs that were not found in

[2] I will later suggest that the 'faience' beads from Bâb adh-Dhrâʿ are in fact made of glazed steatite.
[3] According to the tomb description published by Schaub and Rast (1989: 152), these beads were found when soil from the tomb floors was sifted and as a result, it was suggested that the beads had either fallen out of a vessel or had been placed on the floor itself. This contrasts with Wilkinson (1989: 304) who suggested an association between these beads and the bones found in the tomb. The tomb description is taken here as more likely to be accurate.

Cemetery A including several standard barrel beads made out of a banded grey stone of unknown material (Wilkinson 1989: 308).

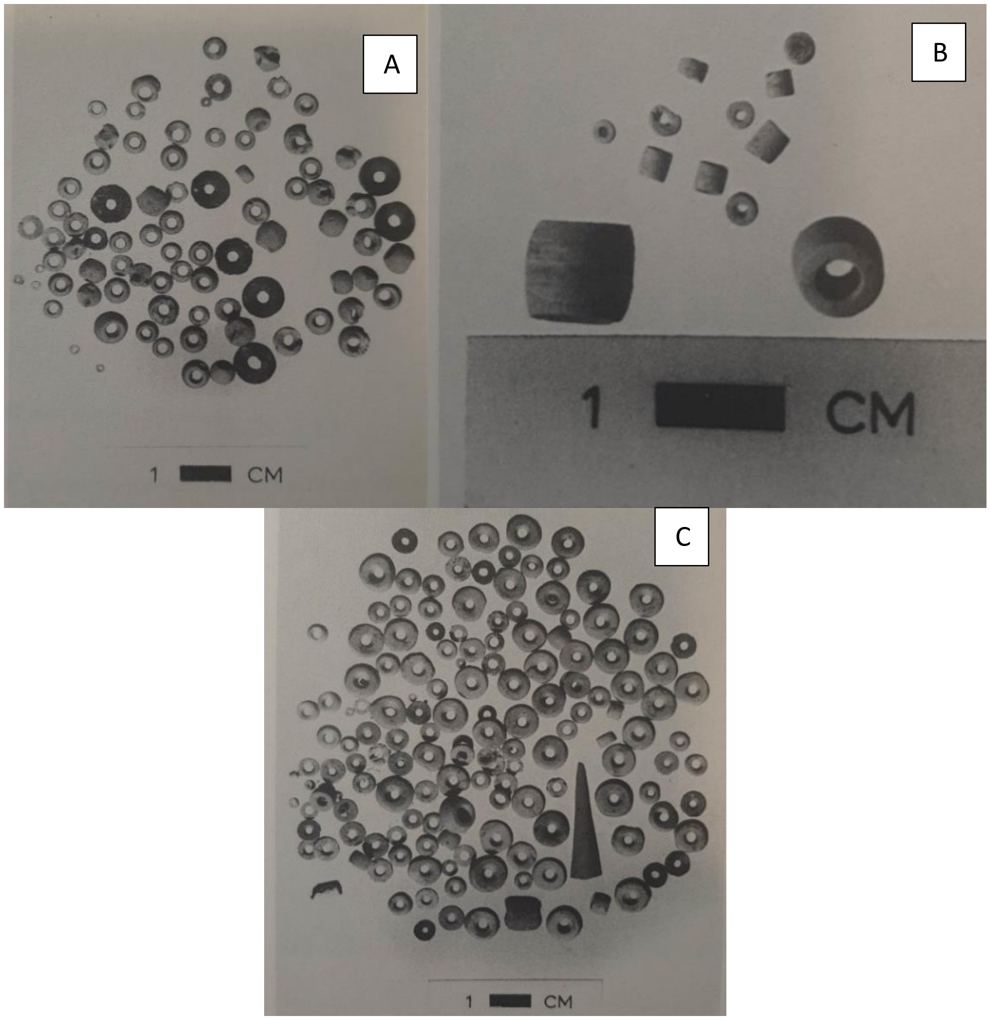


Figure 2. 14 A. Beads from tomb C 1. B. Beads from tomb C 3, C. Beads from tomb C 5 (Reproduced from Wilkinson 1989: 307-308)

This overall pattern suggests that the users of Bâb adh-Dhrâʿ’s different cemeteries placed beads in their tombs according to their own unique traditions. These traditions may have extended beyond how beads were placed and what types of beads were used and might attest to beads playing a slightly different role in the funerary rituals of those who buried their kin in the two cemeteries. In particular, the inclusion of beads amongst bones, rather than placed at a distance in pots is especially suggestive of beads taking on a different role for the users of Cemetery C. The repetitive patterning of beads being placed in family's tombs in exactly the same way over time meanwhile suggests that individual families or kinship groups held long-lived pervasive traditions of their own beyond the guidelines and traditions that dictated burial practices within the broader cemeteries (Chesson 2001: 104, 2007: 118-119). As with other grave goods at Bâb adh-Dhrâʿ, unfortunately, the mechanism that determined whether or not a family included beads in their burials remains elusive (Schaub 2008b: 42-43).

2.8.2 The Bead Assemblage from Fifa's Archaeological Context

Information on the contexts of Fifa's beads is provided by field notes created during the 1989/90 season (table 2.3). While this provides the opportunity to work with the fullest range of data recorded by Fifa's excavators, in some instances, the amount of data available about an assemblage far exceeds that recorded of other assemblages. For example, while full documentation is available for beads found in four tombs, in one instance, the documentation from a tomb is completely missing while in another case, field notes refer to a group of beads that are not listed in the object catalog.

Beads were reported in six of the sixteen tombs excavated by the Expedition to the Dead Sea Plain during the 1989/90 excavation season. The excavators reported that these beads were all made of either carnelian, a material referred to as talc, or shell. Numerous beads were simply described as 'white' with no further identification provided. These seem to be the same as the talc beads. The number of beads found in each tomb varies considerably, with one tomb containing several hundred, and another containing just two (table 2.4).

In the following section, the individual tombs beads were found in are discussed further with reference to their construction, the number and types of burials, the other grave goods found in a tomb, and the specific contexts that different groups of beads were found in. Since beads are small and light, it is possible that they could have moved from their original depositional contexts through post-depositional processes. Some beads may also not have been recovered during excavation. Both factors could impact the final bead counts for each tomb and our understanding of how beads were originally deposited. For example, beads that were recovered strewn across the tomb floor may at one time have formed discreet jewelry ornaments.

It should be noted that the number of beads counted during my research visit to Pittsburgh varied somewhat from the original counts done by the excavators. The new counts are provided below. Lastly, in the case of the 'white/talc' beads, the large numbers of fragmented beads made it impossible for to ascertain the true original number of beads recovered from some tombs. Instead, the number of observed individual fragments are reported alongside the number of complete beads.

Tomb	Robbed	Slab or Cobble Tomb	MNI	Pots	Other Grave Goods
2	N	Mixed	4 (3 adults, 1 subadult).	3	?Beads?
7	N	Mixed	5 (2 adults, 3 subadults)	1	Carnelian, Talc/White, and Shell Beads, Macehead, Metal Ring.
8	Y	Cobble	3 (3 subadults).	20	?Beads?
12	N	Mixed	2 (2 subadults)	4	Perforated Shells, Talc/White Beads, Animal Scapula
20	N	Cobble	6 (3 adults, 3 subadults)	5	Macehead, Animal Scapula, Talc/White Beads
22	N/A	Slab	2 (2 adults)	1	Carnelian Beads

Table 2.3 **Summary of tombs at Fifa which contained beads.**

Tomb:	Robbed	Carnelian	Talc/White	Shell
2	N	?	?	?
7	N	61	657 (26 fragments)	1
8	Y	1	1	0
12	N	0	164 (10 fragments)	3
20	N	0	11 (3 Fragments)	0
22	N/A	2	0	0
Total:		64	833 (+39 Fragments)	4

Table 2. 4 ***Counts of beads made of different materials from Fifa's tombs.***

Tomb 2:

The field notes from tomb 2 indicated that an unspecified number of beads made of an unmentioned material were found in a layer of loose sandy gravel located above the tomb's mud floor. No additional information is available on the beads found in this tomb and none of the beads examined in Pittsburgh could be associated with tomb 2.

Tomb 7:

Three groups of beads were found in tomb 7. The largest group (reg #5070) included 726 beads, 51 of which the excavators identified as carnelian and 674 of which were identified as white/talc. This group was found interspersed, mixed, and somewhat below the large bone cluster at the chamber's north wall. Two smaller groups of beads (reg #5075, 5076) were uncovered in distinct areas of the tomb's floor. These included far fewer beads with reg #5075 having only 4 carnelian and 4 white/talc beads and reg #5076 including 4 carnelian and 7 white/talc beads.

Tomb 8:

No field notes were available to provide information about this tomb. The assumption that beads were found in this tomb is based on Fifa's object registration list, which lists reg #5016, consisting of one carnelian and one talc/white beads as belonging to tomb 8. According to Littleton (1990), this tomb contained three subadult skeletons. While these were elsewhere associated with tomb 1, the original field notes from that tomb do not mention the presence of beads.

Tomb 12:

Three perforated shells were found in tomb 12. Two of these were next to and under the skull of an articulated infant burial, while the last one was found next to the animal scapula. Two main groups of beads were observed in the tomb. The first consisted of white/talc beads that were found around the neck of the articulated infant. The second group was unrelated and consisted of 50 beads found at the southern end of the tomb next to the disarticulated mandible that likely detached from the second subadult skull. Unfortunately, the two separate contexts in which beads were found in this tomb were mixed under one registration number consisting of 177 white/talc beads (reg #5108) and one consisting of 4 talc/white beads (reg #5106). It is unclear why the beads registered as #5106 were separated.

Tomb 20:

According to field notes, tomb 20 contained two groups of beads. The first was found alongside the tomb's pots, a stone macehead, and an animal scapula. An additional group of beads was found in the tomb's southwest corner. While the fieldnotes state that 12 beads were found in each context, or 24 beads in total, in the final registration list, 12 white beads were assigned to one basket (reg #5101) and 2 additional white/talc beads to another (reg #5103). The excavators noted that this tomb had particularly strong evidence for water disturbance.

Tomb 22:

While sifting through backdirt from the excavation of this tomb, 2 carnelian beads were found (reg #5100). The excavators believed that these came from tomb 22 but were not entirely certain.

2.9 The Production and Use of Carnelian and Glazed Steatite Beads: a Technological and Historical Background

In this section, I discuss the geological qualities, production methods, and respective histories of carnelian and glazed steatite beads in the Levant and southwest Asia. In particular, I note the ways that scholars have in the past suggested these objects were made in order to introduce the evidence for manufacture and function that use-wear analysis might reveal.

2.9.1 Carnelian Beads:

Carnelian (SiO_2) is a red or orange form of microcrystalline chalcedony (Kenoyer et al. 2022: 6). Many sources are known with known outcrops existing in the Sinai Peninsula, the Negev Desert, the Egyptian Eastern Desert, Anatolia, Mesopotamia, and Arabia (Albaz and Reed 2021: 55; Bar-Yosef Mayer 2019: 79). While carnelian has a mohs hardness of 7, its microcrystalline matrix allows it to be reduced with relative ease through knapping (Roux et al. 1995). In addition, when carnelian is heat treated between 350 and 380 Celsius, its color is reddened, and it becomes easier to flake (Kenoyer et al. 2022: 5-6).

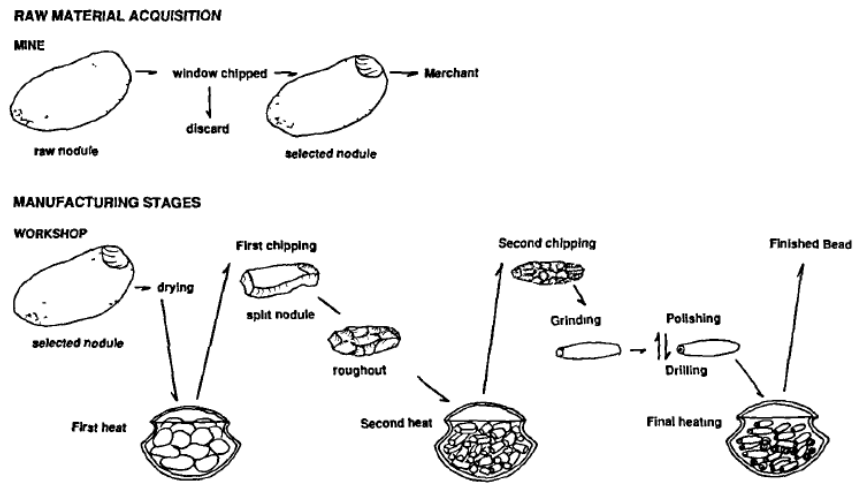


Figure 2. 15 Manufacturing sequence of carnelian beads produced in ethnographic context in Khambat, India (Kenoyer et al. 1991).

Our understanding of carnelian bead production is drawn both from ethnographic observation, primarily of bead makers working in Khambhat India (Kenoyer et al. 1991), and from the study of excavated workshops (e.g., Haibt 2018). These studies have found that carnelian beads are universally created through a process involving knapping, grinding, polishing, perforation, and in some cases, heat treatment (Kenoyer et al. 1991) (fig. 2.15). For the production sequence observed in Khambhat, carnelian pebbles were initially collected and then heat treated in order to remove moisture and to increase the ease of knapping. Then, the carnelian was knapped into a roughout that roughly resembles their intended final shape. Subsequently, beads were ground to remove flaking scars and to ensure they are of proper size and shape. This was followed by an extended process of polishing aimed at increasing a bead's luster and removing prior manufacturing marks. Lastly, beads werere perforated.

While there might be slight differences in the aforementioned production sequence related to how many times the carnelian is heat treated, how many stages of grinding and polishing a bead might go through, or the exact order in which polishing and perforation take place, the greatest source of variation relates to how carnelian beads are perforated (Kenoyer and Vidale 1992; Kenoyer et al. 2022). Broadly, perforation can be performed using two methods, rotary drilling and pecking. Rotary drilling involves the continuous rotation of a drill in order to generate a hole. Due to carnelian's hardness, drilling with a flint drill on its own is not efficient. Efficiency is markedly increased through the use of lubricants and abrasives such as crushed quartz (Gwinnet and Gorelick 1988). Drilling efficiency is further improved through the use of a bow or pump drill, which increases the speed and friction of the drill bit, which in turn significantly reduces the time needed to create a perforation. The bow drill may have been in use at a relatively early date, with some arguing for its use as early as the 8th or 7th millennium BCE (Groman-Yaroslavski and Bar-Yosef Mayer 2015; Gwinnet and Gorelick 1990: 30). Most reconstructions suggest that carnelian beads were perforated using flint drill bits that were hafted onto bow drills (Kenoyer and Vidale 1992) (fig. 2.16).

Figure 2. 16 Reconstruction of a bow drill with a hafted flint splinter (Reproduced from Groman-Yaroslavksi and Bar-Yosef Mayer 2015: 86).

Alternatively, carnelian beads of certain lengths and diameters could be perforated using a percussive technique called pecking (Chevalier et al. 1982). This technique involves repetitive pecking on one or both sides of a bead using a flint perforator with a thin tip (fig. 2.17). This perforator may have been hafted, or alternatively could have been used for indirect percussion by being hit with a hammer. By repeatedly striking the hard surface of a bead, gradually, material is removed from the bead's center, creating a perforation (Kenoyer et al. 2022: 16). Pecking may be carried out from both ends of a bead, or alternatively done relatively deeply on one end. Thereafter, on beads pecked from one side, the perforation is completed using single powerful percussive blow directed through the perforation which removes a negative cone from the bead's other end (Chevalier et al. 1982: 57). On examples of beads perforated using this technique, pecking scars are found on only one side. In general, pecking produces a shallow biconical drill hole accompanied by characteristic scarring (Kenoyer et al. 2022: 21).

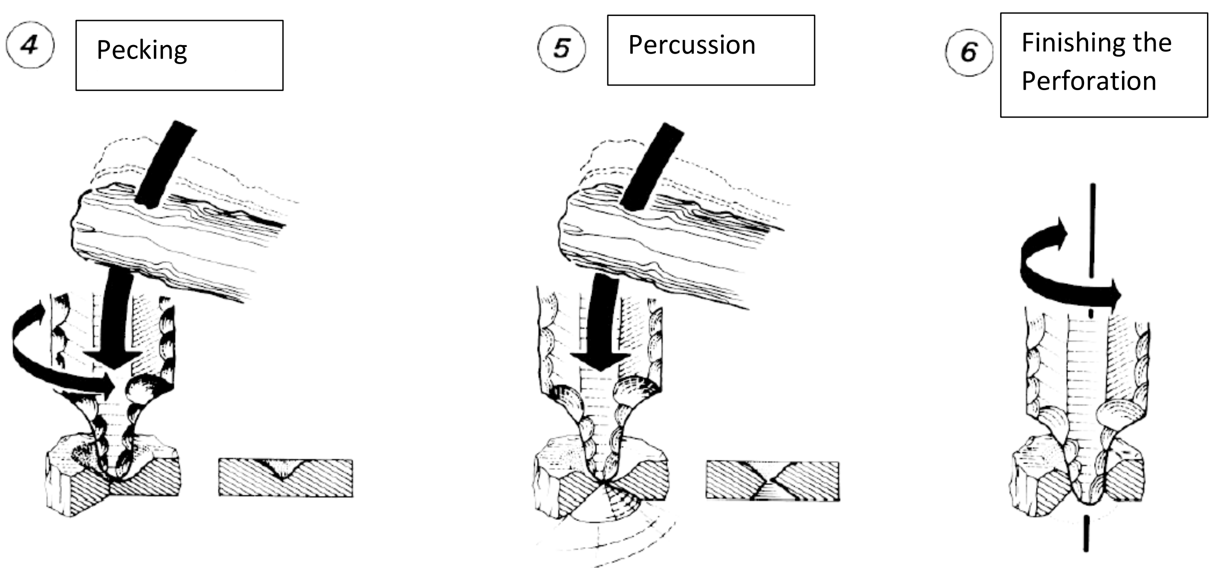


Figure 2. 17 Schematic of pecking perforation technique used to perforate a short cylinder carnelian bead (Reproduced from Chevalier et al. 1982: 62).

Carnelian beads are found in the Southern Levant from as early as the Middle Pre-Pottery Neolithic B (9900-9500 BP) (Groman-Yaroslavski and Bar-Yosef Mayer 2015), with examples found throughout the rest of the Neolithic and subsequent Chalcolithic periods (Bar-Yosef Mayer 2019). Whereas earlier Neolithic carnelian beads are found in complex shapes such as the well-known butterfly beads found across Neolithic southwest Asia (Alarashi 2016), by the Chalcolithic, carnelian beads were becoming increasingly small and restricted to a few shapes including, primarily, short barrel and short cylinder beads.

During the Chalcolithic, beads were perforated using both rotatory drilling and the pecking technique (Bar-Yosef Mayer and Porat 2013: 341). Throughout the EBA, carnelian beads were amongst the most common variety of beads in use and were, in almost all known cases shaped into short barrel or short cylinder shapes (Albaz and Reed 2021). Though the vast majority of carnelian beads from the EBA are thought to have been perforated using the pecking technique (Ludvik 2018: 721-725), some were apparently perforated using rotary drilling (Yannai and Bar-Yosef Mayer 2016: 117).

Whereas by the Intermediate Bronze Age (c. 2500-2000 BCE), a select number of the carnelian beads found in the Levant came from as far away as the Indus Valley (Ludvik 2018), in the EBA, beads likely came from more local sources. Despite the wide variety of known carnelian sources, only a few 4th millennium BCE workshops are known from the southwest Asia and Egypt. Two of these are in Upper Egypt, at the sites of Hierakonpolis (Hikade 2004; Quibell and Green 1902: 11-12) and Abydos (Peet 1914: 3-4), one is in Lower Egypt at Tell el-Farkha (Chłodnicki 2017), and the final one is located at Tayma in North West Arabia (Haibt 2018; Purschwitz 2017). An additional carnelian bead workshop is thought by several scholars to have existed at Naqada in Upper Egypt due to its role as a center of craft production and goods exchange (Bard 1994: 107; Hassan et al. 2017; van Wetering and Tassie 2020: 71). Excavations there, however, have not yet uncovered this hypothesized workshop. Each of these sites produced the type of short cylinder and barrel beads known from Levantine EBA contexts. The published evidence for carnelian bead manufacture at each is highly variable, ranging from the presence of flint microdrills to the extensive presence of production waste from knapping carnelian nodules.

The presence of carnelian bead workshops in upper Egypt is unsurprising considering the local availability of carnelian (Aston et al. 2000: 26-27), as well as the abundant carnelian beads found throughout every known predynastic cemetery in the region (Andrews 1990; Harrell 2017; Xia 2014: 74). In later periods of Egyptian history, carnelian was understood as a magical stone that was stipulated for use as the heart amulet and represented traits such as the restoration of life, energy, dynamism, and power (Andrews 1994: 72; Ludvik 2018: 292-293)

The most extensively published bead workshop in Egypt is that located at Hierakonpolis where an area was excavated with abundant quantities of complete carnelian pebbles and debitage (Hikade 2004: 187-189). Several preforms were found, demonstrating that short barrel and cylinder beads were produced in the workshop (Hikade 2004: 189). These were found in the same context as flint microdrills (Hikade 2004: 190-191). According to the excavator, these finds could be dated to the Naqada IIC-D (c. 3450-3325 BCE). As a result, the workshop seems to post-date Fifa’s use. In addition, this workshop was quite small and could not have been responsible for producing the total quantity of beads known from Hierakonpolis, much less a significant quantity of exported beads (Hikade 2004: 192).

While an additional predynastic carnelian workshop was found at Hierakonpolis by its earlier excavators, its exact date is uncertain (Quibell and Green 1902: 11-12). This is very similar to the evidence for the predynastic bead workshop at Abydos, which can also not be dated more precisely. Evidence for this workshop is provided by several hundred flint microdrills and a large number of unworked carnelian pebbles (Peet 1914: 3-4). Though the workshops at both sites made beads of the same type found in the EBA southern Levant, they all appear to post-date the EB IA. The same issue holds true for the bead workshop found at Tell el-Farkha in the Nile Delta which dates to the Naqada IIIB-C (c. 3100 BCE) (Chłodnicki 2017: 213).

Recent research has uncovered evidence for much more extensive carnelian bead production at the oasis site of Tayma in Northwest Arabia. Limited excavation at the site has revealed extensive production waste from carnelian bead manufacture including debitage from knapping carnelian nodules and worn-out flint microdrills (Purschwitz 2017: 294). While this material was found in discard dumps around the site, rather than in an excavated workshop space, in the view of the excavators, the sheer quantity of material associated with manufacturing waste from bead production speaks to the intensity of production that took place at the site (Purschwitz 2017: 301). In fact, while only 18 complete short barrel and cylinder carnelian beads were found over the course of excavation, based on the sheer extent of carnelian debitage, one study estimated that over 110,000 carnelian beads were made at Tayma (Haibt 2018: 116).

The lack of finished beads known from Tayma has led the excavators to conclude that the vast majority of beads produced at the site were exported (Haibt 2018: 129). In light of this, the presence of a fan scraper, a diagnostic chipped stone artifact of the Chalcolithic/EBA Levant, may be crucial to demonstrating connections with the Levant (Purschwitz 2017: 292). Further evidence for connections with the Levant may be provided by the presence of bitumen and copper fragments in association with production debris from carnelian manufacture. As no evidence of copper mining or smelting is known from Arabia that predates the 3rd millennium BCE (Haibt 2018: 108; Magee 2014: 71), this copper may have originated in the Levant. Radiocarbon dates from the site have established that carnelian bead production most likely started there in the early 4th millennium BCE and possibly continued until the start of the 2nd BCE millennium BCE (Haibt 2018: 15).

2.9.2 Glazed Steatite Beads:

Steatite ($Mg_3Si_4O_{10}(OH)_2$) is a fine-grained, compact, and very soft stone primarily composed of the mineral talc, which has a mohs hardness of 1 (Rapp and Hill 2006: 210). As a result, it can easily be carved and abraded using a wide range of materials. When fired at a temperature of 900-1100 centigrade for at least one hour however, steatite is chemically transformed into enstatite ($MgSiO_3$), a mineral of mohs hardness 7 (Vandiver 1983: A-67). While examples of unglazed chemically hardened steatite objects are known from 5th and 3rd millennium BCE contexts in Mesopotamia (Beck 1934: 76-77), by in large, historically, and across a wide geographical area, the use of chemical hardening appears in tandem with glazing (Bouquillon et al. 1995; Tite and Bimson 1989).

The term glaze refers to a vitreous substance that when heated to a certain temperature forms a discrete layer on the outside of an object. Glazes typically include several elements including silica, which helps to form the glass layer, a flux, which lowers the melting point of the glaze, facilitating its formation, and a colorant (Tite and Shortland 2008: 18). In the case of glazed steatite, the silica is provided by the steatite itself, the flux was provided by an alkali, either natron or plant ashes, and colorants could be provided by a variety of mineral pigments, such as malachite (Tite et al. 2008: 29). At present, three glazing methods are known to have been used in antiquity (fig. 2.18). These are application, cementation, and efflorescence.

In brief, application glazing involves either an object being dipped into or painted with a liquid glaze. Objects are then suspended and fired in the kiln (Nicholson and Peltenburg 2000: 191). Cementation glazing involves an object being placed in a dry glazing powder, which is held in some kind of larger receptacle. This receptacle is then fired, after which, objects are glazed, and easily removed from the friable glazing powder (Matin and Matin 2012). Lastly, in efflorescence glazing, the glazing elements are part of the raw body of an object. When fired, these materials percolate to the object's surface, forming a glaze layer (Nicholson and Peltenburg 2000: 189). While the first two methods require a solid, pre-formed object, efflorescence glazing involves molded objects made out of pastes that become solid after firing. Certain general criteria are suggested for the proper identification of these different varieties of glaze at macroscopic and low power microscopic levels (Tite et al. 2008b: 49; Vandiver 1983: A-38-A-43). The reliability of some of these criteria has however recently been questioned, particularly for cementation glazing (Matin and Matin 2012: 768-769).

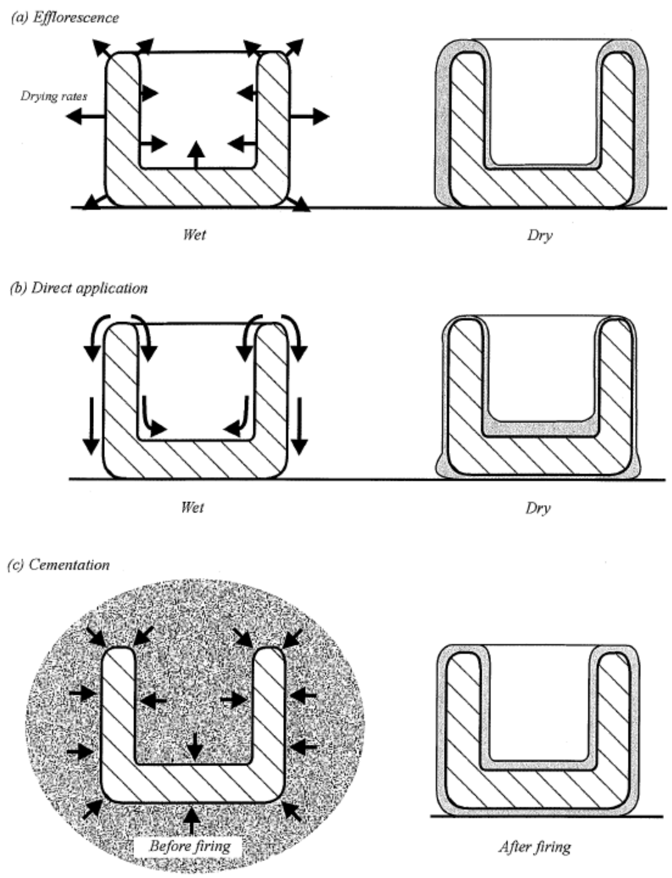


Figure 2. 18 Schematic diagram showing the three different methods used for glazing (Reproduced from Tite et al. 2008b: 48)

Since the 1930s, scholars have suggested two production sequences for the manufacture of glazed steatite beads (Mackay 1937; Xia 2014: 33-34[4]). The first involves the carving and shaping of steatite blocks, which are then glazed using application or cementation glazing. The second involves forming steatite into a paste which is glazed using efflorescence. The production of a glazed steatite bead from solid material begins by sawing a block of steatite into smaller rectangular cuboids. The cuboid is then transformed into a cylinder by being rolled on a flat grinding stone. Thin slices are then removed from the raw steatite cylinder to form bead blanks. These are then perforated to make a bead. Due to steatite's softness,

[4] This work actually dates to 1932 but has only recently been published.

perforation may have been accomplished using a wide variety of materials. Some scholars however suggest that perforation was primarily carried out using copper perforators (Payne 1993: 204). Finally, bead's lengths and diameters are reduced through abrasion against a flat grinding slab. In particular, by placing a large number of steatite beads on a string and abrading their profiles against a flat grinding stone, it is possible to reduce them to a very minute size within a very short period of time (Vidale 1995) (fig. 2.19).

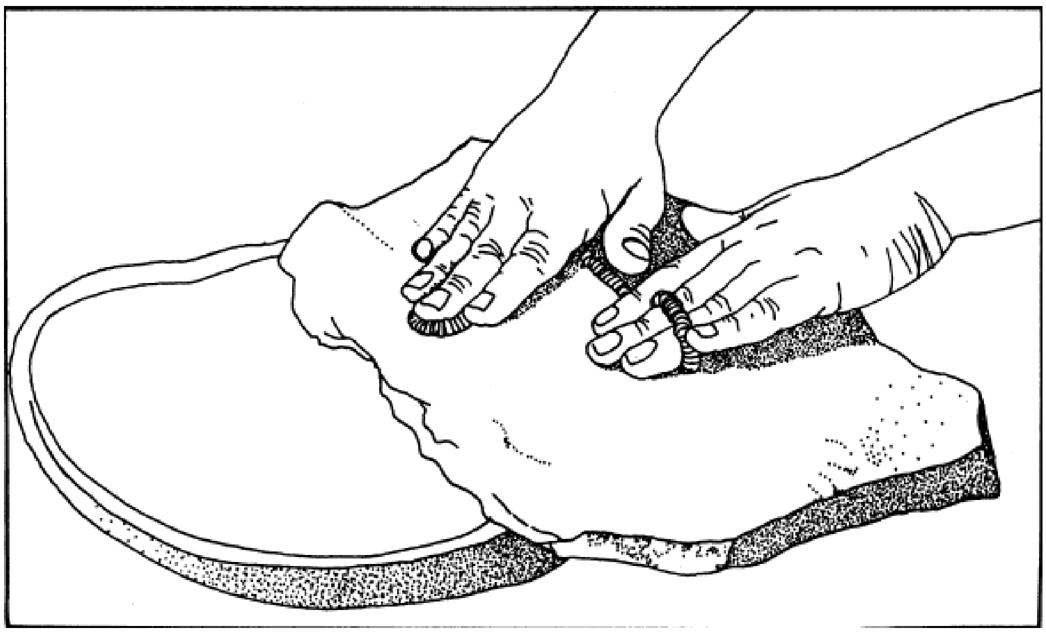


Figure 2.19 Technique for reducing the size of many beads at once (Reproduced from Vidale 1995: 69)

For application glazing, beads could have acquired their glaze by having it poured on them while they were in a receptacle, by being dipped into vats of glaze either individually or in groups placed on strings, or by being individually painted with glaze (Xia 2014: 35). Once exposed to glaze, beads were would have been suspended in the kiln by a string, which would then burn up during the course of firing with the beads falling to the kiln bottom (Lucas and Harris 1962: 44-45). Alternatively, some scholars suggest that beads would be held up in the kiln by some kind of device that maintained regular contact with the bead's profiles (Vandiver 1983: A-68). For cementation glazing, a large number of beads could be placed within a receptacle holding glazing powder. This receptacle would then be fired, leaving the powder friable and easily removed, and the beads evenly glazed.

It has long been theorized that a second method was used to produce glazed steatite beads (Mackay 1937: 11-12). This method involves the initial crushing of steatite into a powder, which would then be combined with glazing and binding elements in order to form a paste (Hedge 1983). This paste would then be poured into a tube of the desired shape and size. In order to include a perforation, some material, possibly straw, is thought to have been placed at the center of the tube. During firing, the tube would be heated to the proper temperature, forming a solid and glazed object. Afterwards, the tube would be removed from the kiln, the inner contents would be removed, and individual bead blanks would then be sawn off (Bar-Yosef Mayer et al. 2004: 497). Alternatively, slicing may have taken place before firing (Bar-Yosef Mayer and Porat 2009: 118). Some scholars have recently cast doubt on whether this method was ever used to produce glazed steatite beads, particularly in the Indus Valley where scholars originally suggested this production method (Law 2018).

Glazed steatite beads are known from a wide variety of contexts including Egypt, the Levant, Mesopotamia, the Indus Valley, Anatolia, and southern Arabia. Steatite is locally available in each of these regions, with the exception of the Levant (Bar-Yosef Mayer et al. 2004: 497; Damick and Woodworth 2015: 605). Due to its softness, unfired steatite was used to make ornaments in several regions from a relatively early date with it being in use in the Indus Valley as early as the 7th millennium BCE (Kenoyer 2021: 45) and Anatolia from as early as the 10th millennium BCE (Baysal 2019: 107). The earliest reported steatite artifacts in Egypt date to the 5th millennium BCE and are glazed (Aston et al. 2000: 59).[5]

Glazed steatite technology first emerged in several regions during the second half of the 5th millennium B.C.E. While differences in regional chronologies makes it difficult to compare where the technology was first used, the fact that it seems to have emerged contemporaneously with the spread of copper working and use across a broad area has led some to speculate that glazing technology formed part of a broader Chalcolithic pyrotechnological "experimental package" that spread across the southwest Asia and beyond (Bar-Yosef Mayer et al. 2004: 499). Though independent invention of the technology in several areas remains a possibility (Tite et al. 2008: 35), the fact that glazed steatite beads of minute size appear almost simultaneously in Mesopotamia (Beck 1934: 76-77), the Levant (Bar-Yosef Meyer et al. 2004), Egypt (Horn 2015), Anatolia (Ekmen et al. 2020), and the Indus Valley (Bouquillon et al. 1995) has been used by some scholars to suggest technological spread (Bar-Yosef Mayer et al. 2004). With regards to the Levant and Egypt, one recent study has suggested that 5th economic cooperation between Nile Valley groups and individuals from the Levant during the Chalcolithic was responsible for the spread of copper technology and glazing techniques to Egypt. As a result, it is possible that people living in both areas shared ideas around the meaning and significance of glazed steatite beads (Ben-Marzouk 2020: 192-195).

Connections with copper production and its spread are borne out by the universal use of copper-based glazes with green or greenish-blue colorations in all regions that glazed steatite beads appeared (Tite et al. 2008a: 30). Further indications of technological spread

[5] Over the course of my research, I have been unable to find any references to steatite objects in Egypt that date before the use of glazed steatite beads in the 5th millennium BCE.

may also be indicated by the shared emphasis on glazed steatite beads' small sizes across a vast area. Lastly, in most regions that they appeared, glazed steatite beads were mostly found in funerary contexts (Brunton and Caton-Thompson 1928; Ekmen et al. 2020; Bar-Yosef Meyer and Porat 2009: 112; Panei et al. 2005) or as part of foundation deposits (Klimscha 2011: 190-191; Mallowan 1947: 159-160; Rowan and Golden 2009: 66). This might indicate a shared body of ideas regarding these objects and their significance that accompanied the technology as it spread.

Research focused on the chemical composition of glazes from Egypt (Vandiver 1983: A-42-A-45; Tite and Bimson 1989: 90-91), the Levant (Bar-Yosef Mayer and Porat 2009: 113), Anatolia (Pickard and Schoop 2013: 9), and the Indus Valley (de Saizieu and Bouqillon 2001) has revealed slight compositional differences between the glazes used in these different areas. This relates not only to the different percentages of certain elements being present in a bead's glaze, but also to the wholesale appearance or non-appearance of particular elements in the glaze at all. This is, however, likely attributable to the local availability of different materials (Tite et al. 2008a: 35).

Our understandings of glazed steatite bead production is highly uneven across these different regions. In fact, the only known workshops devoted to producing glazed steatite objects are in the Indus Valley (Meadow and Kenoyer 2005; Vidale 1989). While excavators suggested that a kiln found at Çamlıbel Tarlası in Anatolia may have been used for glazing, this remains inconclusive (Pickard and Schoop 2013: 17). Nonetheless, the local availability of steatite outcrops and large numbers of beads found in places such as Egypt are taken as highly suggestive that such workshops did indeed exist but have yet to be found.

Lastly, the preservation of glazes on glazed steatite beads are highly variable. As noted by Kenoyer (2021: 59), glaze does not adhere well to steatite beads and tends to flake off. In addition, Kenoyer observed that soil chemistry has a profound effect on the preservation of glazed steatite which can become weathered and friable in certain soil conditions (Kenoyer 2021: 52). This is borne out in the context of the some of the glazed steatite beads found in the Levant. At the Chalcolithic burial cave of Peqi'in for example, almost the entirety of the bead assemblage had lost its original green or greenish blue coloration with some beads retaining only a slight greenish hue (Bar-Yosef Mayer et al. 2004: 495-496). In fact, according to Bar-Yosef Mayer (et al. 2014: 270) only one site in the Levant is known where some part of the glazed steatite assemblage maintained its original coloration.

2.10 Conclusion:

In this chapter I provided the background to the production and use of the beads found in the Fifa cemetery. Reviewing the Chalcolithic period, I highlighted the recent emergence of scholarship around the importance of copper production and use to Chalcolithic religion. This likely informed the significance of the glazed steatite beads used in that period and vested them with specific meanings. Next, I discussed the transition from the Chalcolithic to the EB IA highlighting the sheer extent of transformation between the two periods as well as how religious and ideological change may have played an important role. Despite the changes that took place in the Levant, contact with Egypt may have increased in this period as borne out by the establishment of several sites that likely acted as centers of trade for a variety of goods, but particularly copper. Turning to the EB IA, I focused on a recent body of scholarship that has highlighted the potential importance of mobility in the lives of EBA peoples, some of whom may have occupied multiple sites at different times of the year. In addition, I reviewed the importance of mobile peoples to the production and movement of a variety of objects used during the EB IA. This focus on mobility is extremely important to consider in light of the fact that the kinship groups who buried their dead at the cemeteries of the Dead Sea Plain possibly lived a mobile existence.

Turning towards burial, I reviewed the currently known cemeteries and burial sites that date to the period. There, I highlighted the fact that most, if not all known burial sites from the period cannot clearly be associated with a permanently occupied sedentary settlement, demonstrating that burial practices were yet another arena for mobility and aggregation. The Nawamis of the Sinai were also discussed due to the likely role of their builders in the exchange both of goods and ideas between the Levant and Upper Egypt. The similarities between the three cemeteries of the Dead Sea Plain were then reviewed before each was discussed in turn. Particular emphasis was placed on the interpretation of the burial ground at Bâb adh-Dhrâʿ as it has been the most extensively excavated, published, and theorized with several of its research conclusions thought to graft directly onto the cemeteries at Fifa and Naq'.

While little is known about Naq''s bead assemblage, a close review of the beads from Bâb adh-Dhrâʿ revealed differences in both the types of beads and the way that beads were used in the two distinct burial grounds at the site. This was argued to demonstrate that beads could be used as evidence for slightly different burial rituals between these two groups as well as for the maintenance of specific traditions around their use within particular kinship groups. The specific contexts of Fifa's beads were reconstructed on a tomb-by-tomb basis. This revealed that while most contexts were either dispersed or mixed with the tomb's bone piles, in some cases, beads could be connected to particular persons. Lastly, I surveyed prior scholarship on carnelian and glazed steatite beads focusing on how they were manufactured, where they may have been produced, and the history of their use both in the Levant, and across southwest Asia more broadly. Each of these issues will later come together in the presentation of a unique life history for both the carnelian and glazed steatite beads found at Fifa.

Chapter 3: Methods

3.1 Introduction

This chapter presents a synthesis of the methods used to analyze the bead assemblage from the Fifa cemetery. The chapter begins with a brief introduction to use-wear analysis and its application to the study of beads. Subsequently, it introduces the sampling and data collection procedures used by the author during a research visit made to the Carnegie Museum of Natural History in September and October 2021. A framework is then presented for low magnification use-wear observation on carnelian and glazed steatite beads. The methodology used to conduct experiments on glazed and unglazed steatite beads is also presented. The use of SEM-EDS and XRD analysis to the study of beads is discussed before the sampling and analytical procedures these instruments were used for are described. Lastly, the chapter addresses the creation of a synthetic database of published bead assemblages from the Levantine Chalcolithic and EB I.

3.2 Use-wear Analysis and Its Application to the Study of Ornaments

3.2.1 Overview of the Use-wear Approach to the Study of Ornaments

It has long been recognized that the study of beads found in archaeological contexts can be greatly enhanced through microscopic study. Writing in 1934, Horace C. Beck noted that, “In no branch [of archaeology] is the microscope of more use than in the study of ancient beads (Beck 1934b: 186).” Nonetheless, the study of beads under the microscope remains relatively uncommon, with most beads receiving only descriptive treatments which note their numbers and possible materials. Over the past 30 years however, scholars have begun to apply use-wear frameworks, developed for the study of stone tools, to beads (Groman-Yaroslovski and Bar-Yosef Mayer 2015: 79). These studies have dramatically expanded our knowledge of bead manufacture and have demonstrated the capability of bead assemblages to offer windows into broader topics such as exchange and craft production.

Through careful observation at micro and macroscopic scales and the comparison of these observations to experimental and ethnographic ornaments, scholars have begun to understand the use-wear patterns that develop on beads in association with their manufacture, use, and deposition (Falci et al. 2019). Use-wear analysis has been applied to ornaments of numerous materials including shell (d'Errico et al. 2005; Margarit 2016; Tátá et al. 2013), stone (Kenoyer 2017a; Vidale 1995), bone (Winnicka 2016; Van Gijn 2017), and ostrich eggshell (Wei et al. 2017).

In addition to expounding the stages involved in manufacturing beads, which is by far the most common type of research pursued through use-wear studies (Bains et al. 2013; Gurova and Bonsall 2017; Kandel and Conard 2005; Kenoyer 2017a, b; Vidale 1995), many studies have utilized use-wear analysis on beads to better understand a broad array of topics such as funerary practices (Cristiani and Boric 2012; Minotti 2012), trade and exchange (Ludvik 2018; Bar Yosef-Mayer et al. 2004), the emergence of hominin symbolic behavior in the Paleolithic period (d'Errico et al. 2005; Tata et al. 2014), and the organization of craft production in prehistoric societies (Wright et al. 2008).

3.2.2 What is Wear and What Causes Wear?

The term 'wear' refers to, "a continuous damage process of surfaces, which are in contact with a relative movement (Shizhu and Ping 2012: 263)." This damage or alteration can be attributed to four processes that typically operate in tandem. These are adhesive wear, fatigue wear, abrasive wear, and tribochemical wear (Adams et al. 2009: 46). Adhesive wear forms as a result of molecular bonds breaking when two surfaces move across one another. Fatigue wear takes place when the topographically highest points of elevation on a surface collapse due to being overexposed to pressure from another surface. Abrasive wear forms as a result of the scratching or gouging of a softer surface by a harder surface's asperities. Tribochemical wear forms as a result of chemical processes that take place when two surfaces interact **(**Adams et al. 2009: 46). Though wear formation has largely been studied for ground and chipped stone tools as well as for bone tools, these same processes operate to create wear on beads.

While the manufacturing processes involved in creating beads for different materials varies, in most instances, the production of a bead involves the reduction of a larger piece of raw material such as a bone or a block of stone through sawing or cutting, shaping through abrasion on one or several materials, perforation, and polishing (Kenoyer 2017a: 130). Each of these processes generates a form of wear referred to as manufacturing traces (Groman-Yaroslovski and Bar-Yosef Mayer 2015: 79).

Wear continues to develop after manufacture. This additional wear develops as a result of contact between the bead and string, a type of wear generally referred to as 'string wear.' In addition, wear can form as a result of a bead's surface making contact with another bead's surface while worn as an ornament, as a result of a bead's contact with a worn garment, and as a result of a bead's contact with skin and bodily oils. The extent to which each of these post-manufacture factors leave behind wear depends heavily on the hardness of the material the bead was made from, the amount of time a bead was in use for before deposition, and the exact way a bead was strung. Further, post-depositional processes may also affect the manifestation of wear and erase traces that might have been visible at the time of deposition. Though wear may be found across an entire object, beads most commonly manifest wear on their ends, profiles, perimeters, and in and around drill holes (Falci et al. 2019: 792; Kenoyer 2017a).

Use-wear analysis has revealed that the techniques and materials used for each stage of an object's manufacture leaves behind diagnostic traces (Adams et al. 2009: 48). The meaning of these traces in turn can be understood by a use-wear analyst via comparison with an experimental or ethnographic dataset (Falci et al. 2019; Kenoyer et al. 1994; Roux et al. 1995; Vidale 1995). Though later stages of manufacture largely erase diagnostic wear from earlier production stages, these are occasionally preserved on limited parts of the bead, making it possible to utilize use-wear analysis expound much of a bead's life history (Groman-Yaroslovski and Bar-Yosef Mayer 2015: 84).

Different types of wear might only be visible at higher or lower levels of magnification or using different types of microscope. The magnification at which beads' wear traces can be observed depends on numerous factors including the size of the bead and the ways that different materials manifest wear. Ideally, a use-wear analyst will be able to study objects at multiple scales of magnification in order to evaluate the full range of wear. Practically however, this approach is far more feasible for the analysis of a small assemblage or subset of beads due to the time involved in locating and photographing less common and smaller wear traces.

Many significant wear traces may be obtained from lower magnifications. These include a bead's general state of preservation, marks from sawing, grinding, and chipping, areas of smoothing and sheen, either from polishing during manufacture or factors like string-wear, and the shape of a bead's drill hole (Kenoyer 2017a: 163-5). Higher magnifications meanwhile might reveal information such as whether a stone bead was heat treated or the specific materials that might have been used to abrade and polish it (Groman-Yaroslovski and Bar-Yosef Mayer 2015: 84).

While bead's exteriors are readily visible to use-wear analysts, sometimes information, such as the extent of string wear, or the type of drill or drilling technique used to perforate a bead is only available from the study of a bead's perforation. In order to access this information, Gwinnet and Gorelick (1979; 1981; 1993) pioneered a technique whereby impressions can be taken of bead holes and thereafter examined under a scanning electron microscope (SEM). Kenoyer (2017b) has spent decades building on this technique for researching hard stone beads. I elected not to pursue the use of impressions and SEM analysis for two primary reasons. Firstly, the drill holes of Fifa's carnelian beads are cone shaped rendering them entirely visible with optical microscopy. Secondly, tests conducted with dental impression putty and raw blocks of steatite found that the putty left behind significant staining. As a result, this technique was not pursued.

3.2.3 Equipment and Software Used for Use-wear Study of Fifa's Beads

An AM73915MZTL Dino-lite digital USB microscope was utilized for low-power microscopic use-wear observation and photography at between 10x and 140x. In addition, the Dino-lite's built in photography software, DinoCapture, allowed for rapid object photography. Its built-in measurement software expedited the process of taking measurements and was especially useful for measuring the small and delicate glazed steatite beads that could have otherwise been physically damaged by the use of metal digital calipers. DinoCapture's measurement software was calibrated using measurements taken from a metal set of digital calipers.

Carnelian beads were lit using a combination of the Dino-Lite's built in LED lights, a backlight that lit the bead from below, and two external light sources that provided raking light. This raking light was especially important for highlighting areas of polish. DinoCapture had some difficulty properly capturing the white balance of Fifa's steatite beads. These could only be properly imaged using a combination of the Dino-Lite's built in LED light and a backlight. Carnelian beads were commonly photographed using the Extended Dynamic Range (EDR) function. This function stacks multiple photographs of the same object taken at different exposures and commonly brought out the carnelian bead's depth of color. Steatite beads were best captured simply using the 'photograph' function.

Helicon Focus 7 photo stacking software was used to stack photographs. Though DinoCapture has a built-in photo stacking option, when used, this function produced glossy and translucent photographs of a low quality. As a result, it was avoided.

3.3 Use-Wear Frameworks for the Study of Fifa's Beads

3.3.1 Sampling Strategy and Data Collected from the Excavated Assemblage of Fifa's Beads

Beads were selected for study from each of the 14 original registration numbers assigned to them during the 1989/90 excavation season at Fifa. These numbers separate beads by tomb, locus, and basket. Before any other steps were taken, each bead was counted to double check the rough counts done immediately after excavation. When a registration number encompassed fewer than 20 beads, every bead within that context was photographed and measured. When a registration number included more than 20 beads however, regardless of bead material, a 20% random sample was taken for study. While the selection of most beads was entirely random, a group of 10 beads from 5070.004, a context from Tomb 7, were selected for examination due to at least part of their exteriors being green. These were of particular interest due to the suggestion by some scholars that the exteriors of glazed steatite beads found in the Levant were originally entirely coated in a green or blue-green glaze that has faded with time (Bar-Yosef Mayer and Porat 2009: 113). Ultimately, 231 beads and 3 seashells were examined, including 205 ‘white’ beads out of 833, 24 carnelian beads out of 64, and 1 bead made out of an unknown material, likely shell. These were drawn from every registration number.

Selected beads were placed under the Dino-lite and photographed on both ends as well as on their profiles. After being photographed, several measurements were taken including the bead’s maximum length and diameter, and the maximum diameter of its drill hole on both sides. Maximum length and diameter measurements were used to classify the bead’s shape according to the standardized terminology published by Horace C. Beck (1928). This publication allows beads to first be sorted according to the shape of their longitudinal sections (i.e., circular, elliptical, ovoid, etc.). Subsequently, measurements of the beads length and diameter are used to classify them as disc beads, defined by having a length less than 1/3 diameter, short beads, defined by having a length more than 1/3 and less than 9/10 diameter, standard beads, defined as having a length more than 9/10 and less than $1^{1/10}$ diameter, and long beads, defined as having a length more than $1^{1/10}$ diameter (Beck 1928: 4). Beads were then classified according to 23 unique shape classes (fig. 3.1). Drill hole types were also characterized at this point using the standard established by Beck

(1928: 54). Ultimately, each of these levels of standardized classification allows beads to be precisely described and classified by established regional standards in bead typology. Lastly, bead's colors were recorded using a Munsell Soil Color Chart. Colors were reported by vernacular names rather than by specific chroma and value.

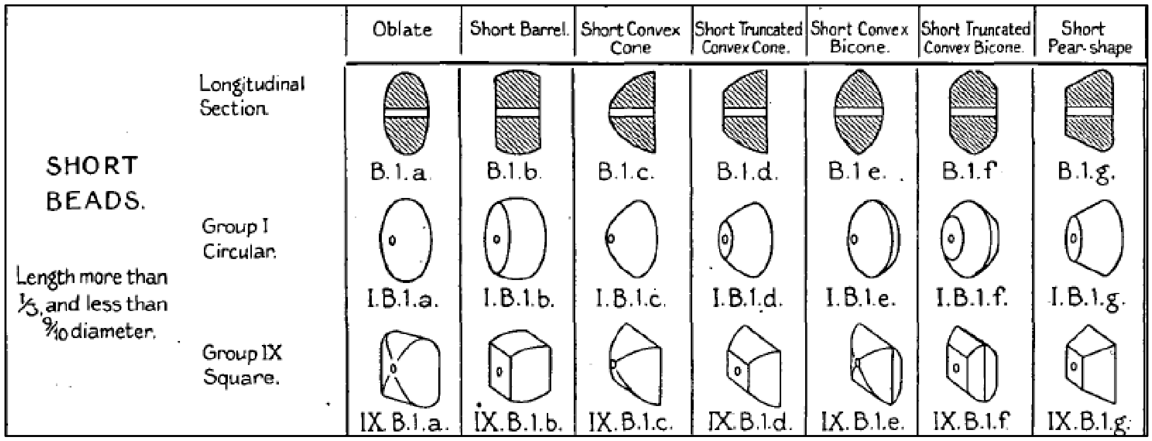


Figure 3. 1 Beck classification scheme with examples of short and square short beads (Reproduced from Beck 1928: Pl 2.)

3.3.2 Use-Wear Framework for Carnelian Beads

The most prolific descriptive use-wear framework for carnelian beads is that developed by Kenoyer (2017a). This framework provides a standardized set of criteria for describing a hardstone bead's state of preservation, exterior surface, and perforation (Kenoyer 2017a: 163-165). Although the criteria provided in that publication are useful for classifying use-wear on carnelian beads, it does not provide a means of classifying the state of development or morphological characteristics of particular wear traits. For example, beads may only be described as chipped and ground, without the ability to classify exactly how much of the bead's surface retains evidence of chipping or the distribution, density, and disposition of its grinding marks. As a result, for the purposes of classifying the use-wear found on the carnelian beads studied for this thesis, I have drawn on Kenoyer's framework, but complemented it through the inclusion of terminology taken from frameworks used to describe use-wear on groundstone tools including those published by Adams et al. (2009) and Dubreuil et al. (2015). Use-wear was described on several distinct parts of the carnelian beads including on their ends, profiles, perimeters, at the intersection of the bead end and the drill hole, and within the drill hole itself. The traits recorded for different parts of the bead are referenced in Tables 3.1 whereas Table 3.2 defines different levels of intensity that traits may appear at.

The interpretation of the use-wear found on carnelian beads is assisted by several ethnographic studies that have greatly expanded our understanding of their production. Examining contemporary carnelian bead workshops using 'traditional production methods' in Khambhat, India, various scholars have clarified the production sequence used for producing carnelian beads as well as the archaeological correlates one might expect to see in a hardstone bead workshop (Kenoyer et. al 1991; 1994; Roux et. al 1995). These ethnographic studies however have not explored the development of wear on completed carnelian beads as they are worn.

Ethnographic studies of carnelian bead manufacture have been complemented by several experimental studies focusing on drilling, shaping, and heat-treating carnelian and other hard stones (Chevalier et. al 1982; Stocks 1989; Stocks 2003: 203-222; Kenoyer 2017a; Kenoyer and Vidale 1992; Groman-Yaroslovski and Bar-Yosef Mayer 2015). As a result of these studies, as well as the aforementioned ethnographic studies on carnelian beads, use-wear analysts have a very reliable baseline for interpreting how carnelian beads found in the archaeological record were manufactured. As a result, for the purposes of this thesis, no experimentation on carnelian was carried out. As with ethnographic studies however, experimental studies have also not examined the rate at which wear traces, particularly polish, develop when carnelian beads are included as part of certain types of ornament.

Trait Name	**Trait Definition**	**Location**
Heat Treatment	Refers to evidence that a bead was heated prior to manufacture in order to darken its color.	Whole Bead
Polish	A polished area is smooth and reflective without evidence of residual chipping or grinding marks.	End, Profile
Chipping	Chipping is defined by the presence of flake scars.	End, Profile, Perimeter
Grinding	Evidence of grinding used in the shaping or polishing of a carnelian bead is defined by the presence regularly oriented linear traces of consistent width.	End, Profile, Perimeter
Polish from Wearing/String Polish	Polish from wear develops as a result of a bead's friction against another bead surface, string, skin, and sweat. This friction and accompanying chemical reactions leave behind a discrete shiny and reflective area (Adams et al. 2009: 50).	End, Profile, Perimeter, Intersection of End and Drill Hole
Drilling Technology	Refers to the type of drill or drilling technique used to perforate a bead.	Drill Hole, Intersection of End and Drill Hole

Table 3.1 ***Parts of carnelian beads that were examined for different use-wear traits.***

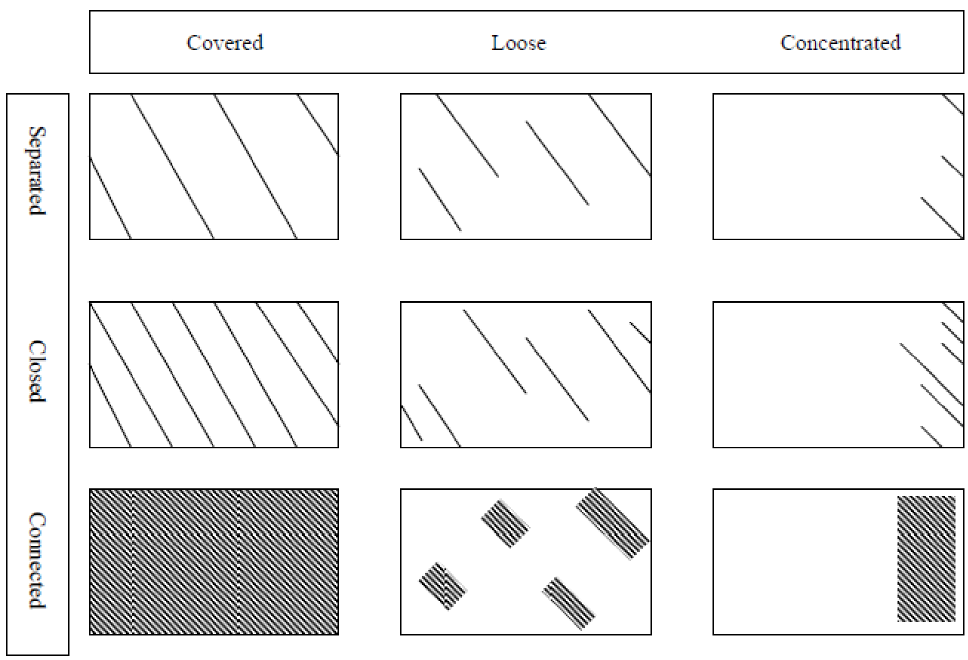


Figure 3. 2 Framework for the distribution and density of wear traces including linear traces and polish (Adams et al. 2009: 50).

Heat Treatment	Absent: A lighter orange or more yellow surface.	Moderate: An orange or lighter red surface.	Extensive: A darker red or reddish-brown surface.	
Chipping	Absent/Polished: None visible.	Concentrated: Chipping is found on only one part of the bead.	Loose: Chipping is found on two or more parts of the bead.	Covered: Chipping is found throughout the entirety of a part of the bead.
Grinding Trace Distribution	Absent/Polished No grinding marks visible.	Concentrated: Grinding marks are found on only one part of the bead.	Loose: Grinding marks are found on two or more parts of the bead.	Covered: Grinding marks are found on the entirety of a bead's surface.
Grinding Trace Density: (fig. 3.2)	Separated: Considerable distance exists between grinding marks.	Closed: Grinding marks are closer together, but do not touch.	Connected: Almost no distance exists between grinding marks.	
Grinding Trace Disposition: (fig. 3.2)	Random	Concentric	Parallel	Oblique
Polish from Wear Distribution	Concentrated: Polish is found on one part of a bead's surface.	Loose: Polish is found in two or more parts of the bead.	Covered: Polish is found on the entirety of a bead's surface.	
Polish from Wear Reflectivity	Slight	Moderate	Extensive	
Drill Technology:	Pecking: A broad conical drill hole filled with characteristic impact marks.	Rotary Drilling: A less tapered drill hole combined with the presence of parallel striations within a drill hole.		
Drill Direction:	One Side: Indicated if evidence for a type of drilling is found on one side.	Two Sides: Indicated by presence of evidence of a type of drilling on two sides.		

Table 3.2 ***Classification options for use-wear observed on carnelian beads.***

3.3.3 Use-Wear Framework for Glazed Steatite Beads

Whereas the use-wear framework used for hardstone beads has a basis in a very clear understanding of the development of manufacturing wear, no such framework yet exists for understanding the development of wear on glazed beads. Many of the traces of pre-glazing manufacture might be obscured when an originally soft stone bead is coated in glaze and fired. As a result, my impressions of wear development on the set of glazed steatite beads created for this thesis have been instrumental in demonstrating how different patterns come about. Although this has clarified the development of certain traces, such as polish, it has not been able to provide a clear understanding of the development of every trace observed on Fifa's beads. Equally problematic and difficult to study is the role of post-depositional processes, which may be responsible for much of the exterior appearance of the glazed steatite beads found at Fifa. This problem is common to use-wear analysts but might especially be an issue considering the extensive siltation of Fifa's tombs and the saline soils of the Dead Sea Plain (Harlan 1981: 158).

The framework produced here has been designed to capture any variability in the wear-traces that appear on Fifa's glazed steatite beads. Wear traces were, in every instance, recorded for the bead's ends and profiles as well as at the intersection of the end and the drill hole. In the rare instance where beads were found broken and their interiors were visible, a set of traits has been included to specifically describe wear found in this part of the bead. As with the previously discussed framework, the traits recorded here are a combination of ones drawn from Adams (et al. 2009), Beck (1928), and several created by the author specifically for this assemblage (Table 3.3).

Use-wear Trait	Bead End	Profile	Intersection of End and Drill Hole	Interior of Drill Hole.
Linear Trace Distribution	X	X		
Linear Trace Density	X	X		
Linear Trace Orientation	X	X		
Linear Trace Incidence	X	X		
Polish Distribution	X	X	X	
Polish from Wear Intensity	X	X	X	
Cracking on Surface or Smooth	X	X		
Number of Layers Visible on Object	X	X		
Flat surface or Appearance of Concavity	X			
Chipping Around Perimeter	X			
Bead Uniformity	X			
Drill Hole Shape (Exterior)			X	
Drill Hole Shape (Interior)				X
Chipping Around Drill Hole			X	
Chipping on One or Both Sides			X	
Parallel Striations Visible				X
Presence of Glaze Inside drill hole				X

Table 3. 3 Locations on glazed steatite beads where different wear traces were recorded.

Use-Wear Trait	Descriptive Characteristics			
Linear Trace Distribution	Separated	Loose	Covered	
Linear Trace Density	Concentrated	Closed	Connected	
Linear Trace Orientation	Parallel	Concentric	Random	Oblique
Linear Trace Incidence	Shallow	Deep		
Polish from Wear Distribution	Concentrated	Loose	Covered	
Polish from Wear Intensity	Slight	Moderate	Extensive	
Glaze Cracking on Surface	Cracked	Smooth		
Number of Layers Present on Object	1: Bead appears brown or white and uniform perhaps without glaze.	2: White or brown glaze transition layer present, perhaps above brown surface layer.	3: Thin brown or white homogenous glaze layer visible above transition layer. This layer could potentially have cracks in its surface.	4: Green color appears above thin homogenous layer.
Flat end or Appearance of Concavity	Flat	Presence of Concavity		
Chipping Around Perimeter	Absent	Concentrated	Loose	Covered
Bead Uniformity	A: Bead is neither round nor has a flat surface.	B: Bead is not round, but with a flat surface.	C: Bead is round but has an angled surface.	D: Bead is both round and has a flat surface.
Drill Hole Shape (Exterior)	Circular	Elliptical	Irregular	
Drill Hole Shape (Interior)	Single Cone	Double Cone	Straight	
Chipping Around Drill Hole	Absent	Concentrated	Loose	Covered
Chipping On One (1) or Both Sides (2)	1	2		
Parallel Striations Visible	No	Yes		
Presence of Glaze Inside drill hole	No	Yes		

Table 3.4 Framework for the description of wear traces on glazed steatite beads.

3.4 Experimental Program

3.4.1 The Use of Experiments in Use-wear Analysis and Rationale for Experiments

The proper interpretation of use-wear requires a comparative collection to verify preliminary results These can be drawn either from an ethnographic or experimental assemblage (Dubreuil et al. 2015: 110). Ethnographic reference collections provide several advantages. As objects from ethnographically documented cultures, it is often possible to connect the wear found on these ornaments to more complex life histories. These are often more sinuous than those imagined by an archaeological analyst (Falci et al. 2019: 757). Experimental assemblages by comparison suffer from experiments being limited to the imagination of the archaeological analyst and their familiarity or awareness of various techniques that may have been used in the past as well as the fact that certain materials cannot always be obtained (Outram 2008). In addition, while archaeological analysists have often made the implicit assumption that beads were strung on necklaces, a brief examination of the ethnographic record makes clear that this cannot be assumed as beads are often incorporated into other ornamental media including bracelets, anklets, earrings, or sewn onto clothing (Falci et al. 2019: 756).

Though many studies have applied optical microscopy to the study of glazed and unglazed steatite beads, in most cases, patterns observed under a microscope have been classified according to empirical assumptions made by scholars, rather than comparison with an experimentally produced reference collection (e.g., Beck 1934a; Damick and Woodworth 2015: 606; Pickard and Schoop 2012; Vandiver 1983). As a result, in most cases, a direct causal link is missing between wear on the observed objects and the suggestions of analysts for how to explain those observed patterns.

The most extensive experimental study on the production of steatite beads is that carried out by Vidale (1995) (fig. 3.3). In that study, the author used copper blades to cut blocks of talc into bead blanks. These were subsequently ground down to roughly the proper shape and size. The beads were then perforated from two sides using a hafted chert drill. Lastly, beads were strung on a hemp string and run over a flat grinding stone until properly smoothed and rounded (Vidale 1995: 68-74). Here, I expand on Vidale's experiments by diversifying the number of materials used for cutting, shaping, perforation, and grinding. This was done in order to observe any possible variability in bead's morphologies and wear development accompanying the use of different production toolkits.

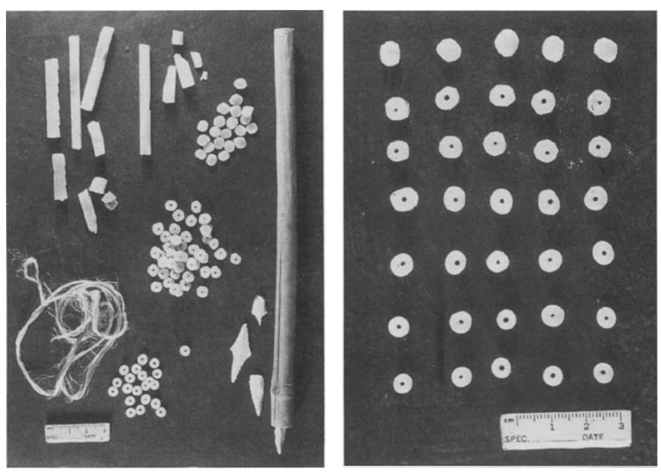


Figure 3. 3 Materials and production sequence from experiments on the creation of steatite beads (Reproduced from Vidale 1995: 28).

Due to the long-standing hypothesis that some glazed steatite beads may have been formed from a thick paste (Beck 1934a: 81; Mackay 1937: 12; Hegde 1983), several scholars have attempted, albeit unsuccessfully, to replicate this potential method of manufacturing and glazing (Kenoyer 2021: 51-52; Panei et al. 2005). Experiments that attempted to create glazed steatite beads from paste were not attempted for two primary reasons. Firstly, some scholars have cast doubt on whether paste was actually ever used to produce glazed steatite beads (Law 2018). Secondly, time constraints meant that it was simply not feasible to carry out experiments on steatite paste manufacture especially due to the author's limited expertise in chemistry and due to other scholars' prior lack of success.

Several scholars have attempted the replication of glazed steatite beads, primarily based on ones found in 5th millennium graves in Upper Egypt. These experiments have utilized two different glazing techniques. The first, application, involves painting, dipping, or pouring a viscous glazing mixture onto a steatite bead before firing (Nicholson and Peltenburg 2000: 191). Lucas and Harris (1962: 174) used this technique in their experimental recreation of Egyptian glaze. These results were replicated by Vandiver (1983). The second technique scholars have used to replicate Egyptian glazed steatite beads is cementation. This technique involves burying the beads in a glazing powder before firing (Nicholson and Peltenburg 2000: 190). Using a glazing mixture observed in an ethnographic study in Qom, Iran (Wulff et al. 1968), Tite and Bimson (1989) were successful in their attempt to create glazed steatite beads using cementation.

In each of these instances, the studies were mostly devoted to the proper replication of the ancient glazing recipe. While Tite and Bimson (1989) took an interest in surface morphology, their study was primarily devoted to differentiating different glazing techniques using microscopy. These studies did not focus on morphological changes that might take place during glazing or the development of wear on experimentally glazed beads. As a result, I decided to undertake a set of glazing experiments to address these gaps in our knowledge.

3.4.2 Experiments with Talc, Establishing a Baseline

A group of 24 talc beads, produced by undergraduate students, were examined for evidence of use-wear produced during their manufacture. This talc originated in quarries located in the state of Minas Gerais in Brazil. The 24 beads were selected from a larger assemblage as the students who created them had more extensively documented their manufacturing process. The production sequence suggested to students largely followed that published by Vidale (1995). The students were asked to produce steatite beads using a variety of different materials for slicing, grinding, perforation, and shaping. Beginning with a rectangular block of steatite, students first used either a clam shell, a mollusk shell, or a flint blade to slice off a thin rectangular preform from the larger steatite block. These preforms were ground down into a disc-shaped bead blank using either a basalt, limestone, hornfels, or sandstone grinding stone (fig. 3.4). The blanks were then perforated using a drill made out of flint, bone, or a hafted and sharpened piece of copper wire. Lastly, students used the same variety of grinding stones to reduce their beads' size and to round them (table 3.5).

Figure 3. 4 Shaping a steatite blank on a basalt grinding stone.

The majority of materials offered to students for slicing, grinding, perforation, and shaping were selected in large part due to their having corollaries in 5th and 4th millennium BCE southwest Asia. Flint flakes and bladelets were offered as options for slicing due to their ubiquity in the archaeological record and their function as cutting tools (Rosen 1997: 67). Copper saws could also have plausibly been used for the initial slicing of steatite (Stocks 2003: 236; Odler 2016: 162). As no such saws were commercially available, it was not possible to incorporate them into these experiments.

The materials used for grinding and shaping beads in my experiments included basalt, hornfels, granite, limestone, and sandstone. These were commonly used as to make grinding slabs in both the Levant and Egypt during the 4th millennium BCE (Lee 2003; Rizkana and Seeher 1988:48-50; Rosenberg and Greenberg 2014). The basalt slabs originated in northern Israel, the limestone slabs originated in Ontario, and the sandstone slabs came from various places including Israel, Ontario, and Colorado.

Flint microlithic drills used for perforation in these experiments (fig. 3.5) are commonly cited as evidence of bead manufacture wherever they are found in the prehistoric record (Hikade 2004; Kenoyer and Vidale 1992; Rosen 1995). These are commonly assumed to have been hafted for use in a bow drill (Burian and Friedman 1985; Gwinnet and Gorelick 1990: 30). Due to difficulties the author had in recreating a bow drill, all drilling was conducted by-hand.

Figure 3. 5 Experimentally created flint microlithic drills used to perforate the steatite beads created for my experiments.

Conversely, scholars do not typically associate bone and copper awls and needles with bead manufacture or drilling (Ilan and Sebbane 1989; Adovasio et al. 2003). On account of talc's softness however, any of these objects could very easily have been used to drill steatite beads.

The use of copper or bone drills or even copper wire for perforating glazed steatite beads has long been suggested by scholars (Brunton and Caton-Thompson 1928: 41; Lucas and Harris 1962: 45; Xia 2014: 75). Though no glazed steatite bead workshop have yet to be identified in southwest Asia, at some 4th millennium sites, primarily located in the Sinai Peninsula, steatite beads have been found in tombs in association with copper awls, pins, or wire (Currelly 1906: 242-244; Bar-Yosef et al. 1977: 80). The best primary evidence that copper objects may have been used for perforating beads comes from the EB II southern Sinai site of Sheikh Mukhsen, where a faience bead was found, in-situ, penetrated by a copper awl (Beit-Arieh 2003: 36) (fig. 3.6). The use of copper and bone drills is therefore likely and such objects were approximated and used in these experiments. It should however be noted that experiments carried out by Stocks (2003: 111-12) demonstrated that due to its softness, talc could also be drilled using a reed tube in conjunction with an abrasive. This type of drilling however was not attempted during the present set of experiments.

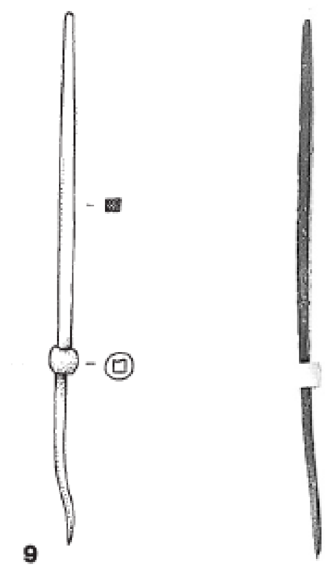


Figure 3. 6 EB II copper awl from Sheikh Mukhsen (Beit-Arieh 2003: fig. 6.2: 18, 6.3: 9).

Slicing	**Grinding**	**Perforation**	**Shaping**
Flint Blade, Mollusk Shell, Clam Shell	Granite, Limestone, Hornfels, Sandstone	Flint Microdrill, Copper Drill, Bone Drill	Basalt, Limestone, Hornfels, Sandstone

Table 3. 5 ***Materials used by students to produce experimental steatite beads.***

Following manufacture, the 24 experimentally created beads were examined for wear using a Nikon SMZ 1000 stereomicroscope. The beads were observed at between 10x and 30x magnification. This low-level magnification allowed for the observation of many of the wear types defined in previous use-wear frameworks for the study of beads (e.g., Kenoyer 2017b). The beads were photographed with a DSLR Canon EOS T2i camera, and Helicon Focus was used to stack images. Beads were examined and photographed on both their ends as well as on their profiles. Use-wear meanwhile was recorded on bead's ends, profiles, and in and around their drill holes.

After initial manufacturing wear was recorded, the 24 beads were worn on a hemp string by the author for two months. These were worn as a necklace with the string's only contact with the beads in and around the drill hole. During that time, they were examined for use-wear after one week, three weeks, and two months. In each of these instances, wear was again systematically recorded on bead's ends, profiles, and drill holes.

The use-wear and traits recorded for beads are found in Table 3.6. Descriptions of these various traces can be found in Table 3.7.

	Ends	Profile	Drill Hole
Linear Trace Consistency	x	x	
Linear Trace Distribution	x	x	
Linear Trace Density	x	x	
Linear Trace Incidence	x	x	
Linear Trace Disposition	x	x	
Linear Trace Orientation	x	x	
Linear Trace Length	x	x	
Chipping on Both Surfaces			x
Degree of Chipping Around Surface			x
Extension from Drill Hole			x
Drill Hole Shape (At top of hole)			x
Drill Hole Shape (Inside Bead)			x
Parallel Striations			x

Table 3. 6 Categories used to describe wear on experimentally created steatite beads.

Use-Wear Trait				
Linear Trace Consistency	Consistent	Variable		
Linear Trace Distribution	Concentrated	Loose	Covered	
Linear Trace Density	Separated	Closed	Connected	
Linear Trace Disposition	Concentric	Parallel		
Linear Trace Orientation	Longitudinal	Transversal	Oblique	Random
Linear Trace Length	Long	Short	Oblique	
Presence of Chipping on Both Surfaces	Absent	Variable		
Degree of Chipping Around Surface	Very minor (1-5%)	Minor (5-20%),	Moderate (20-50%)	Extensive (> 50%).
Extension of Chipping Away from Drill Hole	Minor	Short	Long	
Drill Hole Shape (At top of hole)	Circular	Elliptical		
Drill Hole Shape (Inside Bead)	Single Cone	Double Cone	Plain	
Parallel Striations	Absent	Present	Straight	

Table 3. 7 Descriptions of the different categories of wear traces used to describe experimentally created steatite beads.

3.4.3 Glazing Experiments

The steatite beads found at Fifa were initially all assumed to be glazed as every previously scientifically examined 5th and 4th millennium BCE steatite bead found in the Levant and Sinai has been glazed (Bar-Yosef Mayer et al. 2004; Bar-Yosef Mayer et al. 2014; Bar-Yosef Mayer 2021; Yannai and Bar-Yosef Mayer 2016). As a result, in order to develop a fully appropriate reference collection for discussing use-wear, it was necessary to create glazed steatite beads and to subsequently observe wear associated with their manufacture and use over time. An added benefit of these experiments was that they provided empirical evidence for how certain wear traits develop in association with glazing. The experiments conducted for this thesis all followed attempts at recreating glazed steatite beads found in Predynastic Egyptian burials.

Prior to glazing, additional steatite beads were created. Beads were first glazed using the application method wherein they were coated with liquid glaze and subsequently fired in a kiln. The glazing recipe used for creating an application glaze was drawn from that published by Lucas and Harris (1962: 172-174). In their experiments, Lucas and Harris sought to recreate Egyptian glazing methods. This involved mixing ground malachite and natron, a naturally occurring compound of sodium sesquicarbonate, which can also be produced by mixing Na_2CO_3 (sodium carbonate) and $NaHCO_3$ (sodium bicarbonate) (Nicholson and Peltenburg 2000: 105). While only these chemicals are relevant to the glazing process, naturally occurring deposits contained impurities such as NaCl (sodium chloride) and Na2SO4 (sodium sulphate) (Lucas and Harris 1962: 267; Tite et al. 2008b: 38, 42). As a result, in order to ensure that my experiments were actualistic, similar impurities were added to my glazing mixture. Lastly, water was then added to this mixture to form a slurry. Additional alterations were made at the suggestion of Jean-François Koprivnjak, an Assistant Professor of Chemistry at Trent University. These included the addition of silica dioxide and suggestions related to how much water should be added to form a slurry of the proper consistency.

The glaze mixture utilized for application glazing experiments included 4 parts sodium bicarbonate, 4 parts sodium carbonate, 2 parts sodium chloride, 1 part silica dioxide, and 1 part malachite (fig. 3.7). These were mixed with 10 ML of water. While the mixture was initially more liquid than paste, after a day of sitting, the mixture thickened considerably. Several experiments were carried out with application glazing. While the beads were coated with the same mixture in each case, each experiment varied in terms of the kiln temperature, the amount of time the beads were fired for, and the way the glaze was applied (table 3. 8).

Figure 3.7 Application glazing mixture.

Coated beads were fired in an electric pottery kiln. Five beads were fired in each experiment. These beads were suspended above a ceramic pot in the kiln using a metal kiln wire that was capable of maintaining its shape at over 1000 C (fig. 3.8). It is not clear how ancient Egyptians suspended objects glazed using application in the kiln. Some scholars have claimed that beads were suspended using an organic string that burnt up during the firing process (Lucas and Harris 1962: 44-45). Vandiver (1983: A68), however, interpreted brown protrusions she observed on predynastic glazed steatite beads as evidence for some kind of support. As it was difficult to imagine what type of support would fit with Vandiver’s suggestion, these experiments used the suspension method instead. Whereas it would have been preferable to utilize an organic string that would burn up in the kiln, as all firing was done indoors, it was infeasible to use a material that would catch on fire and as a result, heat resistant ceramic kiln wire was used instead.

Figure 3. 8 Beads coated with application glaze mixture and suspended with kiln wire.

Experiment #	Method of Applying Glaze	Maximum Kiln Temperature	Amount of Time at Max Temperature
1	Painted on with a brush.	950 C	1.5 Hours
2	Immersed for 3 minutes each.	950 C	1 Hour
3	Immersed for 3 minutes and swirled. Subsequently painted with additional glaze before firing.	1000 C	1.5 Hours
4	Dipped and swirled for 1 minute. Subsequently painted with glaze and fired.	1000 C	1 Hour.

Table 3. 8 Application glazing experiments.

After conducting these application glazing experiments, additional experiments were carried out using cementation glazing, a process involving burying the beads in a glazing powder. These experiments were especially essential as Tite and Bimson's (1989) study of 5th millennium BCE Egyptian glazed steatite beads concluded that they were produced using cementation. As part of their experiments, Tite and Bimson recreated a glazing powder following a recipe observed by Wulff et al. (1968) in Qom, Iran. This recipe consisted of, 3 parts plant ash, 3 parts of hydrated lime, two parts quartz powder, ½ a part of ground charcoal, and a minimal amount of copper oxide (Wulff et al. 1968: 100).

Figure 3. 9 Cementation glazing powder.

This recipe was altered slightly, with the Qom mixture's plant ash alkali substituted for natron (fig. 3.9). This substitution was made due to the fact that a natron mixture had already been created for the earlier set of application experiments, and due to the fact that scholars argue that natron was the source of alkali for the glazes used in 5th millennium Egypt (Tite et al. 2008a: 29). In addition, following Tite and Bimson (1989: 93), who noted that additional malachite was needed to ensure a proper green glaze, one part malachite was added for every two-parts Qom mixture.

As a result, my final glazing mixture for cementation was made up of 3 parts Natron (a 1:1 mixture of sodium bicarbonate and sodium carbonate), 3 parts calcium hydroxide, 2 parts quartz powder, ½ a part of ground charcoal, and 4.25 parts malachite. This combination was termed cementation mixture 1. The powder generated from this mixture was then placed at the bottom of a small ceramic flowerpot with the beads completely submerged in the mixture. As every experiment that used this mixture was unsuccessful and resulted in the powder fusing, making it impossible to extricate the glazed objects, this recipe was altered slightly in the hopes that a reduction of calcium hydroxide and malachite would render the mixture friable after firing. The second cementation mixture consisted of

3 parts natron, .75 parts calcium hydroxide, 2 parts quartz powder, ½ a part of ground charcoal, and 3.25 parts malachite. This was referred to as cementation mixture 2. The cementation experiments carried out are presented in Table 3.10.

Cementation Mixture	Natron	Calcium Hydroxide	Quartz Powder	Ground Charcoal	Malachite
1	3 Parts	3 Parts	2 Parts	½ Part	4.25 Parts
2	3 Parts	.75 Parts	2 Parts	½ Part	3.25 Parts

Table 3. 9 Cementation mixtures used for glazing experiments.

Cementation Experiment #	Cementation Mixture Used	Firing Temperature	Duration of Maximum Temperature
1	1	1000 C	1.5 Hours
2	1	1000 C	1 Hours
3	1	950 C	1 Hour
4	1	900 C	1 Hour
5	2	1000 C	1.5 Hours
6	2	1000 C	1 Hour

Table 3. 10 Cementation experiments.

As with the unfired steatite beads, experimentally glazed beads were examined for use-wear on both their ends, profiles, and drill holes. In many cases it was not possible to observe wear on or in drill holes due to unexpected extensive residues left behind by the kiln wire used to suspend beads during the application glazing process. Initial observations on the beads were made using the Nikon SMZ 1000 stereomicroscope. After examining the beads for manufacture related wear, the beads were strung on a necklace and worn. Observations were made after 2 weeks, after 5 weeks, and after 2 months. After the initial observations all beads were examined and imagined under a Dino-lite digital microscope. The criteria used to describe wear on the experimentally produced set of glazed beads is the same as that used to describe the archaeological examples from the Fifa cemetery (Tables 3.3, 3.4).

3.5 SEM and EDS Analysis

3.5.1 Overview of SEM and EDS Analysis

As previously noted, Scanning Electron Microscopy (SEM) has become one of the key techniques used for examining the use-wear found on beads, especially the drill holes (Gwinnet and Gorelick 1979; Kenoyer 2017b). With its high magnification complimented by a large depth of focus and high-resolution imaging capabilities, the SEM can provide an unparalleled look at an object's physical structure. As opposed to optical microscopy, which uses light to illuminate an object, an SEM bombards an object with electrons that are subsequently reflected and read by the microscope in order to produce the image (Froh 2004: 159).

SEMs can generate two kinds of images, secondary electron images, and backscattered images. Secondary electron images generate high-definition images in greyscale that are most useful for studying an object's texture and topography (Ponting 2004: 167; Olsen 1988: 358). By contrast, backscattered images offer a lower resolution, but reflect an object's chemical composition (Froh 2004: 161). In a backscattered image, elements with a greater atomic weight are rendered brighter than parts of an object that contain elements with lower atomic weights (Ponting 2004: 168). This makes backscattered images especially useful for examining objects where different sections have very different compositions. Backscatter imagery can also be used to generate element maps that isolate individual elements and generate individual images reflecting where on an object a particular element is found (Olson 1988: 373). In all cases, it is ideal to coat an object with a conductive metal alloy. When working with archaeological objects however, this is not always feasible (Froh 2004: 164).

Most modern SEMs are equipped with an Energy Dispersive Spectrometer (EDS), an instrument which uses x-rays to measure the elemental composition of selected parts of an object (Froh 2004: 163). The technique is rapid, non-destructive, and allows for extremely localized readings (Olson 1988: 358). It is however less accurate than some other more time-consuming techniques used to measure chemical composition (Kenoyer 2017b: 412). The data recorded by an EDS is presented as a histogram with different peaks representing the relative presence of different elements. In addition, this information can be viewed quantitatively with the EDS providing specific atomic percentages of the part of an object it is aimed at (Ponting 2004: 169).

SEM-EDS has been used extensively in the study of glazed steatite beads. Based on textural information provided by a secondary electron image of a glazed steatite bead's surface, Bar-Yosef Mayer et al. (2004: 496) argued that the glazed steatite beads found in the Chalcolithic burial cave at Peqi'in were formed from a powder rather than carved and subsequently fired. More commonly however, SEM-EDS has been used to characterize the chemical composition of glazes. EDS readings are available for 5th – 3rd millennium glazed steatite beads found in the Levant (Bar-Yosef Mayer et al. 2004; Damick and Woodworth 2015), Egypt (Tite and Bimson 1989; Vandiver 1983), Anatolia (Pickard and Schoop 2012; Ekmen et al. 2021), and the Indus Valley (de Saizieu and Bouquillon 2001). As a result, the EDS readings taken of Fifa's beads for this thesis can easily be compared with beads from a wide variety of contexts and may assist in the identification of the beads' origins.

3.5.2 SEM and EDS Program for Fifa's Beads

Tomb	Complete Beads	Fragments
7	8	3
12	2	3
20	2	2

Table 3. 11 Number of complete beads and fragments analyzed using SEM-EDS from different tombs.

Twelve complete beads and 8 fragments were selected for SEM-EDS analysis (fig. 3.10, table 3.11). Several factors determined which beads and fragments were chosen. As one of the key research questions guiding this thesis related to differences between the beads found in different family's tombs, beads were selected from Tombs, 7, 12, and 20. More beads were selected for analysis from Tomb 7 due to the fact that its bead assemblage was much larger than that found in any other tomb at Fifa. In addition, several beads were selected from Tomb 7 specifically on the basis of their preserving some green coloration on their glazed exteriors. It was hoped that by analyzing these green sections using EDS and then comparing the results to ones from glazed beads without green coloration, it would be possible to comment on whether beads, whose glazes had lost their green coloration post-depositionally, had at one time possessed a green color. One of the author's experimentally glazed beads was also analyzed.

Three of the bead fragments selected for analysis came from Tomb 7, three came from Tomb 12, and two came from Tomb 20. Fragments were specifically selected so that SEM images and EDS readings could be taken of parts of the bead that were not readily visible on complete examples. These areas included within the drill hole, at the interaction layer between the steatite body and the glaze layer, and the unglazed steatite body itself.

The fragments analyzed for this thesis were already broken when first observed by the author. No objects were modified prior to analysis using the SEM-EDS.

Figure 3.10 Beads selected for SEM-EDS analysis.

The 20 selected samples were mounted on carbon tape and subsequently placed inside a Tescan Vega II XMU, Tungsten Filament Scanning Electron Microscope equipped with an Oxford Diffraction EDS, Energy Dispersive Spectroscopy detector. In most cases, both secondary electron images and backscattered images were generated for each sample. Several EDS readings were taken on each object. These typically included a reading taken of the glaze found on the interior of a bead's drill hole, the glaze found on a bead's surface, and when possible, of the bead's body, beneath the glaze layer. In addition, in several instances, additional EDS readings were taken when other points of interest were identified on a bead including on 'green' sections and on what appeared to be large agglomerations of salt crystals.

3.6 XRD Analysis

3.6.1 Overview of PXRD Analysis

X-ray diffraction (XRD) or powder X-ray diffraction (PXRD) has become the standard technique utilized for the mineralogical identification of beads and other artifacts found in archaeological contexts (Nakai and Abe 2012: 279). While exact mineralogical identification of beads found in southwest Asia was once rare, in the past 30 years, XRD has become increasingly common (Broeder and Skinner 2003; Raad and Makarewicz 2019).[6] The technique has been used widely in the mineralogical characterization of glazed steatite (Bar-Yosef Mayer et al. 2004; Damick and Woodworth 2015; Panei et al. 2005; Pickard and Schoop 2012). The XRD analysis conducted for this thesis took place at the Carnegie Museum over the course of one day.

XRD involves directing x-rays at an object from a variety of angles. After these x-rays make contact with an object, the resulting diffraction reflects a unique pattern that can subsequently be matched to known mineralogical examples (Raad and Makarewicz 2019: 733-734; Heimann 2016). Minute powdered samples of objects provides a higher precision identification and as a result, powder diffraction is commonly used in fields such as minerology and chemistry (Heimann 2016: 332).

3.6.2 PXRD Program for Fifa's Beads.

rAs a result, this technique must be performed with the utmost care with respect to the wishes and concerns of the communities responsible for an object's curation and care. In the case of Fifa's beads, it was possible to conduct PXRD analysis on minute fragments of 'white/talc' beads which had accumulated at the bottom of the bags in which Fifa's beads were stored.

Five samples were selected. Two came from Tomb 20 and 12 each, while the remaining sample was drawn from Tomb 7. Particular care was taken to ensure that these

[6] An early use of XRD to identify bead material mineralogically can be found in P.L.O Guy's Megiddo Tombs (Guy 1938: 179-180).

samples came from unglazed sections of beads so that the base minerology could be properly identified. The diffraction was carried out using a Bruker Photon III Single Crystal X-ray Diffractometer with a microfocus Mo Kalpha source. X-ray diffraction patterns were taken using Debye-Scherrer geometry with an area detector. Though less accurate than methods involving smaller powder samples, using the Debye-Scherrer method allowed for XRD analysis to be performed without further alteration or destruction of bead fragments (Heimann 2016: 331-332).

3.7 Bead Database

3.7.1 Database Rationale

While each of the aforementioned techniques help to explicate the materials and uses of Fifa's beads, in order to fully contextualize them and to further explore their possible origins, it is essential to compare Fifa's beads to other roughly contemporaneous assemblages found throughout the Levant. By casting this wider net, it should, in turn, be possible to explore what other sites used the same types of beads and the exact contexts in which those beads were found. This information is essential to evaluating the potential social significances of Fifa's beads at both the site and regional level. Understanding this significance, as well as the journey the beads might have taken to reach Fifa, is essential for fully drawing out the beads' life histories. Though some of these goals could be accomplished using selected parallels, a well-constructed database benefits from its exhaustiveness. The incorporation of a large number of sites has the potential to draw out contextual patterns that might not otherwise be revealed on a smaller scale. Further, by examining the size of bead assemblages found at different sites, it might be possible to draw out the routes beads may have travelled in order to reach Fifa.

The database created for this thesis is not the first to have been created that focuses on beads from the EBA Levant. In his book on trade in the EBA, Milevski (2011: 171-173) discusses carnelian beads as a commonly traded EB commodity. Milevski's database however includes only 11 EB I sites. These sites are almost entirely split between Israel and the Palestinian territories, with Bâb adh-Dhrâʿ being the only included site located in Transjordan. Albaz and Reed's (2021) database is also exclusively focused on carnelian and includes only sites located in Israel and the Palestinian territories. Albaz's (2018: 902-903) database lists beads made out of all materials, but has limited chronological and geographical resolution, rendering EB I as one category, and including few sites outside of Israel. This study, focused on an EB IA context, required higher chronological and geographic resolution. As a result, the database includes sites from the Late Chalcolithic and EB I, which has been bifurcated into the EB IA (c. 3700-3400 BCE) and EB IB (c. 3400-3100 BCE). In addition, an effort was made to include a greater number of sites located in arid and steppe zones, in Transjordan, in the Northern Levant, and in the Sinai Peninsula.

3.7.2 Overview of Data Taken and Database Organization

The sites included in the database were drawn from several sources. First and foremost, sites mentioned in the *New Encyclopedia of Archaeological Excavations in the Holy Land* and its supplemental volume were investigated for published bead assemblages (Stern 1993; 2008). Additional sites were drawn from *The Archaeology of the Bronze Age Levant* (Greenberg 2019), and from Graham Philip's synthetic summary of the EBA in Transjordan (Philip 2008). Dolmen fields investigated for the database were gathered from Fraser's (2018) *Dolmens in the Levant.* North Levantine sites in the database were largely drawn from *The Archaeology of Syria from Complex Hunter-Gatherers to Early Urban Societies* (Akkermans and Schwartz 2003), from Cooper's (2014) synthesis of Syria during the EBA and Artin (2014) and Genz's (2014) syntheses of Lebanon during the Chalcolithic and EBA. A much more limited selection of sites from the Sinai were investigated for the database. These were primarily Nawami fields with a few corresponding habitation sites (Beit-Arieh 2003; Currelly 1906; Bar-Yosef et al. 1977, 1986; Bar-Yosef Mayer 1999).

Relevant publications for each of the sites drawn from these broader sources were assembled to search for assemblages of beads, pendants, and shells that may have been worn as ornaments. This approach yielded 32 Chalcolithic assemblages, 19 EB IA assemblages, 34 EB IB assemblages, and 13 assemblages from sites that could only be dated to the EB I without further subdivision (Appendix B). These objects were then sorted along two axes. The first subdivided beads by material while the second subdivided beads by shape. Subdivision by material largely followed material classification from publications. Occasionally however, beads were reassigned to a different material on the basis of a later publication (e.g., Bar-Yosef Mayer and Porat 2009). In addition, in several instances, beads were reassigned by the author as glazed steatite on the basis of their descriptions and morphology. This was especially crucial as discussion of glazed steatite forms one of the central themes of this thesis and due to the fact that, as noted by Bar-Yosef Mayer (et al. 2004), the material has been regularly misidentified in Levantine archaeological literature. With regards to shell ornaments, whenever a publication included enough information, shells thought by the excavators to have been worn as ornaments were included in the database. Shells used for other purposes were, when possible, excluded. In many cases however, no distinction was made in site reports. Lastly, in several cases, the exact number of beads of a certain material was not specified. These instances are indicated using a question mark in the final database.

The database's shape axis followed the classification scheme established by Horace C. Beck (1928). Though certain publications followed Beck's scheme, in many cases, no systematic description was used. In such cases, when bead drawings were available, the author reclassified beads according to Beck's system. In cases where such drawings were not available, beads were described as having an unspecified shape. Unmodified perforated objects, such as shell beads were also included in this category. When publications specified how many of a certain type of bead was found, that number was included in the database.

3.7.3 The Identification and Reidentification of Glazed Steatite Beads

As I hypothesize that most of the beads excavated at Fifa were made out of glazed steatite, one of the focuses of the database is on establishing which other EB I sites had these objects in their assemblages. Glazed steatite beads have likely been underreported or misidentified for several reasons. Firstly, on account of their uniquely small size (Bar-Yosef Mayer et al. 2004), it is highly likely that several excavations have inadvertently discarded these beads. Secondly, glazed steatite may easily be mistaken for faience or even bone, especially by scholars who are unfamiliar with the material (Bar-Yosef Mayer et. al 2004: 497; Vandiver 1983: A-64). This is a particular issue in the Levant where until quite recently, scholars were largely unfamiliar with glazed steatite (Bar-Yosef Mayer et al. 2004). As a result, it is highly likely that many glazed steatite beads have been misidentified as other materials.

Whereas only the use of archeometric techniques such as XRD may entirely confirm a bead's material, glazed steatite beads have several unique traits that may assist in their identification. These criteria will be used to reassign published assemblages of EB I beads as glazed steatite. Importantly, as all previously reported and scientifically studied steatite beads uncovered in the 5th and 4th millennium BCE have been made from steatite that was glazed (Bar-Yosef Mayer et al. 2004; Bar-Yosef Mayer et al. 2014; Bar-Yosef Mayer 2021; Yannai and Bar-Yosef Mayer 2016), it is assumed that these newly identified assemblages of steatite beads were glazed as well.

The first and perhaps most notable aspect of glazed steatite beads is their uniquely small size and typical short cylinder shape. These traits have been observed on glazed steatite beads across a wide geographic area (Bar-Yosef and Porat 2009; Horn 2015; Pickard and Schoop 2013). In addition, glazed steatite beads typically have a plain and straight perforation, which is also of a very small size (Horn 2015: 106).

Secondly, glazed steatite beads, especially those found in 4th millennium contexts exhibit green glaze (Finkenstaedt 1983: 28-29). This contrasts with other materials, such as faience, which may have a blue glaze. Scholars working with glazed steatite beads found in the Levant have noted that in many cases their green coloration has faded as a result of weathering (Tite et al. 2008a: 30), often leaving behind only a slight greenish hue laid overtop a generally white exterior (Bar-Yosef Mayer et. al 2004: 495). As a result, beads that are described as slightly green or with green glazed exteriors can, in conjunction with the aforementioned traits be reclassified as glazed steatite. Further, even if beads appear white, if they possess a small size, plain perforation, and short cylinder shape, it may be reasonable to assume that they, at one point had green exteriors and are in-fact glazed steatite.

3.7.4 Potential Problems and Pitfalls

Several potential problems arise from the broad and synthetic nature of creating such a database. Firstly, the database is limited by differences in how bead assemblages are reported in their original publications. True numbers are often not reported, and drawings are often unavailable, making it impossible to classify a large number of beads according to Beck's system. The proper identification of bead material is the most significant issue in creating such a database. Though certain materials, such as carnelian, are readily identified even by non-experts, in many cases bead material identification has been made with varying degrees of expertise. Whereas exceptions exist where techniques such as XRD analysis were performed or when mineralogists or geologists were actively conscripted to assist in identification, such studies constitute only a minority (e.g., Ben-Tor 1975: 23-24; Fischer and Hammer 2008). Though these issues are significant to creating an effective database, for the purposes of this thesis, which broadly focuses on glazed steatite and carnelian beads, both of which are visually distinct, this issue is less directly detrimental.

A second problem is that Beck's system effectively classes beads by shape and by the proportion of their lengths and diameters but does not consider size. For example, two cylindrical carnelian beads might be classified exactly the same even if one is considerably larger than the other. This is the case at the Bâb adh-Dhrâʿ cemetery where both cemeteries A and C contained short cylinder carnelian beads, but those found in Cemetery C were of a larger size (Wilkinson 1989: 310). This has potentially significant ramifications as workshops producing different sized beads of the same material and roughly similar proportion could be rendered invisible to this study.

Additionally, the lack of an easy-to-use systematic classification scheme for pendants means that pendants included in the database were often assigned an arbitrary name based on their original publication or the author's discretion. One area of future work should be to classify these pendants as a complement to Beck's categories. This was not a priority however as no pendants were found at Fifa.

3.8 Conclusion:

The previously discussed techniques will be used in tandem to illustrate the life-histories of the beads found at the Fifa cemetery. Using XRD analysis, it will be possible to definitively address the mineralogical identity of the 'white' beads found at Fifa that have thus far been hypothesized to be made out of glazed steatite. SEM-EDS analysis meanwhile will allow for the characterization of the glaze on Fifa's beads and allow for comparison with assemblages from 5th and 4th millennium BCE southwest Asia. The interpretation of use-wear found on the beads from Fifa will be greatly assisted by several previously conducted ethnographic and experimental studies mostly devoted to manufacture. The framework created for glazed steatite will ideally bring out diversity and similarity within the assemblage. The framework used to describe use-wear on the steatite beads is heavily informed by the set of experiments I conducted, which were themselves informed by prior experimental studies on the manufacture of steatite and glazed steatite beads. Lastly, the database presented here should highlight possible routes for bead exchange and can potentially contextualize their use at Fifa within the broader cultural milieu of the EB IA.

Chapter 4: Experimental Results

4.1 Introduction:

This chapter presents the collated results of the experimental research conducted in order to better understand the life histories of the ‘talc/white’ beads found at the Fifa cemetery, which I hypothesize are in-fact made of glazed steatite. Initially, manufacturing wear, associated with the experimental creation of talc microbeads, is evaluated. In order to do so, use-wear analysis was conducted on a set of 24 experimentally created talc beads. The toolkits used to create these beads were comparable to materials that could have been used in 4th millennium BCE southwest Asia. Attention is focused on whether or not use-wear can be used to suggest what tools were used to perforate and grind talc beads. Focus is also devoted to understanding the development of use-wear on talc beads as they were worn over time.

Next, I present the results of glazing experiments wherein I attempted two different glazing techniques that may have been used to glaze steatite beads in the 4th millennium. After discussing the manufacturing wear associated with these techniques, I lastly discuss changes in use-wear after the experimentally glazed beads were worn.

4.2 Use-wear Analysis of Unglazed Experimental Steatite Beads

4.2.1 Differentiating Use-wear and Other Patterns from Stone, Bone, and Copper Perforation

Use-wear observations were taken on six beads perforated with bone drills, 13 perforated with copper drills, and five perforated with flint microdrills. Whereas most beads drilled with copper were drilled from one side only, in most instances, beads drilled with bone or flint were perforated from both sides. This was due to the generally larger perforating tip of bone and flint drills. In all instances, on account of their softness, talc beads could be drilled quickly and efficiently without much difference between the different perforators. The most regular use-wear patterns associated with each can be found in table 4.1. Each of these criteria are presented in the prior methods section where their descriptions can be found in tables 3.6 and 3.7.

	Chipping Around the Top of Drill Hole on One or Both Sides	**Degree of Chipping at the Top of Drill Hole**	**Chipping Extension Away from Top of the Drill Hole**	**Drill Hole Shape (Top)**	**Drill Hole Shape**	**Parallel Striations**
Bone Drill (n=6)	Two (4/6) One (2/6)	Minor 5/6 Extensive (1/6)	Short (3/6) Long (3/6)	Circular (4/6) Elliptical (2/6)	Double Cone (5/6) Single Cone (1/6)	Absent (0/6)
Flint Drill (n=5)	Two (4/5) One (1/5)	Moderate (3/5) Extensive (2/5)	Minor (4/5) Long (1/5)	Elliptical (3/5) Circular (2/5)	Double Cone (4/5) Single Cone (1/5)	Present (1/6)
Copper Drill: (n=13)	One (13/13)	Minor (5/13) Moderate (4/13) Extensive (4/13)	Minor (10/13) Short (2/13) Long (1/13)	Circular 10/13 Elliptical 3/13	Plain (10/13) Double Cone (3/13)	Absent 0/13

Table 4.1 **Summary of use-wear results for the drill holes of experimentally created talc beads.**

Bone drills produced mostly consistent wear patterns with most drill holes having double cone perforations (4.1a). In one instance the bone drill produced a plain perforation (4.1b). The interior of drill holes produced using bone were extremely smooth and did not exhibit striations (fig. 4.1c). In all observed cases, drilling from both sides of the bead with a bone drill produced chipping at the top of both ends of the drill hole which was typically minor (fig. 4.1 a, b). One exception was observed wherein the top of a drill hole displayed extensive chipping (fig. 4.1 c). Extension of chipping from the drill hole was somewhat variable between beads exhibiting minor extension (fig. 4.1 a, b), beads exhibiting short extension, and beads that exhibiting both on different ends. Most beads had circular drill hole openings with one exception that was elliptical (fig. 4.1 d). This was likely caused by the bead's driller restarting the drill hole or beginning their perforation at an oblique angle.

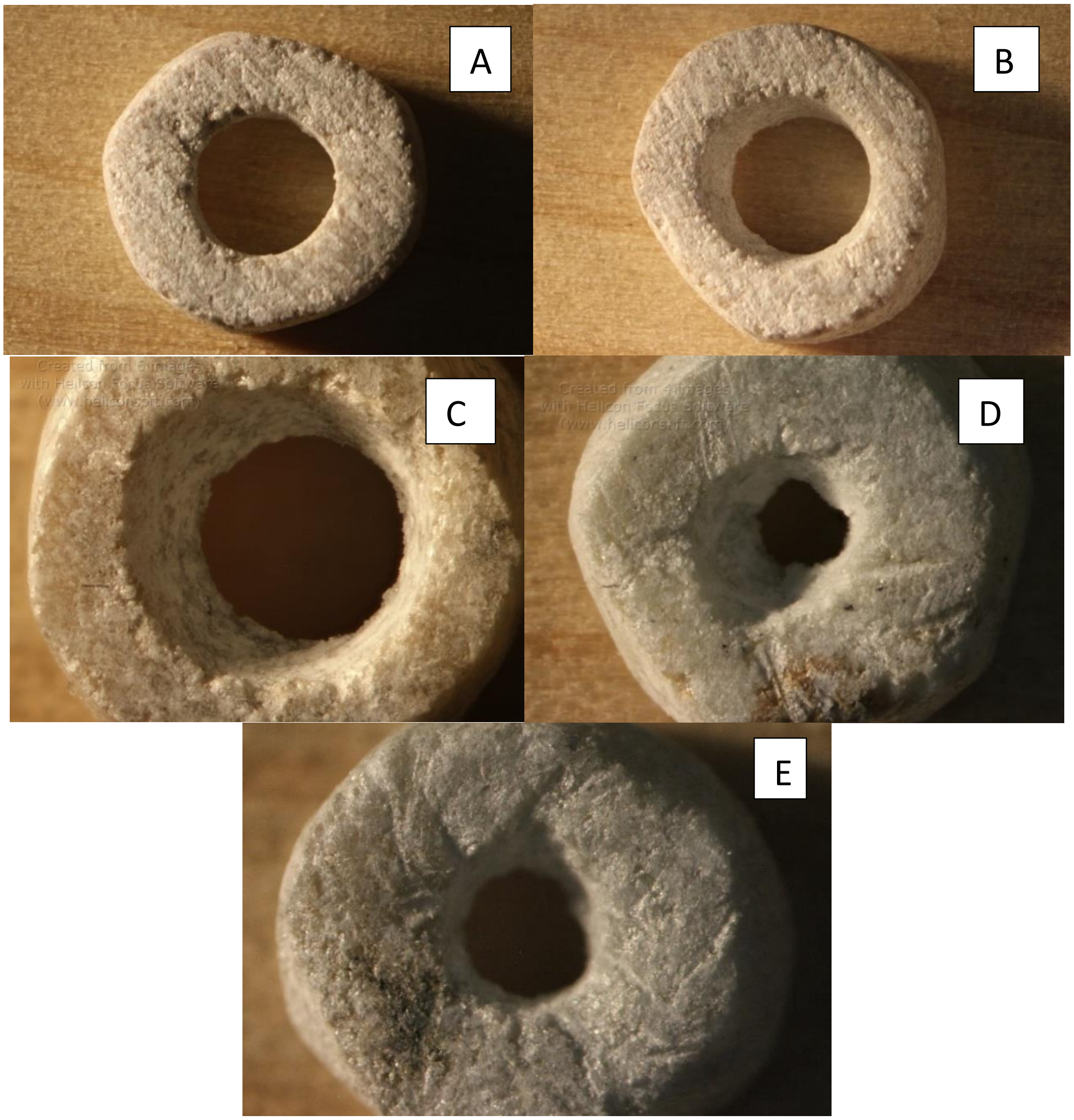


Figure 4.1: Beads perforated with a bone drill. A-B minor chipping on Bead 32 with minor extension from the drill hole. C. Extensive chipping on Bead 60. D. Elliptical drill hole opening on Bead 71. E. Bead 70 with short chipping extension from drill hole.

Beads perforated with flint also exhibited recurring use-wear patterns. Of the five beads observed, most had chipping on both drill hole surfaces (fig. 4.2 a-c). In all cases, this chipping was moderate and had minor extension. With flint, the top of the drill hole's shape was less consistent. Three of five had elliptical openings and two of five exhibited circular ones. The perforation shape was very consistent. Four of five examples drilled from both ends exhibited double cone perforations (fig. 4.2 b), while the one bead drilled from one end exhibiting a single cone perforation (fig. 4.2 a). Flint drills often produced more of a stepped pattern on the interior of the drills hole with visible areas of platforming in the drill hole (fig. 4b). Parallel striation marks were rarely present (fig. 4.2 a). In all cases the interior drill hole was much less smooth than perforations created with bone. The angle of the perforation was also significantly less steep than that produced by bone drills.

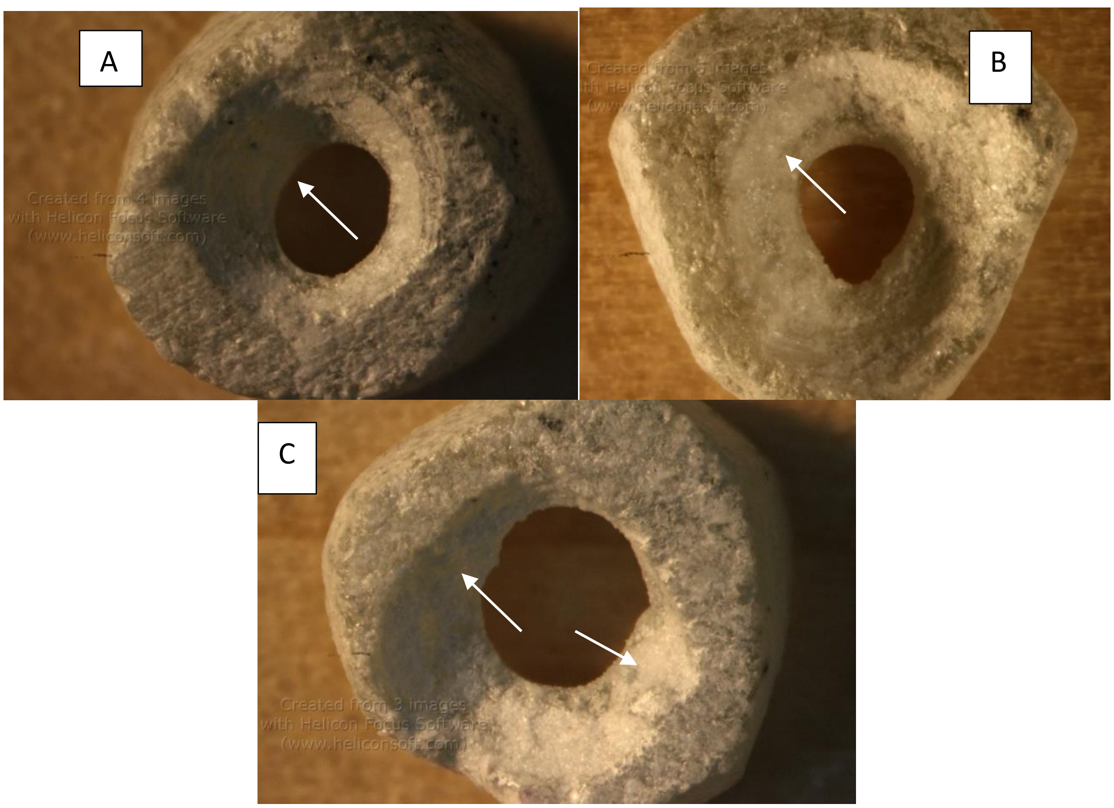


Figure 4.2 Beads perforated with flint: A. Hirsch 48 Drill Hole with Striations Noted. B. Hirsch 53 with examples of stepping noted. C. Hirsch 52 double cone perforation with visible parallel striations, stepping, and less smooth drill hole.

Beads perforated with copper were mostly drilled from one side. These sharp and narrow drills produced much smaller holes than the bone and flint examples (fig. 4.3 a-d). It should, however, be cautioned that the bone perforator used for the experiments was fairly thick, and a thinner one could have been produced from a smaller bone. In 10/13 instances the copper perforators produced plain perforations. When a bead was drilled from both ends, its two perforations did not always join up perfectly, creating a double cone perforation. All beads drilled from one end produced chipping only on the end they were drilled from whereas chipping on the other end was not commonly observed (fig. 4.3 a-b). The degree of chipping around the drill hole surface was highly variable between beads that had extensive, moderate, and minor chipping (fig. 4.3 d). The extension of chipping from the drill hole was highly variable with 7 demonstrating minor chipping extension, 4 exhibiting short, and 2 exhibiting long.

The character of chipping found on objects drilled with copper was unique. Typically, this chipping would be characterized by either one or several sharp angled deviations from the round drill hole. These sharp and occasionally sloping deviations sometimes transformed the circular drill hole exterior into an elliptical one (figure 4.3 d-f). This type of chipping is highly diagnostic. In most cases it was impossible to observe the drill hole's interior due to its small size. In the cases where it was possible however, the interior of the drill hole was smooth and did not clearly exhibit striations (fig. 4.3 a, c). Thus, the best way to distinguish copper drilling was by a small plain perforation surrounded by extensive chipping on a single end. In addition, they may also be distinguished by areas of sharp angular chipping at the top of their drill holes (fig. 4.3 E, f).

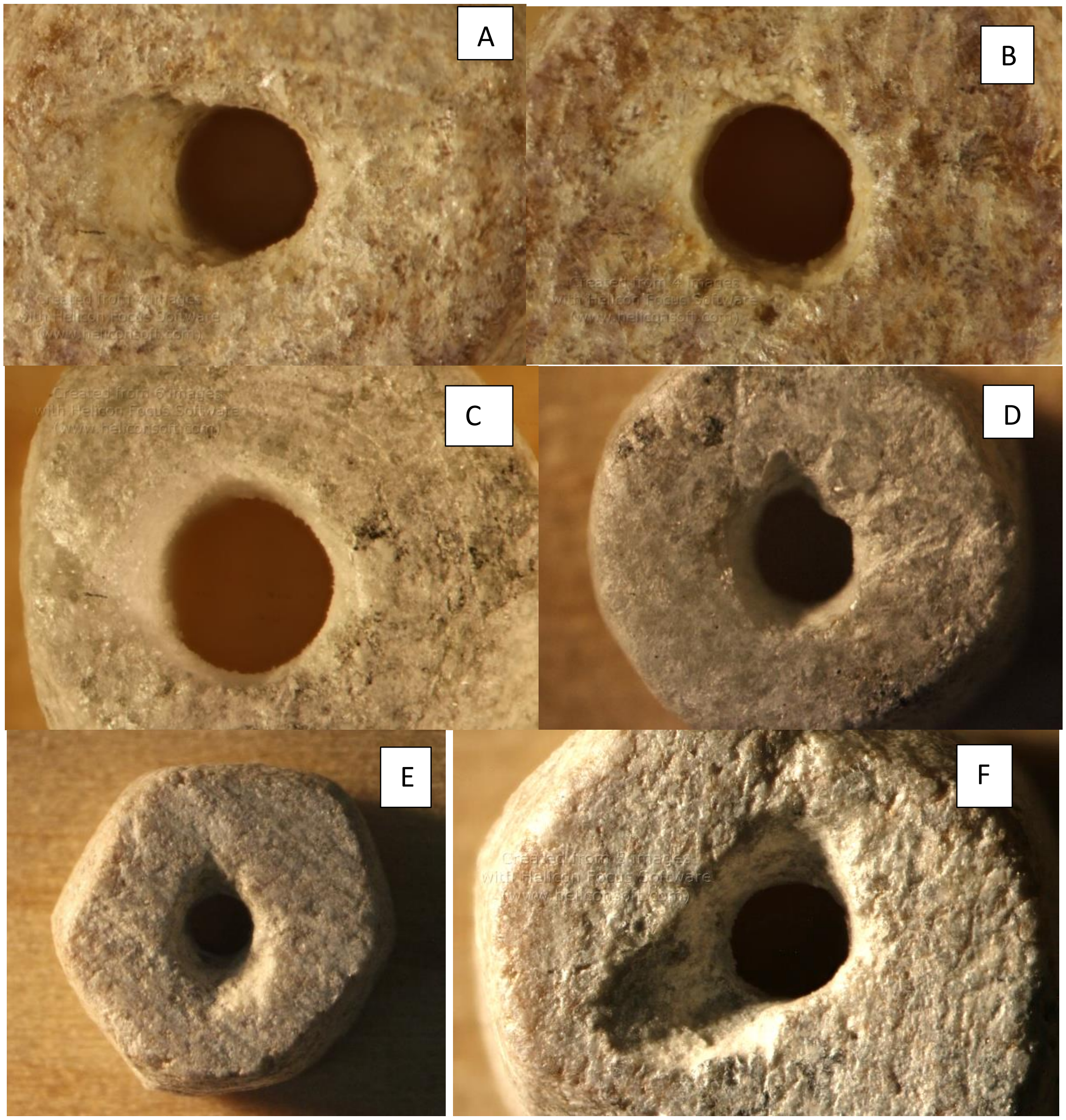


Figure 4.3: A-B Drill holes on both faces of Hirsch 36. A. drill hole demonstrating minor chipping and smooth interior. B. Drill hole exhibiting no chipping. C. Hirsch 47 drill hole with no chipping and smooth interior. D. Hirsch 69 bead drilled with copper exhibiting extensive chipping. E. Hirsch 33 drill hole with characteristic chipping extension. F. Hirsch 31 drill hole made elliptical by characteristic chipping.

4.2.2 Effects of Different Abrading Stones Used for Grinding and Shaping

In this section, I evaluate the linear traces observed on the ends of beads produced using a range of grinding stones. In particular, I focus on whether or not different abrasive stones create consistent patterns of linear traces. This use-wear examination was carried out in order to uncover whether the stones used to create talc beads can be determined on the basis of linear traces. Unsurprisingly, grinding stones with greater levels of asperity and hardness, such as sandstone were more efficient for grinding and shaping than softer stones with less asperity, such as limestone. In all cases however, some kind of striations were observed to develop during the shaping phase of production. A summary of the results is presented in table 4.2.

	Linear Trace Consistency	**Linear Trace Distribution**	**Linear Trace Density**	**Linear Trace Disposition**	**Linear Trace Orientation**	**Linear Trace Length**
Granite (n=6)	Variable (4/6) Consistent (2/6)	Covered (5/6) Concentrated (1/6)	Connected (5/6) Closed (1/6)	Parallel (5/6) Concentric (1/6)	Transversal (6/6)	Long (6/6)
Hornfels (n=7)	Consistent (4/7) Variable (3/7)	Loose (6/7) Covered (1/7)	Separated (5/7) Connected (1/7) Closed (1/7)	Random (5/7) Parallel (4/7)	Transversal (4/7) Oblique (4/7)	Short (7/7)
Limestone (n=2)	Variable (2/2)	Covered (2/2)	Separated (1/2) Closed (1/2)	Parallel (2/2)	Transversal (2/2)	Short (1/2) Long (1/2)
Sandstone (n=8)	Consistent (6/8) Variable (2/2)	Concentrated (3/8) Loose (3/8) Covered (2/8)	Separated (4/8) Closed (3/8) Connected (1/8)	Random (4/8) Parallel (4/8)	Oblique (6/8) Transversal (2/8)	Long (4/8) Short (4/8)

Table 4.2 Summary of use-wear results for grinding experimental talc beads using different stones.

Six of the beads observed were shaped using granite. These examples are especially useful for discussing variability in how linear traces manifest themselves on objects shaped with granite as each of the 6 beads were made by the same student. This makes it more likely that the same kinematics, force, or shaping techniques were to produce multiple beads. Of these 6 beads, the majority exhibited different patterns of linear trace distribution on their two ends. These patterns often differed significantly with some beads having covering distributions on one end (fig. 4.4 a) but concentrated or no linear traces on their other end (fig. 4.4 b). As such, it seems that granite produces highly variable patterns of linear trace distribution. By contrast, the density of linear traces for beads shaped using granite was much more consistent. The disposition of these surface linear traces were also relatively consistent with most having parallel distributions and two of six exhibiting concentric dispositions (fig. 4.4 c). Lastly, in all cases, the surface linear trace's orientation were transversal.

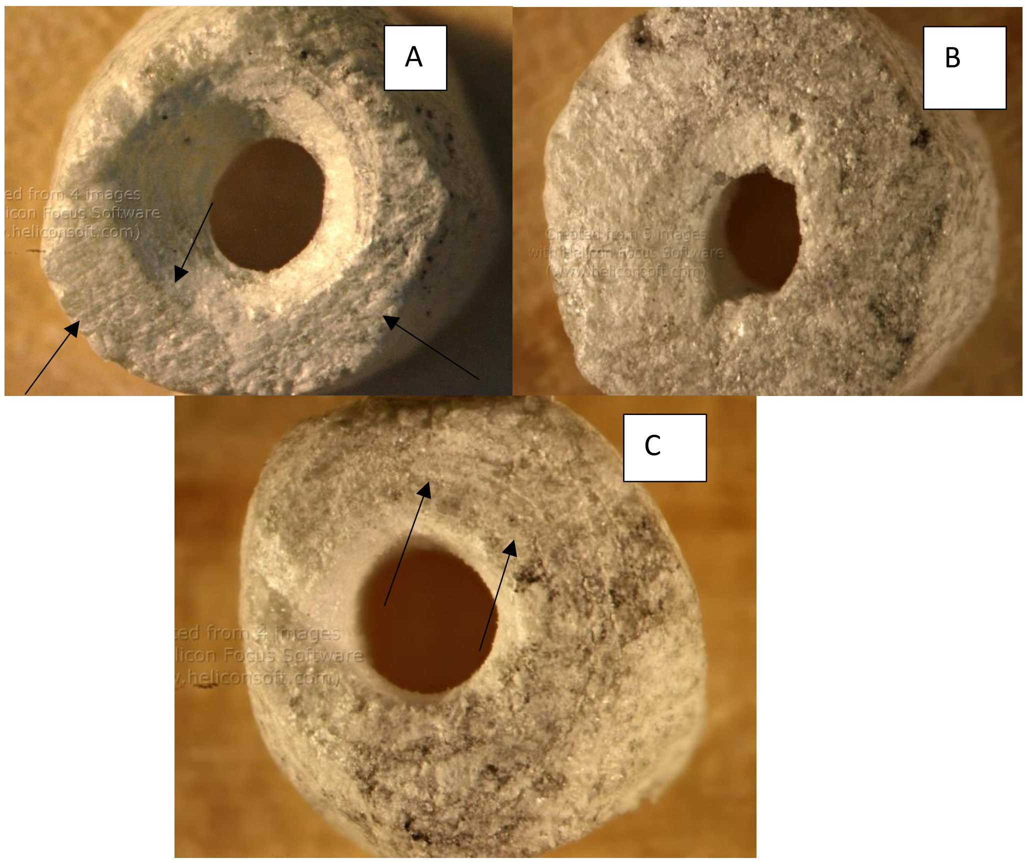


Figure 4.4 Beads Shaped with Granite: A. Hirsch 53 example of bead covered with connected linear traces. B. Hirsch 46 example of concentrated and connected linear traces. C. Hirsch 47 bead with concentric linear traces.

Wear traces on beads shaped using the hornfels were markedly different than on those shaped using granite. In most instances at least one surface of beads shaped with hornfels had loose linear trace distributions and separated densities (fig. 4.5). The disposition of these linear traces was mixed between random and parallel, while in two instances, one bead's surface had parallel linear traces, and another had random. The orientation of these traces was mixed between transversal and oblique.

Figure 4.5: Hirsch 59 with loose, separated, and random linear traces.

Only two beads were shaped using limestone. The linear trace densities for these beads were mixed between separated and closed, but had parallel dispositions and transversal orientations in all cases (figure 4.6)

Figure 4.6: Hirsch 31 with closed, connected, and parallel linear traces formed by limestone shaping.

Eight beads were observed that were shaped with sandstone. Beads shaped using sandstone were particularly inconsistent in terms of their linear traces. Distributions were mixed between concentrated, loose, and covered. Linear trace density was less variable as four of the eight beads had separated linear trace distributions (fig. 4.7a). The remaining beads were evenly split between ones with closed and connected linear traces (fig. 4.7 b). Dispositions were mixed between random and parallel while the orientation of these traces was evenly split between transversal and oblique. Due to this considerable variability linear traces are not a reliable criteria for directly inferring that a bead was ground using sandstone.

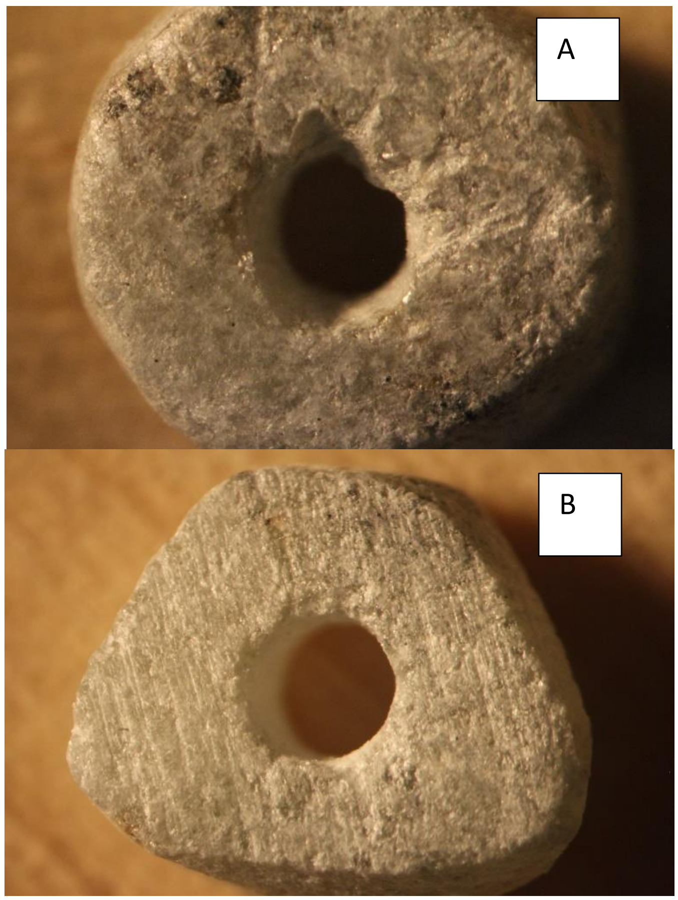


Figure 4.7: Linear traces generated by sandstone grinding: A. Hirsch 69 Concentrated, Separated, Random Linear Traces. B. Hirsch 51 covered, connected, and parallel linear traces.

4.2.3 Use-Wear Conclusions for Manufacturing Wear from Experimental Talc

In conclusion, the use of a flint, bone, or copper drill may be effectively determined on the basis of use-wear. When beads were drilled with bone perforators from both sides, it most often produced a double cone perforation with minor chipping at the top of the drill hole. In addition, beads drilled with bone produced extremely smooth perforations. By contrast, beads drilled with flint produced double cone perforations with steeper angles than those produced by bone drills. Flint drilling produced chipping on both surfaces of beads that was always moderate with minor extension from the drill hole. Flint drilling also often produced parallel striations within the drill hole. Lastly, copper drills had a very distinctive signature, producing much smaller drill holes than the other kinds of perforators. Such drill holes often had chipping on only a single surface corresponding to the single side it was perforated from. They also developed highly distinctive irregularities around their drill holes (e.g., fig. 4.3 e, f).

Each type of stone used to abrade the talc beads produced some kind of linear traces. These linear traces however often exhibited variable patterning, even on beads abraded using the same stones. Whereas sandstone and granite produced highly variable linear traces, beads that were abraded using limestone and hornfels more consistently exhibited the same patterns. Regardless, due to the general variability observed in the types of linear traces that could be produced by different abrading stones, it seems that the linear traces on a bead's end are not reliable indicators for the material used to abrade them.

4.3 Results of Wearing Talc Beads:

4.3.1 Results of Wearing Experimental Talc Beads after One Week

After one week of wearing the assemblage of 24 beads, the beads were reevaluated for use-wear (fig. 4.8a, b).

Figure 4.8 a. Experimental talc beads before being worn. B. Experimental talc beads after being worn for one week.

After a week, the most marked and visible change was related to the beads' color. Whereas prior to wearing, each of the steatite beads maintained the same whitish-grey color, after just one week of being worn, the beads assumed a remarkable number of colors. These ranged from weak and dusky reds to greyish browns and olive greys. Although steatite found in natural outcrops may assume a range of colors, the beads examined for use-wear were all created from outcrops in the same general area of Minas Gerais in Brazil, ruling out that each bead's raw material had a radically different composition. Rather, this change may be associated with the beads' exposure to sweat, oily skin, and dirt as they were worn while the author undertook archaeological fieldwork. It is surprising however that at times, beads that were next to one another and seemingly exposed to the same substances assumed different colors. The rapidity with which the beads' colors changed was also surprising in light of the fact that steatite is considered non-porous (Kora 2020).

Two simultaneous additional processes were observed at work after just one week. Firstly, shallow linear traces that had previously been extremely visible became less pronounced in several instances. This process was especially prevalent on the surfaces of beads which were in regular contact with other bead's ends.

At the same time, polish began to form on the areas of the bead's upper drill hole that were in regular contact with string. Polish also occasionally appeared on the outer edge of the bead's surfaces, though this was not a consistently observed use-wear trait after just one week of wearing.

4.3.2: Results of Wearing After Two Months:

The processes initially observed after just a single week of wearing continued as the group of 24 experimentally created talc beads were worn over time. With regards to color, the assemblage of beads generally became darker the longer they were worn, though they retained the same changed color profiles that they had assumed after just one week of wearing (fig.4.9a).

By the end of two months, linear traces on talc beads that had once been somewhat visible had almost entirely disappeared or were completely gone (4.9b). Polish meanwhile had proliferated on all parts of the bead with the area around the drill hole and the topographic highs of the bead surface being particularly reflective (4.9 b, c).

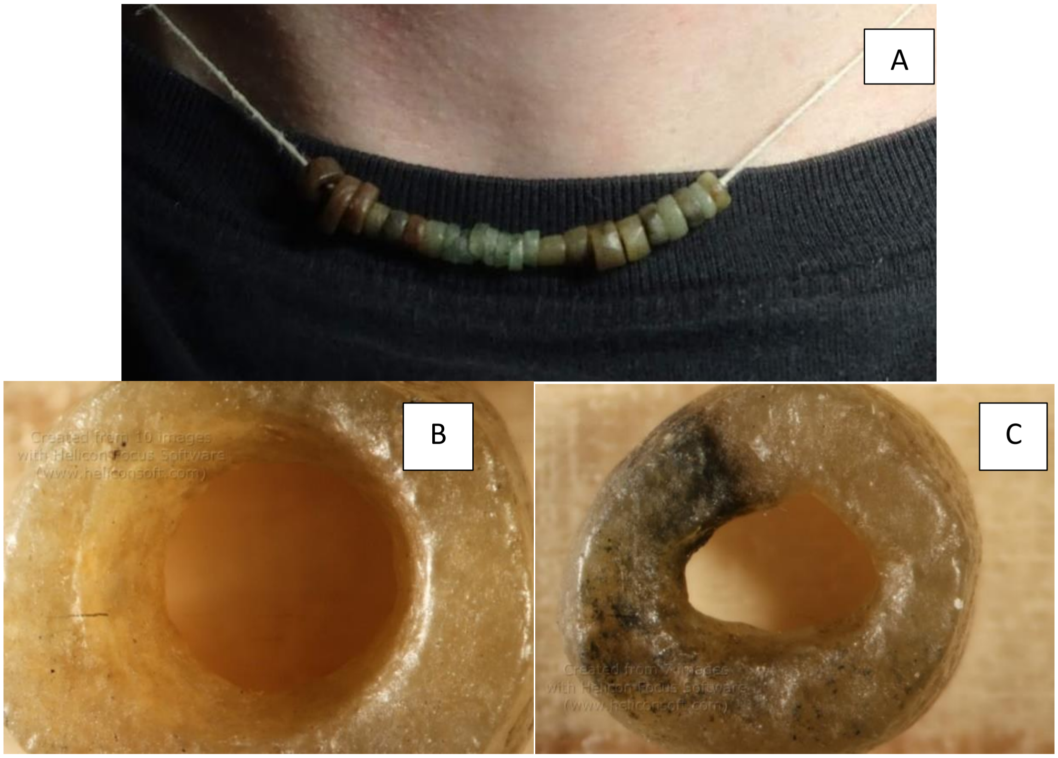


Figure 4.9 Experimentally created talc beads after three months of wearing. A. The whole assemblage being worn. B. Bead 60 with extensive polish and absence of linear traces. C. Bead 34 with polish on topographic highs and around drill hole.

The color of bead's interiors changed in tandem with their exterior surfaces. Unlike glazed beads however, steatite beads that were worn over a period of time maintained a homogenous matrix and did not develop layering (fig. 4.10).

Figure 4.10 Bead 48 interior after being worn for two months. The bead's interior has developed the same coloration of its exterior and appears homogenous without evidence for layering.

4.4 Results of Experimental Glazing of Talc Beads

Attempts were made to create glazed steatite beads using application and cementation glazing, both of which have been suggested as the medium by which steatite beads were glazed in the 4th millennium BCE (Beck 1934a; Lucas and Harris 1962; Tite and Bimson 1989). Application glazing involves applying a liquid glaze to the bead before firing it while suspended. Cementation involves burying the bead in a dry powder that was subsequently heated. Glazing experiments were carried out on a new group of experimentally created steatite beads that were produced using the same materials used for making the previously discussed unglazed talc beads. The compositions of these glazes can be found in the previous chapter. In this section, I describe the results of my experimental glazing attempts using these techniques.

4.4.1 Results of Application Experiments: Manufacturing Wear

Each round of application glazing carried out was successful in at-least partially glazing the experimentally created steatite beads. Different methods of applying the glaze, however, were found to be more effective in ensuring that beads were fully coated.

For the first experiment 5 beads had glaze painted on with a paintbrush and were subsequently fired at 950 degrees for 1.5 hours. The beads glazed using this technique developed an uneven glaze with some seemingly not taking up glaze at all. To rectify this issue, I conducted another experiment where beads were immersed in the glaze mixture before being fired at 950 degrees centigrade for one hour. Surprisingly, this method was even less effective for absorption of glaze.

To investigate whether immersion was truly a less effective method, I again immersed the beads in glaze, but increased the kiln temperature was raised to 1000 degrees, firing the beads for 1.5 hours. By contrast with the previous attempt, I placed the beads on the end of a toothpick and actively swirled them in the mixture for three minutes. After the beads were placed in the kiln, additional glazed was painted on using a paintbrush.

This attempt was more successful than the prior two, but the problem of inconsistent coverage persisted. Certain parts of the bead that were undoubtedly in contact with the glazing mixture still did not take up the glaze, leaving parts of the bead entirely uncoated while others developed a rich blue-green color (fig. 4.11).

Figure 4.11: Bead 73. Application glazed bead with glaze applied through both immersion and painting, subsequently being fired at 1000 c for one hour. Example of uneven glaze absorption.

For the final application experiment I immersed the bead in glaze for only one minute and reduced the firing time at 1000 degrees to one hour. In addition, as with the prior attempt, a paintbrush was used to apply additional glaze. This, and the prior experiment, were by far more successful than those involving only painting on or immersing beads in glaze. Though several beads were glazed throughout their entire bodies, inexplicably, other beads that received the exact same treatment did not glaze nearly as successfully with certain areas appearing to not be glazed at all. In all cases, regardless of whether or not a section of the bead glazed, its overall hardness, as expected, increased considerably.

The results of the application glazing experiments were surprising. According to previously published work, application glazed objects can be visually recognized by signs such as uneven drips and random lines found on an object's surface (Vandiver 1983: A-26, A-39). Neither of these were found on the experimentally recreated beads. Instead, the beads glazed using application that were produced in the course of these experiments were characterized by uneven glazing with some sections becoming a vibrant blue-green, other sections exhibiting only a mild greenish hue, and some sections seemingly not taking up any glaze at all (fig. 4.12). Though unevenness, especially with regards to the thickness of glaze, has been discussed as a sign of application glazing before, the sheer disparity between well glazed and unglazed parts of bead's surfaces was surprising (Tite et al. 2008c: 48-49; Moorey 1999: 183).

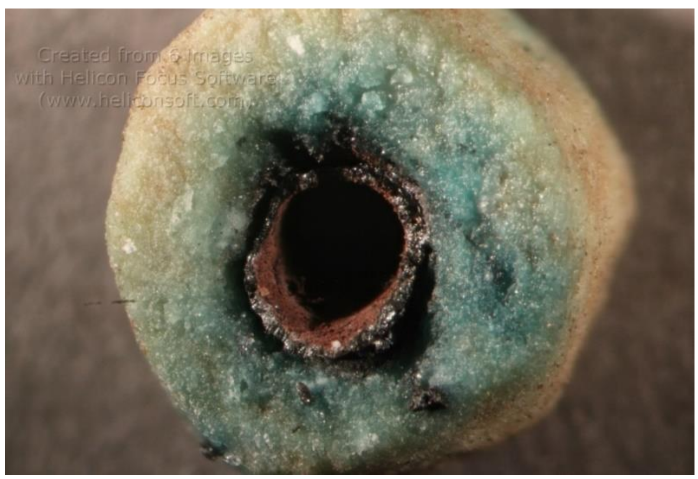


Figure 4.12 Bead 75 bead end demonstrating variable glazing success. Whereas some sections are well glazed, others possess no glaze.

In many cases, glaze seems to have entered into parts of the bead that were characterized by linear traces prior to firing, rendering these mostly invisible as first discussed by Beck (1934a: 73). In some cases, however, just as was observed by Vandiver (1983: A-65), faint traces of the linear traces could be observed beneath the immediate surface, providing direct evidence for the use of grinding for reducing the experimentally created object's size (fig. 4.13). Alternatively, deep linear traces also often remained visible, but were largely filled in with glaze, suggesting that linear traces may assist in ensuring the adhesion of glaze to a bead glazed using the application method.

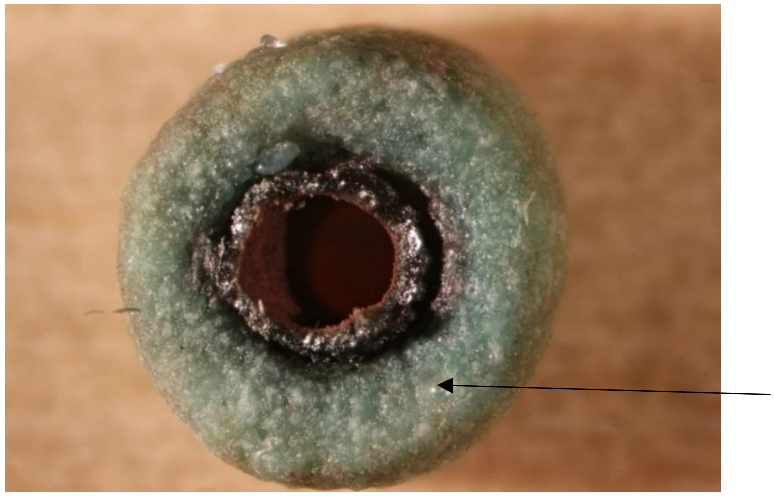


Figure 4.13 Bead 109 with remaining evidence for grinding immediately beneath glaze layer.

Unfortunately, the study of the effects of application glazing on the steatite bead's drill holes was seriously affected because the outer layer of the kiln wire that suspended the beads often melted and adhered to the drill hole. The instances where the drill hole was at least partly visible however revealed that application glazing could successfully glaze within perforations (fig. 4.14).

Figure 4.14 Bead 88 with successful glazing in the drill hole.

Vandiver (1983: A-68), observed that glazed steatite beads commonly had between one and three small brown protrusions sticking out from their glaze. She suggested that they resulted from contact with some type of support used in the kiln during firing. The glazed steatite beads produced using the application method for this study did not exhibit such marks, perhaps supporting the idea that archaeologically produced beads were held up in their firing apparatus rather than suspended.

Lastly, considerable discussion has been devoted to the appearance of extended linear cracks in the glaze found on archaeological, glazed steatite beads. Generally, it has been asserted that these marks emerge in the glaze as a result of thermal shock when the beads are too rapidly removed from a kiln (Beck 1934a: 72; Damick and Woodworth 2015: 606; Pickard and Schoop 2013: 6; Vandiver 1983: A-66). Though the experimentally created beads were often quickly removed from the kiln and exposed to room temperature air to assist in their cooling, in no instance was the type of cracking attributed to thermal shock observed. As a result, the cause of this feature or cracking, which is commonly found in archaeological examples, must be explained another way.

4.4.2 Results of Cementation Experiments: Manufacturing Wear

Six separate attempts were made to successfully glaze steatite beads using a previously published glazing mixture recipe observed ethnographically in Qom, Iran for cementation glazing. This recipe was used successfully to glaze steatite beads by Tite and Bimson (1989). Despite this, none of the experiments attempted here were successful. Alteration of the Qom recipe to include less malachite and calcium hydroxide did not result in successful glazing nor did efforts to change the firing temperature or time.

In instances where the beads were fired in the mixture at 1000 degrees, the glazing powder became hard and metallic looking. Despite the fact that, in some cases, a small part of a steatite bead stuck out from the hard, metallic surface, which was in fact well glazed, it was impossible to extricate these beads from the surrounding layer (fig. 4.15). Lower temperature firings produced a slightly less solid surface, instead producing a dark black, burnt-looking layer. In the rare instances where it was possible to remove objects from this burnt looking layer, the objects were unglazed and had considerable residue from the burnt layer adhering to them.

Figure 4.15 Unsuccessful cementation glazing where beads were fired at 1000 c for an hour. This resulted in the powder hardening making it impossible to extricate the beads.

In the original publication of the Qom mixture, a similar issue was described. According to the authors, if objects were fired at 1100 degrees rather than the optimal 1000 degrees, the beads would fuse with the mixture and both the mixture and beads would be turned into a solid mass (Wulff et. al 1968: 101) (fig. 4.16). Despite several attempts to lower the temperature in order to achieve the easily removable and crumbly post-firing glazing powder described, no attempts were successful. It is technically possible that the kiln was achieving a higher temperature than recorded by its internal thermometer. On the other hand, however, as the same result occurred when the firing temperature was reduced to 900 degrees, it is more likely that the primary issue was with the glazing powder.

Figure 4.16 Unsuccessful cementation glazing attempt where beads were fired at 1000 c for one and a half hours. The glazing powder in this experiment transformed into a solid glassy mass.

Future experiments might benefit from the observations of Matin and Matin (2012) related to the experimental cementation glazing of faience objects. The paper for example found that the amount of alkali (natron) necessary for glazing may only be 5-6% of the weight of the glazing powder, far less than was used for these attempts at cementation (Matin and Matin 2012: 767). Their experiments also found that charcoal powder may in-fact play a detrimental role to the glazing process (Matin and Matin 2012: 768), and that potassium nitrate, a chemical not included in my own glazing mixture, or for that matter the Qom mixture, likely played an important role in the glazing process of Egyptian objects glazed using cementation (Matin and Matin 2012: 768). It remains unclear however exactly why the cementation experiments, which were modeled on previously successful ones was not successful.

4.5 Results of Wearing Experimentally Glazed Steatite Beads:

In order to better understand the development of wear on glazed beads, ten beads that were glazed using the application method were worn and observed over the course of several months. Two beads were lost over the course of that time. Beads were examined after being worn for two weeks and five weeks.

4.5.1 Use-wear after Two Weeks

After two weeks of being worn, polish from wear was clearly visible. This polish could mostly commonly be found at the intersection between the bead surface and edge but was also occasionally visible at the top of the drill hole. In no instance was the development of wear observed on a bead's profile despite regular contact between this part of the bead with skin and cloth. The distribution and intensity of the polish found on the bead's perimeters was somewhat variable. In one instance, no polish developed, in six instances, polish was concentrated on one part of the intersection (fig. 4.17), and in three instances, polish was loosely distributed (fig 4.18). This polish was typically not particularly intense after two weeks with eight examples developing a slight polish and one bead developing moderate polish.

Figure 4.17 Bead 108 with concentrated moderately reflective polish developed after two weeks.

Figure 4.18 Bead 75 loosely distributed slightly reflective polish developed after two weeks.

Despite the fact that the majority of the bead's drill holes were entirely coated by kiln wire, in some instances, polish still managed to develop on parts of the upper drill hole that came in contact with string. In every instance, this polish was distributed in a concentrated pattern with slight intensity (fig. 4.19).

Figure 4.19 Bead 87 with concentrated slight polish around the drill hole.

4.5.2 Use-wear after Five Weeks

After five weeks of wearing, the most notable difference in use-wear was the further accumulation of polish from wearing on each of the previously polished parts of the bead. Though in most instances, it was the intensity of wear that increased on beads, in some instances, the distribution of polish on the bead's end grew as well. With regards to polish found at the bead's perimeter, in seven instances, wear was distributed in a concentrated area of the bead end, while in one instance, the distribution was loose. In the remaining two examples observed, no polish was observed on beads worn for five weeks. In three instances, the polish intensity was extensive (fig. 4.20), in two instances, it was moderate, and in three cases, it remained slight.

Figure 4.20 Bead 75 with concentrated extensive polish developed after 5 weeks wearing.

The same increase in polish intensity was observed on polish found around the bead's drill holes. Whereas prior, in each instance, the observed polish was slightly reflective, after five weeks, these same areas could be characterized as moderately reflective (fig. 4.21).

Figure 4.21 Bead 87 concentrated moderately reflective polish around the top of the drill hole developed after 5 weeks.

4.6 Conclusion:

By recreating talc microbeads, it was possible to examine their manufacturing traces for evidence of variability in the materials used for grinding and perforation. Whereas unique signatures could be identified for bone, flint, and copper perforators, it was not possible to differentiate the abrading stones used to grind talc microbeads based on linear traces. After wearing the talc beads over an extended period of time, they began to lose evidence for their linear traces while taking on a range of colors and developing polish.

Although two glazing techniques were attempted, only one, application, achieved some level of success. Beads glazed using application developed a spotty glaze that often extended over limited portions of a bead's surface. In addition, while the glaze mixture produced a green coloration, this manifested itself in a spectrum, with certain parts of the bead developing only a green hue and others developing a vibrant green glassy layer. In addition, in parts of the bead that were glazed, prior manufacturing wear was typically obscured. When these beads were worn, they developed polish with a greater degree of polish developing as the beads continued to be worn.

Chapter 5: Archaeological Results

5.1 Introduction:

This chapter presents the collated results from the various forms of analysis applied to the bead assemblage from the Fifa cemetery. This includes analysis of the talc/white beads, hypothesized to be glazed steatite as well as analysis of carnelian and shell ornaments. In order to confirm the material of the talc/white beads, XRD results are presented. Subsequently, morphometric data and descriptive statistics are offered for the talc/white bead assemblage both as a whole and split up by individual tombs. As one of this work's primary interests is variation in the assemblage found in different family's tombs, the use-wear analysis of the talc/white beads from tombs 7, 12, and 20 are treated separately. These results are compounded through SEM imagery and EDS chemical analyses.

Following the conclusion of the study on the talc/white beads, use-wear analyses on Fifa's carnelian and shell ornaments are presented with along with descriptive statistics and morphometric data for the carnelian beads. Lastly, results from the database of Chalcolithic and EB I beads are reviewed. This discussion mainly focuses on a review of sites where carnelian, steatite, and shell ornaments have been found.

5.2 Analysis of Glazed Steatite Beads

5.2.1 XRD Results

XRD analysis was conducted on 5 different representative samples taken from the talc/white beads found in tombs 7, 12, and 20 to explore the hypothesis that these beads are in fact made of glazed steatite.

In each instance, beads' bodies contained varying amounts of protoenstatite, enstatite, and pyrophyllite, the same minerals found in previously analyzed glazed steatite beads (Bar-Yosef Mayer and Porat 2009: 114; Panei et al. 2005: 152-153). Analysis of beads' outer layers by comparison revealed an amorphous, vitreous composition. This confirms the hypothesis that the 'talc/white' beads found at Fifa are in fact glazed steatite.

Beyond this basic result, XRD analysis also revealed slight differences in the mineralogical content of the beads tested from different tombs, primarily between the two bead sections tested from tomb 12 and 20 (Table 5.1). The bead interior analyzed from tomb 20 revealed a mixture of enstatite, protoenstatite (an enstatite formed at a higher temperature), and pyrophyllite, a talc mineral. This demonstrates that this particular object was not heated for a long enough period of time or at a high enough temperature to completely transform its interior entirely from talc into enstatite.

By contrast, the beads analyzed from tomb 12 contained very little or no talc, suggesting that they were not heated for long enough or at a high enough temperature to transform completely. Despite the small sample size, these results do suggest a level of variation in manufacturing techniques.

	Protoenstatite	Enstatite	Pyrophyllite	Glass
Sample 1: Tomb 20 Body	~30%	~50%	~20%	
Sample 2: Tomb 20 Body and Outer Layer	~17%	~46%	~7%	~30%
Sample 3: Tomb 7 Outer Layer				~80%
Sample 4: Tomb 12 Body	~20%	~20%	~6%	~54%
Sample 5: Tomb 12 Body and Outer Layer		16%	~4%	~80%

***Table 5.1: XRD results** with* rough estimates of the mineral contents of 5 fragments of 'white beads.' The estimates presented here are +/- 10 due to the considerable amount of amorphous or non-diffractable glass content present in each sample, and especially in sample 3.

5.2.2 Glazed Steatite Descriptive Statistics and Morphometrics:

Descriptive statistics were calculated for bead length, diameter, and the maximum diameters of both drill holes (Table 5.2). These were calculated both for the assemblage as a whole, but also broken down by tomb. All measurements are calculated in millimeters. In addition to the presentation of descriptive statistics, each of the evaluated categories are compared between tombs using box and whisker charts (fig. 5.1-5.3).

	Tomb 7	Tomb 8	Tomb 12	Tomb 20	Total:
Fragment				2	2
Cylinder Disc	1				1
Short Cylinder	146		34	9	189
Standard Cylinder	1	1	6	3	11
Long Cylinder			1		1
	148	1	41	14	204

Table 5.2 Number and shapes of analyzed beads.

	Length	Diameter	Drill Hole Diameter
Overall Sample (N=205)			
Mean	1.38	2.09	.9
Median	1.32	2	.89
Standard Deviation	.4	.33	.12
Range	2.12	1.54	.71
Minimum	.5	1.46	.64
Maximum	2.62	3	1.35
Tomb 7 (N=148)			
Mean	1.22	1.97	.87
Median	1.23	1.96	.87
Standard Deviation	.26	.26	.1
Range	1.84	1.31	.58
Minimum	.5	1.46	.66
Maximum	2.34	2.77	1.24
Tomb 12 (N=41)			
Mean	1.77	2.31	.93
Median	1.8	2.33	.93
Standard Deviation	.38	.27	.13
Range	1.65	1.41	.58
Minimum	.91	1.59	.64
Maximum	2.56	3	1.22
Tomb 20 (N=14)			
Mean	1.92	2.57	1.04
Median	1.92	2.52	1
Standard Deviation	.3	.21	.14
Range	1.07	.83	.55
Minimum	1.33	2.09	.75
Maximum	2.4	2.92	1.3

Table 5.3 Descriptive statistics for Fifa's glazed steatite beads.

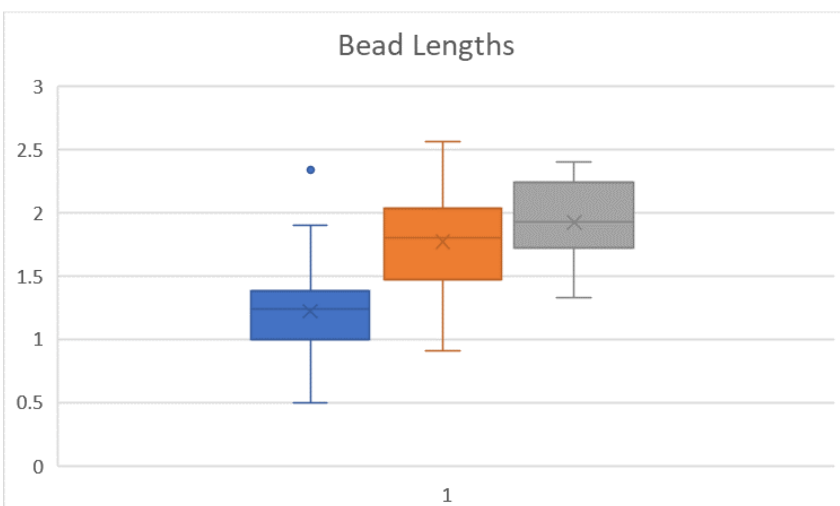


Figure 5. 1 Comparison of bead lengths from tomb 7 (blue), 12 (orange), and 20 (grey).

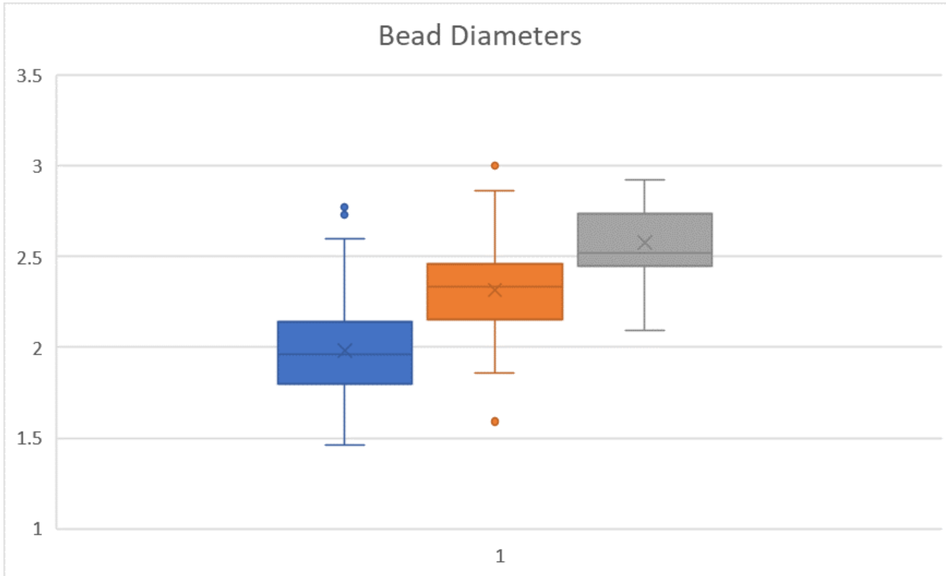


Figure 5. 2 Comparison of bead diameters from tomb 7 (blue), 12 (orange), and 20 (grey).

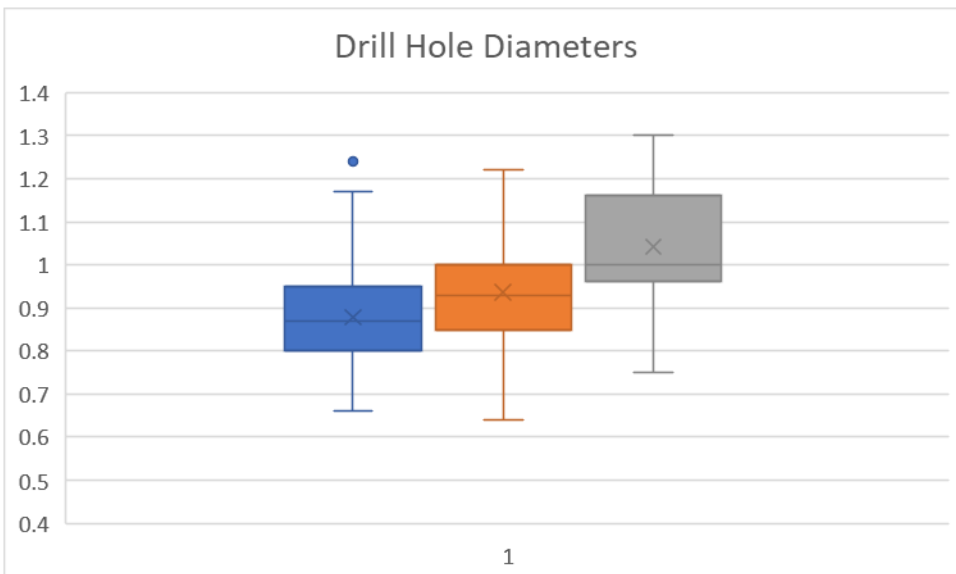


Figure 5. 3 Comparison of drill hole diameters tomb 7 (blue), 12 (orange), and 20 (grey).

5.2.3 Glazed Steatite Use-Wear

Use-wear observations were made on one bead from tomb 8 (100%), 148 beads from tomb 7 (~21%), 41 beads from tomb 12 (~24%), and 14 beads from tomb 20 (100%). These observations were conducted on beads' ends, perimeters, profiles, and in and around the top of the perforation. In order to draw out any potential differences in the life histories of beads from the different tombs, use-wear from each of these tombs is presented separately. The single bead from tomb 8 however will not be discussed as a single bead is too small of a sample size to establish any pattern of manufacture or use by the family who buried their dead in that tomb. The results of use-wear observations on the ends, profiles, and drill holes of the beads from tombs 7, 12, and 20 are presented in Tables 5.4 - 5.6.

In most cases, glazing layers obscured evidence of earlier manufacturing stages. As a result, the examples of beads with manufacturing traces that can be located beneath glaze layers are especially important for successfully reconstructing how the beads found at the Fifa cemetery were made. In the following sections, wear-traces are discussed following the chaîne opératoire of their life histories. First, evidence for shaping using abrasion is presented. Next, I discuss manufacturing wear associated with the perforation stage. After that, the glaze on Fifa's steatite beads is reviewed with particular emphasis placed on beads that retained green glaze coloration. Lastly, polish other and traits that most likely developed in post-depositional context are examined.

Post-depositional processes appear to have had a profound effect on the collection's glazed steatite beads. This is not altogether surprising in light of Kenoyer's observation that, "due to weathering and differential shrinkage, glazes do not adhere well to steatite, and they usually flake off (Kenoyer 2021: 59)." Kenoyer's suggestion is borne out in the large number of beads throughout the assemblage that exhibit cracking on their glazes, or which have had varying amounts of glaze flake off. As a result, not every bead in the assemblage manifests wear associated with each stage in its life-history. Thus, in order to present the assemblage's entire story, it is necessary to draw on wear observed on a variety of beads, extrapolating that such traces were likely once common on many other beads in the assemblage.

Table 5.4 presents a comparative summary of the use-wear traits observed on the ends of beads from tombs 7, 12, and 20. Linear traces, possibly related to grinding, were not commonly observed on beads from tombs 7 and 20 but were more prevalent on beads from tomb 12 (26.8%). When linear traces were observed, they were most commonly found oriented in parallel disposition. Polish was not commonly observed on beads' ends appearing on less than 10% of bead ends from tombs 7 and 12. It was somewhat more common on beads from tomb 20 where 21.5% of beads had this trait. The low levels of polish throughout the assemblage may however be a factor of post-depositional taphonomy, rather than an indication that the beads were not worn.

The sheer extent of the effects of post-depositional processes are revealed by the large numbers of beads whose glazes had evidence for flaking off. The glazes on tomb 7, however, were best preserved. Evidence for the considerable toll of post-depositional processes on the assemblage is further provided by the variability in the number of preserved layers found on the beads' ends. While most beads did indeed retain at least some traces of their solid outer glaze layers, the colored outer green glaze layer was preserved in less than 10% of instances in tomb 7 and 20, and not at all in the beads from tomb 12.

One surprising trait observed on the assemblage was the presence of a central concavity on one end. While this trait was uncommon in tomb 7 (2%) and 20 (0%), it was more prevalent on beads observed from tomb 12 (21.9%). Examination of gross bead shapes revealed that while a large number of beads were perfectly rounded with ends that were perpendicular to their axis (T. 7: 46.6%, T. 12: 39%, T. 20: 57.1%), a significant number of beads from each tomb were either not entirely round or had ends that were not perpendicular to their axis. Overall, the beads from tomb 7 seem to vary from those found in the other tombs which generally have more in common. While tomb 7's most distinctive trait was its high degree of glaze preservation with little evidence for polish and linear traces, tomb 12 could be recognized by its more common linear traces and its unique central concavity that appeared on nearly 1/5 of beads examined from the tomb. Tomb 20 meanwhile had a similar level of glaze preservation to that observed in tomb 12 as well as better preservation of polish.

The use-wear traits preserved on beads' profiles is presented in table 5.5. These are largely similar to the traits preserved on beads' ends with some key differences. Linear traces were far more commonly observed on beads' profiles than on their ends. This is most notably the case for beads from tomb 12, where ~35% of beads had linear traces. These are generally obliquely oriented with closed densities and parallel dispositions. Polish meanwhile was a barely observed trait while cracking was very common. The profiles of beads from each of the tombs preserved some evidence for colored glaze, although this section of the bead appeared more prone to flaking. As with the bead's ends, glaze adhered to beads from tomb 7 at a much higher rate, with far less evidence for chipping and cracking than observed on beads from the other tombs.

Linear Trace Distribution	Not Observed	Concentrated	Loose	Covered
Tomb 7	146/148 (98.6%)	2/148 (1.3%)		
Tomb 12	30/41 (73.1%)	1/41 (2.4%)	5/41 (12.1%)	5/41 (12.1%)
Tomb 20	13/14 (92.8%)	1/14 (7.1%)		
Linear Trace Density	Not Observed	Separated	Closed	Connected
Tomb 7	146/148 (98.6%)		1/148 (.6%)	1/148 (.6%)
Tomb 12	30/41 (73.1%)	2/41 (4.8%)	5/41 (12.1%)	4/41 (9.7%)
Tomb 20	13/14 (92.8%)		1/14 (7.1%)	
Linear Trace Orientation	Not Observed	Parallel	Concentric	Oblique
Tomb 7	146/148 (98.6%)	2/148 (1.3%)		
Tomb 12	30/41 (73.1%)	11/41 (26.8%)	4/41 (9.7%)	
Tomb 20	13/14 (92.8%)	1/14 (7.1%)		
Polish Distribution	Not Observed	Concentrated	Loose	Covered
Tomb 7	136/148 (91.8%)	7/148 (4.7%)	5/148 (3.3%)	
Tomb 12	38/41 (92.6%)	3/41 (7.3%)		
Tomb 20	11/14 (78.5%)		2/14 (14.2%)	1/14 (7.1%)
Polish Intensity	Not Observed	Slight	Moderate	Extensive
Tomb 7	136/148 (91.8%)	9/148 (6%)	2/148 (1.3%)	2/148 (1.3%).
Tomb 12	38/41 (92.6%)	1/41 (2.4%)	2/41 (4.8%)	
Tomb 20	11/14 (78.5%)			3/14 (21.4%)
Smooth or Cracked	Smooth	Cracked		
Tomb 7	125/148 (84.4%)	23/148 (15.5%)		
Tomb 12	23/41 (56%)	17/41 (41.4%)		
Tomb 20	8/14 (57.1%)	6/14 (42.8%)		
State of Preservation	1	2	3	4
Tomb 7		24/148 (16.2%)	110/148 (74.3%)	14/148 (9.4%)
Tomb 12		15/41 (36.5%)	26/41 (63.4%)	
Tomb 20		4/14 (28.5%)	9/14 (64.2%)	1/14 (7.1%)
Concavity	Absent	Present		
Tomb 7	145/148 (97.9%)	3/148 (2%)		
Tomb 12	31/41 (75.6%)	10/41 (24.3%)		
Tomb 20	14/14 (100%)			
Chipping Around Perimeter	Absent	Concentrated	Loose	Covered
Tomb 7	95/148 (64.1%)	40/148 (27%)	10/148 (6.7%)	3/148 (2%)
Tomb 12	21/41 (51.2%)	16/41 (39%)	4/41 (9.7%)	
Tomb 20	12/14 (85.7%)	2/14 (14.2%)		
Shape Uniformity	A	B	C	D
Tomb 7	20/148 (13.5%)	27/148 (18.2%)	31/148 (20.9%)	69/148 (46.6%)
Tomb 12	3/41 (7.3%)	12/41 (29.2%)	15/41 (36.5%)	16/41 (39%)
Tomb 20	2/14 (14.2%)	1/14 (7.1%)	2/14 (14.2%)	8/14 (57.1%)

Table 5.4 Summary of use-wear observed on bead ends from tombs 7, 12, and 20.

Linear Trace Distribution	Absent	Concentrated	Loose	Covered
Tomb 7	129/148 (87.1%)	10/148 (6.7%)	8/148 (5.4%)	1/148 (.6%)
Tomb 12	27/41 (65.8%)	2/41 (4.8%)	6/41 (14.6%)	6/41 (14.6%)
Tomb 20	12/14 (85.7%)	1/14 (7.1%)		1/14 (7.1%)
Linear Trace Density	Absent	Separated	Closed	Connected
Tomb 7	129/148 (87.1%)	7/148 (4.7%)	11/148 (7.4%)	1/148 (.6%)
Tomb 12	27/41 (65.8%)	4/41 (9.7%)	9/41 (21.9%)	1/41 (2.4%)
Tomb 20	12/14 (85.7%)	1/14 (7.1%)	1/14 (7.1%)	
Linear Trace Orientation	Absent	Parallel	Concentric	Random
Tomb 7	129/148 (87.1%)	16/148 (10.8%)		3/148 (2%)
Tomb 12	27/41 (65.8%)	12/41 (29.2)		2/41 (4.8%)
Tomb 20	12/14 (85.7%)	1/14 (7.1%)		
Linear Trace Incidence	Absent	Shallow	Deep	
Tomb 7	129/148 (87.1%)	6/148 (4%)	13/148 (8.7%)	
Tomb 12	27/41 (65.8%)	3/41 (7.3%)	11/41 (26.8%)	
Tomb 20	12/14 (85.7%)		2/14 (14.2%)	
Polish Distribution	Absent	Concentrated	Loose	Covered
Tomb 7	147/148 (99.3%)	1/148 (.6%)		
Tomb 12	40/41 (97.5%)		1/41 (2.4%)	
Tomb 20	14/14 (100%)			
Polish Intensity	Absent	Slight	Moderate	Extensive
Tomb 7	147/148 (99.3%)			1/148 (.6%)
Tomb 12	40/41 (97.5%)			1/41 (2.4%)
Regular or Cracked	Regular	Cracked		
Tomb 7	116/148 (78.3%)	32/148 (21.6%)		
Tomb 12	20/41 (48.7%)	21/41 (51.2%)		
Tomb 20	3/14 (21.4%)	11/14 (78.5%)		
Number of Layers Visible	1	2	3	4
Tomb 7		20/148 (13.5%)	124/148 (83.7%)	4/148 (2.7%)
Tomb 12	2/41 (4.8%)	14/41 (34.1%)	23/41 (56%)	1/41 (2.8%)
Tomb 20		7/14 (50%)	6/14 (42.8%)	1/14 (7.1%)

Table 5.5: Summary of use-wear observed on bead profiles from tombs 7, 12, and 20.

Use-wear observed from around and within beads' drill holes are presented in table 5.6. Close examination revealed the almost total absence of string polish from all the beads in the assemblage. The study of drill hole shape revealed that while the majority of beads from tomb 7 had circular drill hole openings on both sides, this trait was far less common in the beads from tombs 12 and 20 where a greater deal of irregularity was observed. Chipping around the top of the drill hole was an extremely common use-wear trait in all three tombs with this trait typically manifesting on one side only. Lastly, while parallel striations were not common at all within bead's drill holes, glaze was regularly found within the perforation.

Polish Around the Drill Hole Distribution	Absent	Concentrated	Loose	Covered
Tomb 7	147/148 (99.3%)	1/148 (.6%)		
Tomb 12				
Tomb 20				
Polish Around the Drill Hole Intensity	Absent	Slight	Moderate	Extensive
Tomb 7	147/148 (99.3%)	1/148 (.6%)		
Tomb 12				
Tomb 20				
Top of Drill Hole Shape	Both sides circular	Both sides elliptical	Mixed circular/elliptical	
Tomb 7	88/148 (59.4%)	30/148 (20.2%)	30/148 (20.2%)	
Tomb 12	16/41 (39%)	11/41 (26.8%)	14/41 (34.1%)	
Tomb 20	5/14 (35.7%)	3/14 (21.4%)	5/14 (35.7%)	
Chipping around Drill Hole	Absent	Concentrated	Loose	Covered 3
Tomb 7	68/148 (45.9%)	61/148 (41.2%)	16/148 (10.8%)	3/148 (2%)
Tomb 12	14/41 (34.1%)	17/41 (41.4%)	9/41 (21.9%)	1/41 (2.8%)
Tomb 20	5/14 (35.7%)	3/14 (21.4%)	4/14 (28.5%)	2/14 (14.2%)
Chipping on One or Both Sides	Absent	One	Two	
Tomb 7	68/148 (45.9%)	57/148 (38.5%)	20/148 (13.5%)	
Tomb 12	14/41 (34.1%)	24/41 (57.5%)	3/41 (7.3%)	
Tomb 20	5/14 (35.7%)	6/14 (42.8%)	3/14 (21.4%)	
Drill Hole Shape Interior	Single Cone	Double Cone	Plain	
Tomb 7	17/148 (11.4%)	9/148 (6%)	133/148 (89.8%)	
Tomb 12	5/41 (12.1%)		36/41 (87.8%)	
Tomb 20	3/14 (21.4%)	3/14 (21.4%)	7/14 (50%)	
Parallel Striations	Absent	Present		
Tomb 7	137/148 (92.5%)	11/148 (7.4%)		
Tomb 12	37/41 (90.2%)	4/41 (9.7%)		
Tomb 20	11/14 (78.5%)	3/14 (21.4%)		

Table 5.6 Summary of use-wear observed on drill holes from tombs 7, 12, and 20.

5.2.3.1 Use-Wear Observations on Beads from Tomb 7:

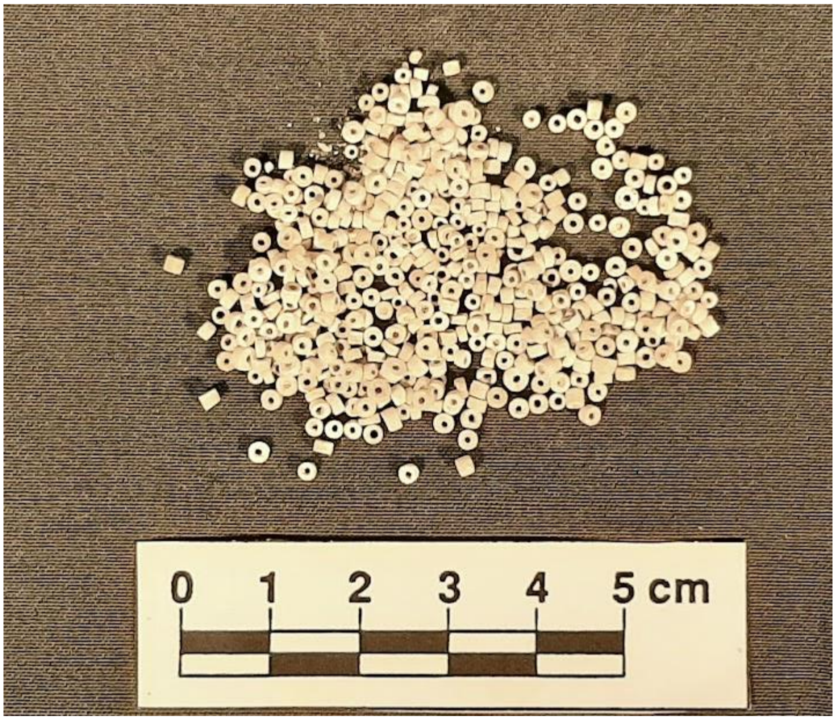


Figure 5.4 Glazed Steatite beads from tomb 7

This section discusses use-wear traces on glazed steatite beads found in Fifa tomb 7 (fig. 5.4). The description of wear on beads from tomb 7 is the most extensive and will establish a set of parameters for comparative descriptions for the assemblages from tombs 12 and 20. Traits are presented in the order they are thought to have been produced in.

5.2.3.1.1 Tomb 7 Linear Traces:

Linear traces associated with grinding are extremely rare on the ends of beads from tomb 7. Of the 148 beads examined, such traces were only visible on two beads, both of which exhibited concentrated distributions of closed parallel and shallow linear traces (fig. 5.5). These were barely visible, having been covered by glaze in all instances. By contrast, linear traces were more commonly found on the profiles of beads from tomb 7 (~13%). Despite variability in the distributions and densities of linear traces, they were generally characterized by their parallel dispositions and oblique orientations with varying degrees of depth (fig. 5.6).

Figure 5.5 5070.004-095 loose, closed, parallel, shallow linear traces on the end.

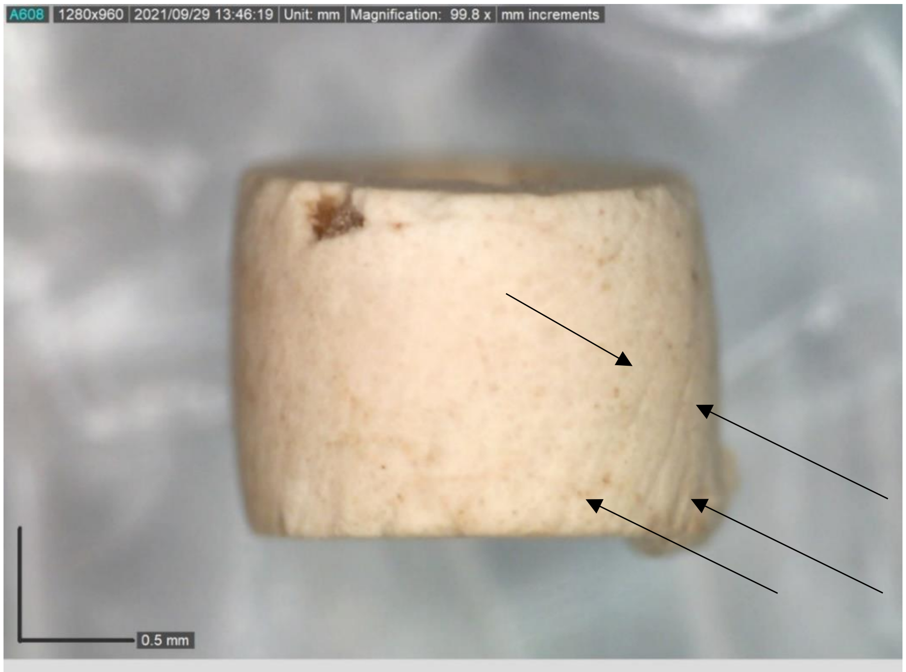


Figure 5.6 5070.004-004 loose, separated, parallel deep linear traces oriented obliquely on the bead's profile.

5.2.3.1.2 Tomb 7 Shaping

While grinding traces were rare, the variable roundness of beads as well as the fact that many beads had ends that were not perpendicular to their axis are highly suggestive that the beads were ground into their final shape. Such variability was commonly observed on experimentally produced beads (see section 4.2.2). Sixty-nine beads (46%) from tomb 7 were completely round and had ends perpendicular to the bead's axis (fig. 5.7a). The remaining 54% meanwhile were split between beads that were not completely round (5.7b), did not have ends perpendicular to their axis (5.7c), or both (5.7d). In all instances, even when a bead's end was not perpendicular to its axis, it still formed a straight plane.

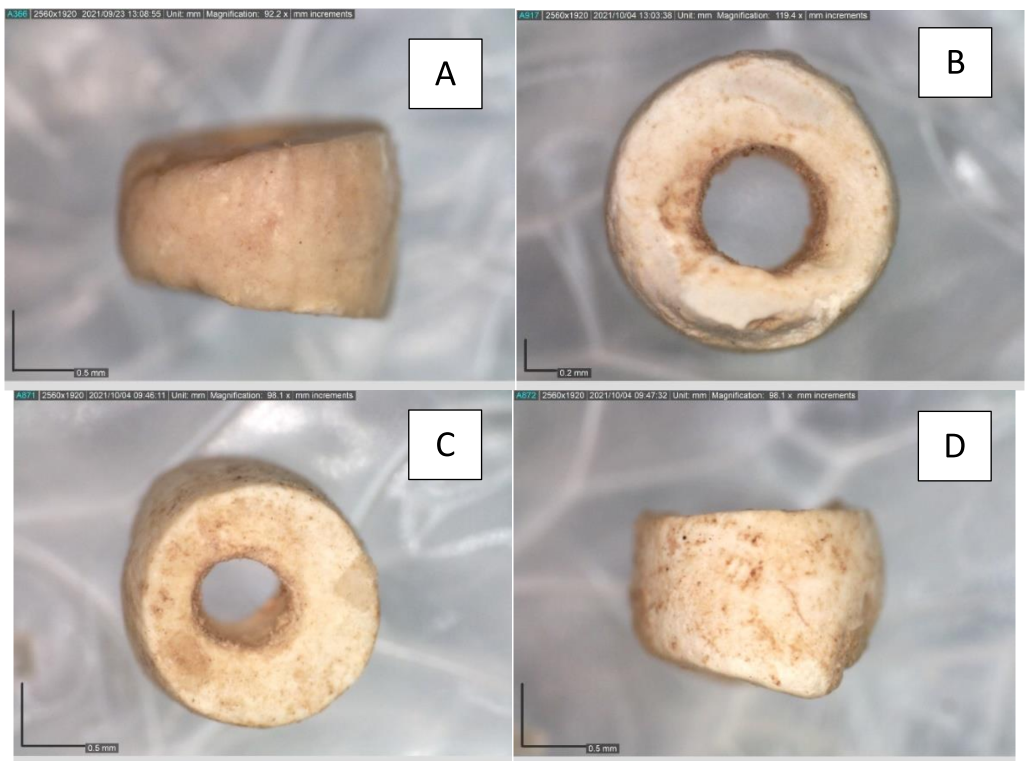


Figure 5.7: A. 5070.003-008 angled end. B. 5070.004-091 bead with non-circular perimeter. C: 5070.004-076 bead that has neither a circular perimeter, nor ends perpendicular to its axis.

5.2.3.1.3 Tomb 7 Perforation

Though drill hole interiors were somewhat visible from the 'top down' on most beads, several beads in the assemblage were broken in such a way that rendered their drill holes completely visible. In nearly 60% (N=88) of the sample, the top of both sides of beads' drill holes was circular. In the remaining instances, the tops of drill holes on beads were evenly split between those that had elliptical openings on both ends, and those that exhibited one circular (fig. 5.8a) and one elliptical opening (fig. 5.8b). Typically, at least one side of a bead's drill hole exhibited signs of chipping (54%, N=77). When chipping was observed, it largely appeared in concentrated areas at the top of the drill hole. This chipping would usually extend out somewhat from a circular or roughly circular drill hole, rendering it at least partly elliptical. In most cases, chipping was found on one side only (5.9b), with the other side appearing smooth (N=57, 38.5%) (fig. 5.9a).

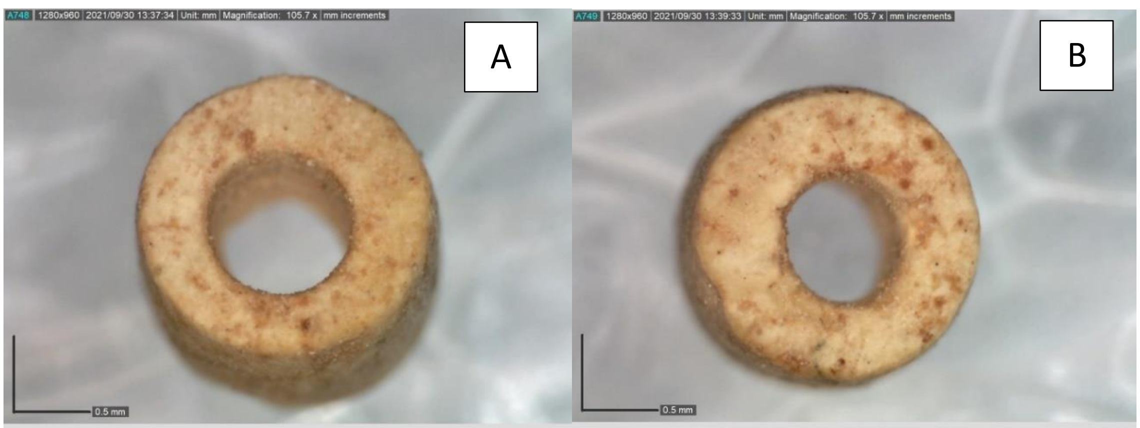


Figure 5.8: 5070.004-041 A. Circular drill hole opening B. Elliptical Drill Hole Opening

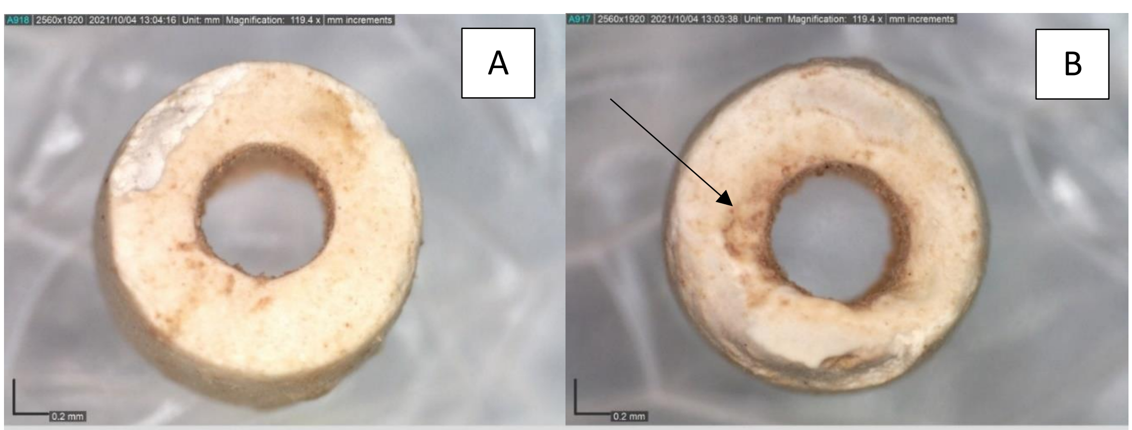


Figure 5.9 5070.004-090 (A) Chipping absent (B) Concentrated chipping on opposite end.

Though the top-down perspective available for most beads suggested that the perforation hole was entirely plain, without any taper, in 26 instances (17.4%), there was some evidence for at least some degree of taper creating single (fig. 5.10a) and double cone perforations (fig. 5.10b). In some instances, the degree of taper was obvious due to relatively considerable differences in the size of the drill hole openings from both sides of the bead. While not visible from a top-down perspective, many of the drill holes ascribed as plain likely had some degree of taper. This conclusion may be reached on account of close examination of a broken bead from tomb 7 whose drill hole appears plain from a top-down perspective (5.11a), but in cross-section has a single cone shape with a very slight degree of taper (fig. 5.11b). In 11 cases (7.4%), it was possible to see parallel striations within bead's drill holes (fig 5.12).

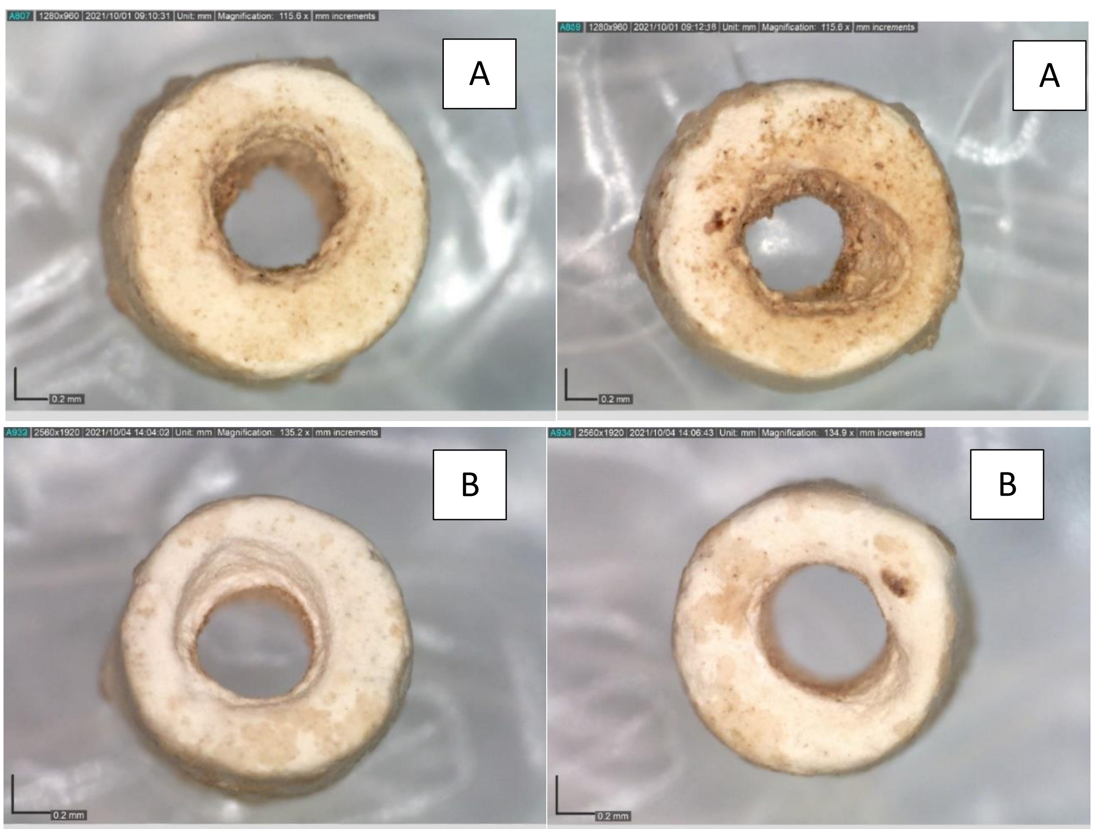


Figure 5.10 (A) 5070.004-060 with a single cone perforation (B) 5070.004-111 bead with double cone perforation.

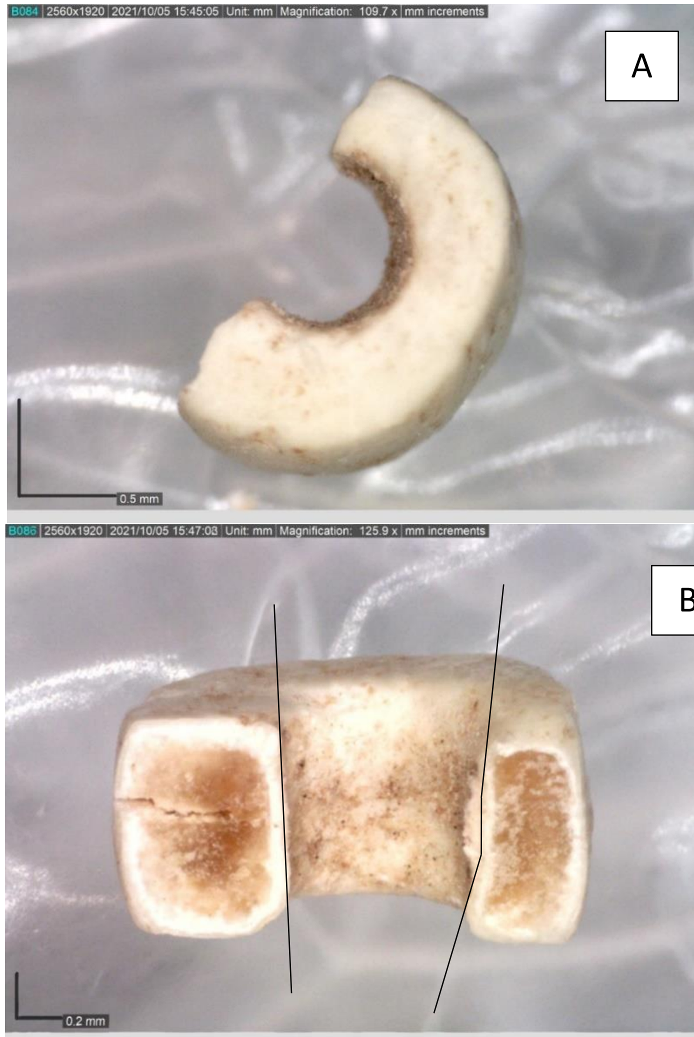


Figure 5.11 Bead 5070.004-121 split in half revealing a single cone perforation despite it appearing to have a straight perforation when observed from a top-down perspective.

Figure 5.12 Bead 5070.003-011 with parallel striations at the top of the drill hole.

5.2.3.1.4 Tomb 7 Glaze

The preservation of glaze on tomb 7's glazed steatite beads was highly variable with relatively few (N=14/148, 9.4%) retaining any trace of their presumed original green coloration. Nonetheless, based on an examination of these beads as well as the broader architecture of the bead's glazes it is highly likely that most, if not all of tomb 7's beads originally possessed a green coloration that has faded as a result of post-depositional processes. The profound impact of these processes is highly evident in the cracking observed on 23 (15.5%) of tomb 7's beads.

While the glazes on tomb 7's beads were variably preserved, manifesting different external appearances, cross sections of bead's transversal (fig. 5.13) and longitudinal (fig. 5.14) sections revealed the internal architecture of the bead's glaze layers. These include an internal unglazed steatite body (A), a white film transition layer between the body and the more solid outer glaze (B), a typically white, solid, vitreous, outer glaze layer (C), and lastly, a green glaze layer (D) (fig. 5.15). These cross sections also reveal that glaze penetrated inside the drill holes of beads from tomb 7.

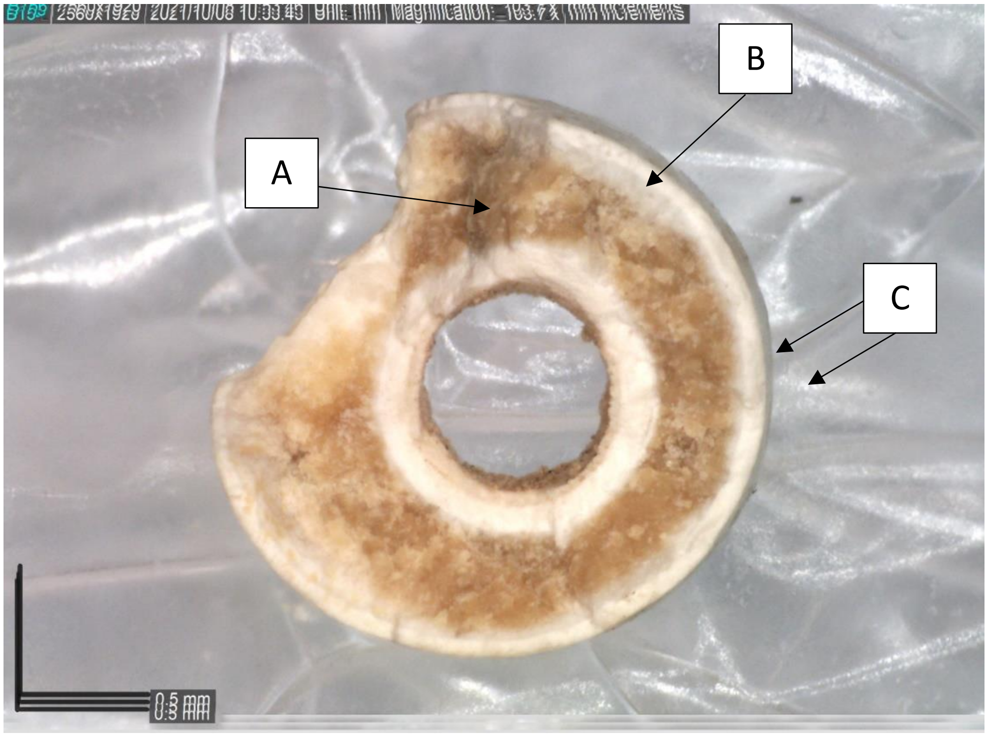


Figure 5.13 Bead 5076.010 transversal section revealing clear transitions between the unglazed steatite body (A), the white film transition layer (B), and the solid outer glaze layer (C).

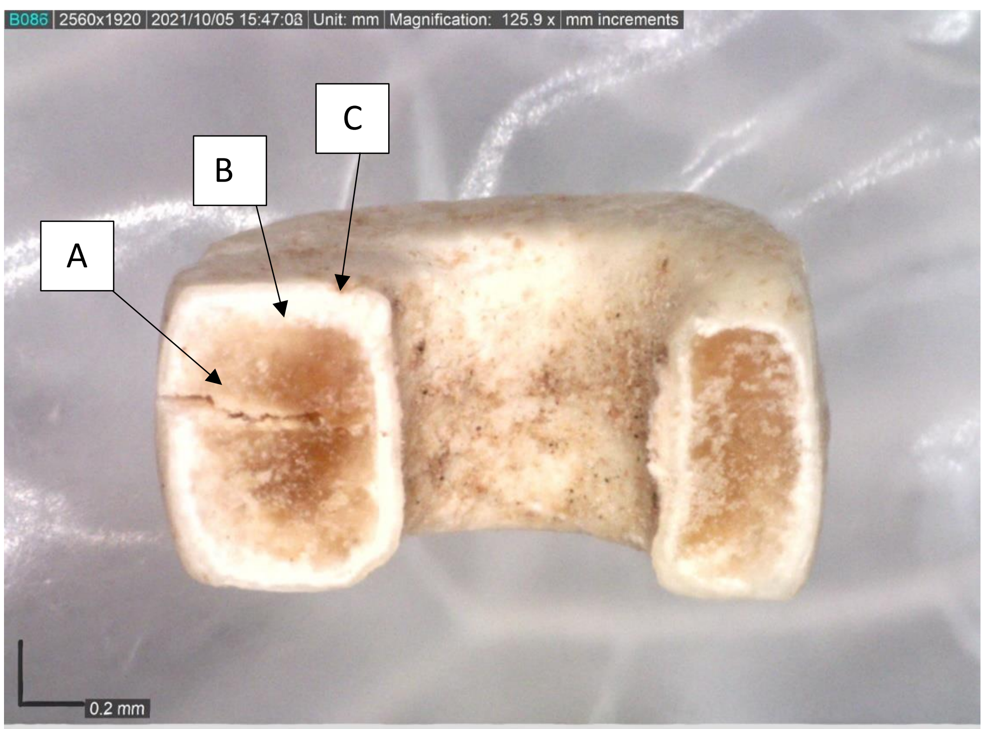


Figure 5.14 Bead 5070.004-121 longitudinal section revealing clear distinctions between the unglazed steatite body (A), the white film transition layer (B), and the solid outer glaze layer (C).

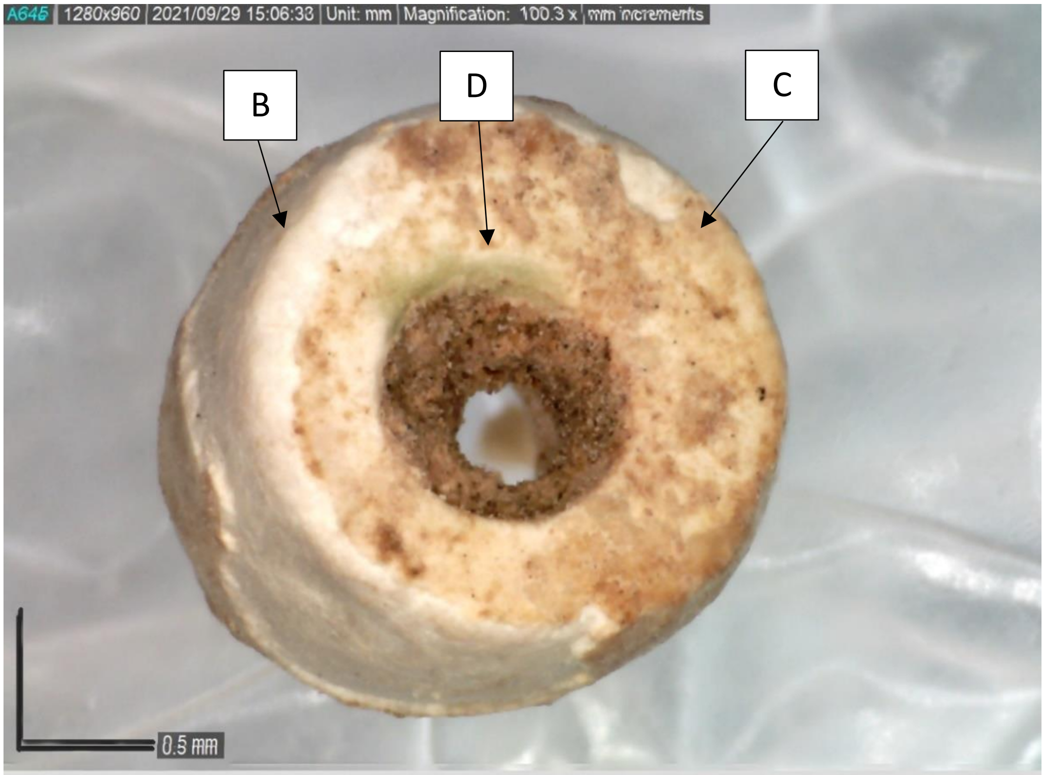


Figure 5.15 5070.004-014 with small area of green glaze layer preserved (D) overtop solid outer glaze layer (C) and white film transition layer (B).

Within tomb 7's assemblage 14 beads (9.4%) retained their green coloration, in 110 instances (74.3%), the outer preserved layer was the solid outer glaze layer, while in 24 cases (16.2%), the solid outer glazed layer had chipped off, leaving behind only the white film transition layer.

On beads that preserved their green coloration, the extent to which it was preserved varied widely. Whereas in some instances, the majority of a bead's surface was covered by a uniformly colored green glaze (fig. 5.16), others maintained their coloration on only part of their surfaces as a spectrum of green color (fig. 5.17). While some instances of green glaze appeared to be part of a solid and separate layer of glaze (fig. 5.16), in most cases, the green coloration retained by beads appeared more like a film, overlaid on top of the solid outer glaze layer (fig. 5.17, 5.18). Despite close visual examination for the presence of green coloration, no such coloration was forthcoming on the vast majority of glazed steatite beads in tomb 7's assemblage. Two factors, however, suggest that all of the beads in tomb 7's assemblage once possessed a green glaze. Firstly, in areas of green colored beads that were not covered in green, a solid outer glaze layer was observed that was identical to the rest of those found throughout the assemblage in terms of color, texture, and appearance (fig. 5.17-5.18). Secondly, on beads whose green coloration appeared in a spectrum, it was possible to observe the gradual fading of green color directly alongside the solid outer glazing layer (fig. 5.17). This is highly suggestive that the beads from tomb 7 were indeed once colored green, but that in most cases, this coloration, with time, faded away.

Figure 5.16 Bead 5070.004-119 with green glaze layer appearing overtop solid outer glaze layer.

Figure 5.17 Bead 5070.004-116 with green glaze differentially preserved in a spectrum laid directly overtop solid outer glaze layer.

Figure 5.18 5070.004-123 with green coloration appearing as a film immediately overtop the solid outer glaze layer.

In 110 of the beads analyzed from tomb 7 (74.3%), the outermost preserved layer was the solid outer glaze layer. While in some cases, this layer was preserved in a smooth white state (fig. 5.19), in many instances it was covered with brown splotches that likely developed post-depositionally (e.g., fig. 5.15). Lastly, in 24 instances (16.2%) the solid outer glaze layer had fallen off completely, leaving behind only the white film transition layer.

Figure 5.19 5070.004-074 with solid outer glaze layer (C) appearing superimposed above the white film transition layer (B)

While most beads with preserved green glaze or solid outer glaze layers manifested a smooth appearance, in some instances bead's ends (N=23, 15.5%) and profiles (N=32, 21.6%) contained some degree of cracking (fig. 5.20). Despite varying in depth, these cracks were characterized by their reddish-brown coloration. In addition, while these cracks were often seemingly randomly distributed and, in most instances, one line of cracks would typically interlock or connect to another line of cracks. In every instance, these cracks appeared on the solid outer glaze layer, suggesting that these cracks were perhaps ultimately responsible overtime for the complete crazing of this layer, leaving behind only the white film transition layer. This is unsurprising in light of Kenoyer's (2021: 59) observation that steatite's glaze tends to flake off over time.

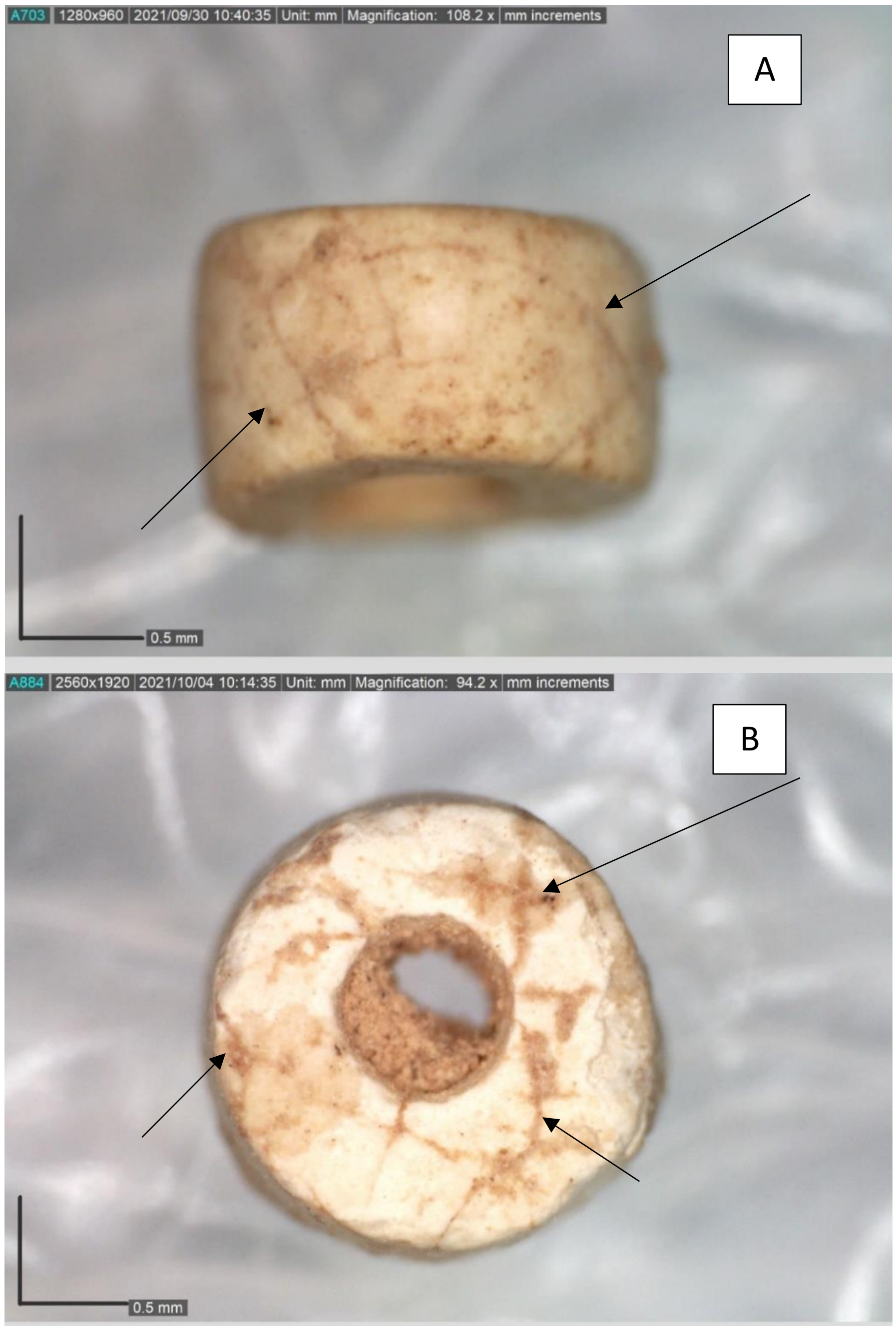


Figure 5.20 (A) 5070.004-027 with interlocking red-brown cracks on its profile (B) 5070.004-079 with cracks on its end.

5.2.3.1.5 Evidence for Wearing: Polish and Fibers

Polish was not commonly observed on the exteriors of beads found in tomb 7 appearing on only 13 (8.2%) of ends and in just one instance (.6%) of profiles. This polish was typically found in a concentrated area on the bead's end, manifesting slight reflectivity (fig. 5.21). In two instances however, this polish was extensively reflective (fig. 5.22). By contrast with the expectation that polish from wearing beads largely develops at the intersections between the bead end and perimeter and between the end and the drill hole (Falci et al. 2019: 776), this polish was largely found on other, seemingly random, parts of the beads' ends.

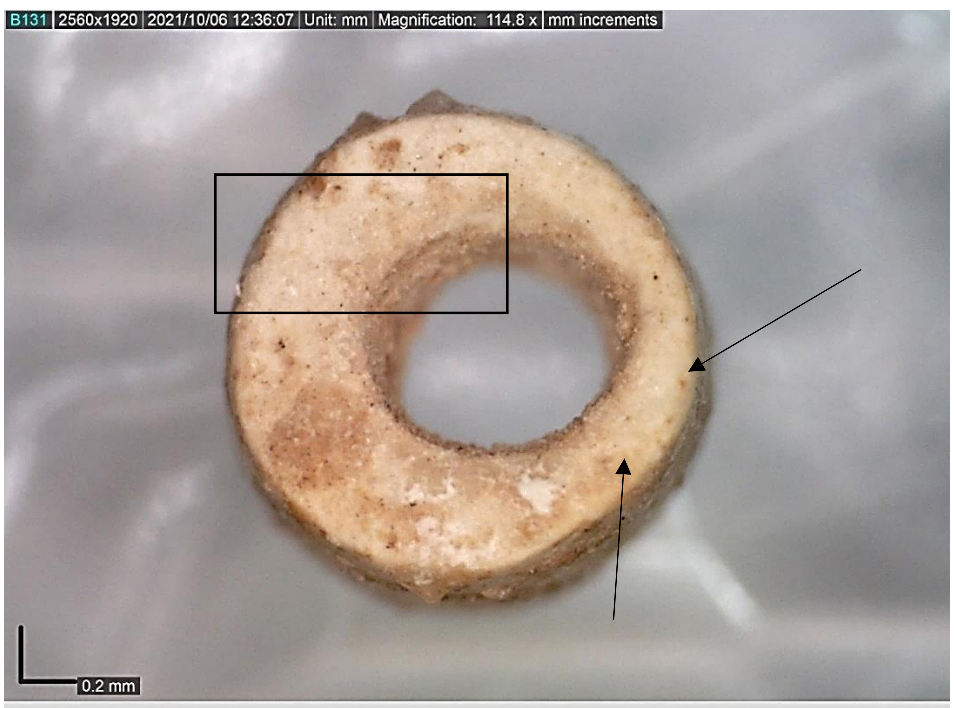
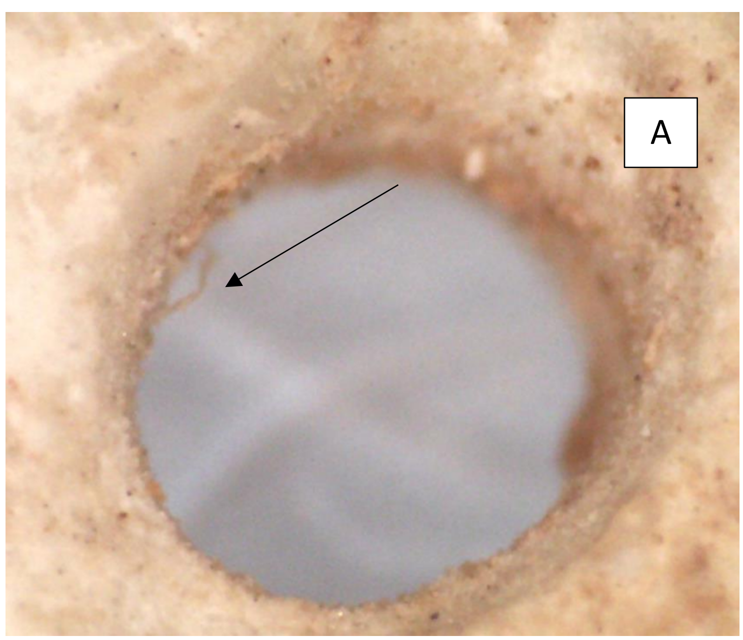


Figure 5.21 5070.004-126 exhibiting a slight polish reflectivity.

Figure 5.22 Bead 5070.003-001 exhibiting extensive polish reflectivity in a concentrated area, but no polish in other areas

In five instances, fibers were found preserved within bead's drill holes. In most cases, only a small strand survived, often adhering one side of the drill hole (fig 5.20a). The fibers found within bead 5070.004-123 were particularly well preserved, forming a cluster (fig. 5.20b). Beads with fibers were not correlated with polish.



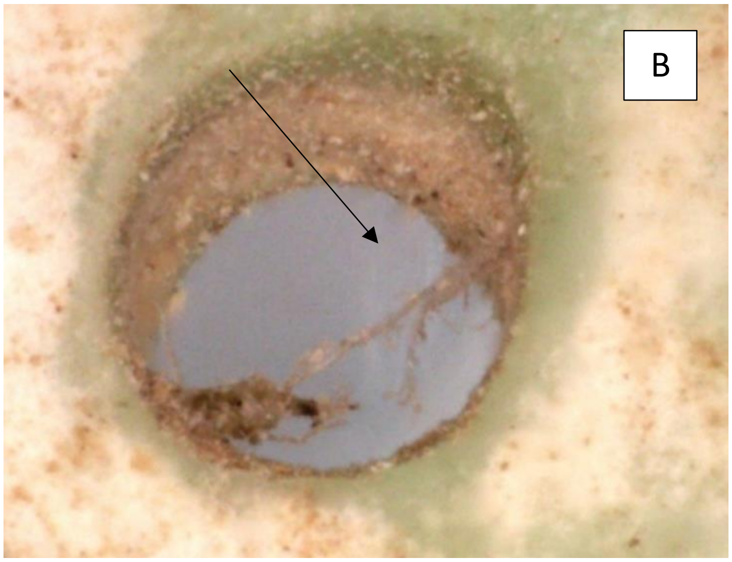


Figure 5.23 (A) 5070.004-078 with preserved fiber. (B) 5070.004-123 with a cluster of fibers inside of its drill hole.

5.2.3.1.6 Uncommon Wear Traits

In 3 cases (2%), the generally flat planes of bead's ends contained slightly concave areas. These appeared in two types. The first type was a central concavity that surrounded the drill hole on both sides that had a slightly lower elevation than the rest of the bead's surface (fig. 5.24). The second type of concavity observed bordered the bead's drill hole on only one side and extended from there to its perimeter (fig. 5.25). In both instances, these concavities were covered by glaze layers.

5.2.3.1.7 Tomb 7 Use-wear Summary

Several diagnostic features characterized the bead assemblage from tomb 7. These rarely had linear traces on their ends and occasionally exhibited loose, separated, parallel linear traces on their profiles that were oriented obliquely. In most cases, beads from tomb 7 possessed plain perforations with circular drill hole openings that had chipping on one of their ends in about half the assemblage. About 10% of beads from this tomb preserved some evidence of green glaze, which was variably preserved. This colored layer appeared atop several other glaze layers including a white film transition layer, and a solid outer glaze layer. Even when green glaze was present, its preservation was highly variable. Whereas cracking was observed, it was not common, suggesting that the glaze from tomb 7 was highly robust. Lastly, while polish and fibers were uncommonly preserved, they were, on occasion, visible.

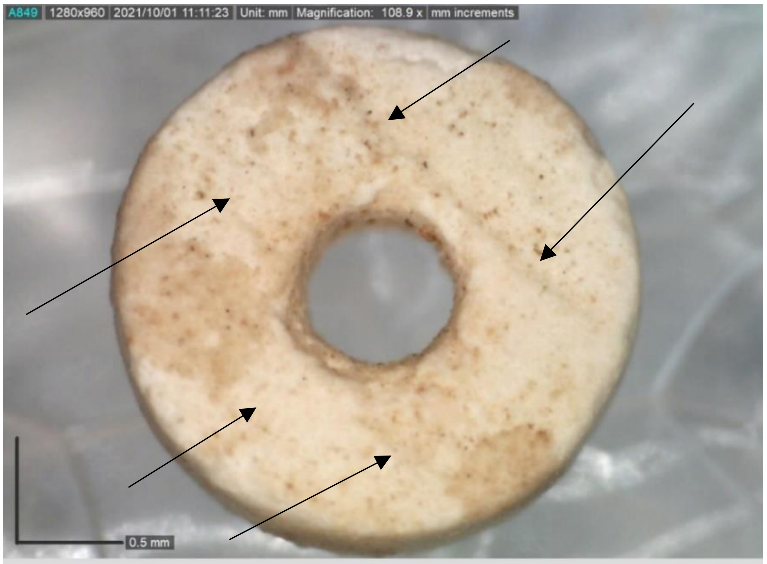


Figure 5.24 5070.004-071 with centrally located slight concavity demarcated by arrows.

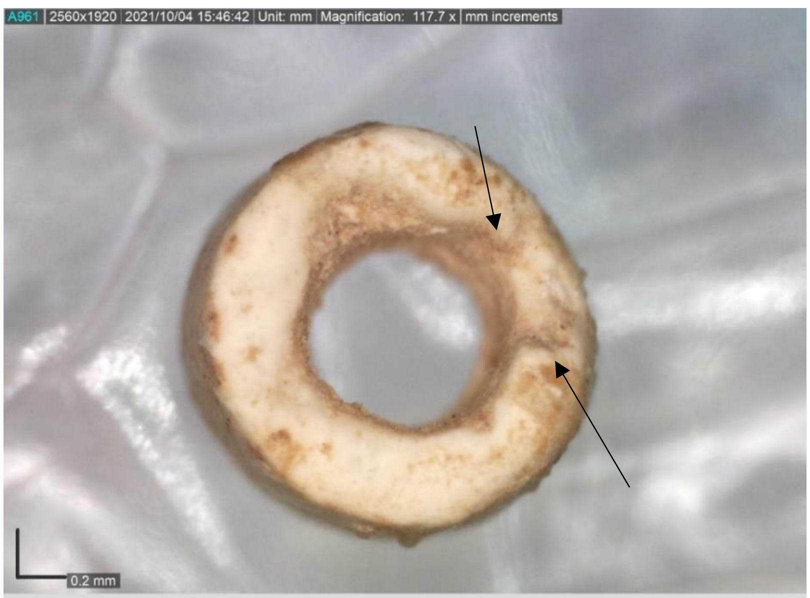


Figure 5.25 Bead 5070.004-108 with a concentrated concavity going from the top of the drill hole to the perimeter.

5.2.3.2 Use-Wear Observations on Beads from Tomb 12:

By in large, observations of wear made on the beads from Tomb 12 revealed similar patterns to the beads found in tomb 7 suggesting mostly similar manufacturing sequences. Nonetheless, close examination reveals some markedly unique aspects of this assemblage. This section will highlight these unique aspects as well as some of the more unusual features observed on beads from tomb 12.

5.2.3.2.1 Linear Traces

Linear traces were far more commonly observed on bead ends from tomb 12, with nearly 27% of ends having these traces. Whereas the linear traces observed on the surfaces from tomb 7 were often randomly placed and only survived on a limited part of the bead surface, all but one of the examples of linear traces from tomb 12 had covered or loose distributions. In each instance, these traces stretched across the bead surface, had parallel orientations, and were variably shallow or deep (fig. 5.26a, 5.26b). In some instances, these traces were especially deep creating craters on the bead surface (fig. 5.26c) In each instance, the area above these linear traces was glazed.

Linear traces appeared more frequently on the profiles of beads from tomb 12 (N=14, 34.2%). These traces were of the same character observed on beads from tomb 7, also being characterized by their parallel dispositions and oblique orientations with varying degrees of depth (fig. 5.27). These linear traces were also, in each instance, covered by glaze.

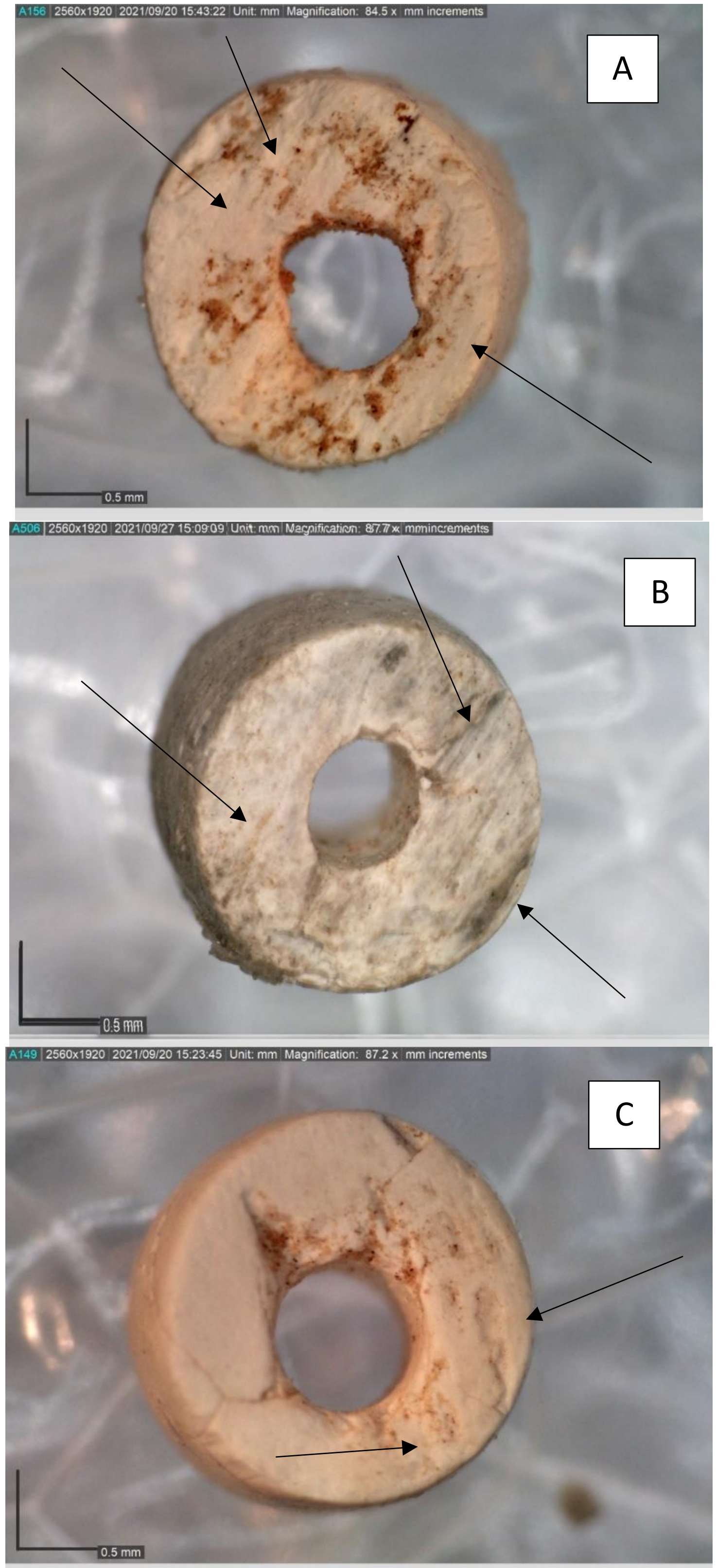


Figure 5.26 (A) 23 5106.002 with covered closed parallel deep linear traces on its end. (B) 5108.001-007 with covered loose parallel and shallow linear traces. (C) 5106.001 with loose, separated, parallel deep linear traces

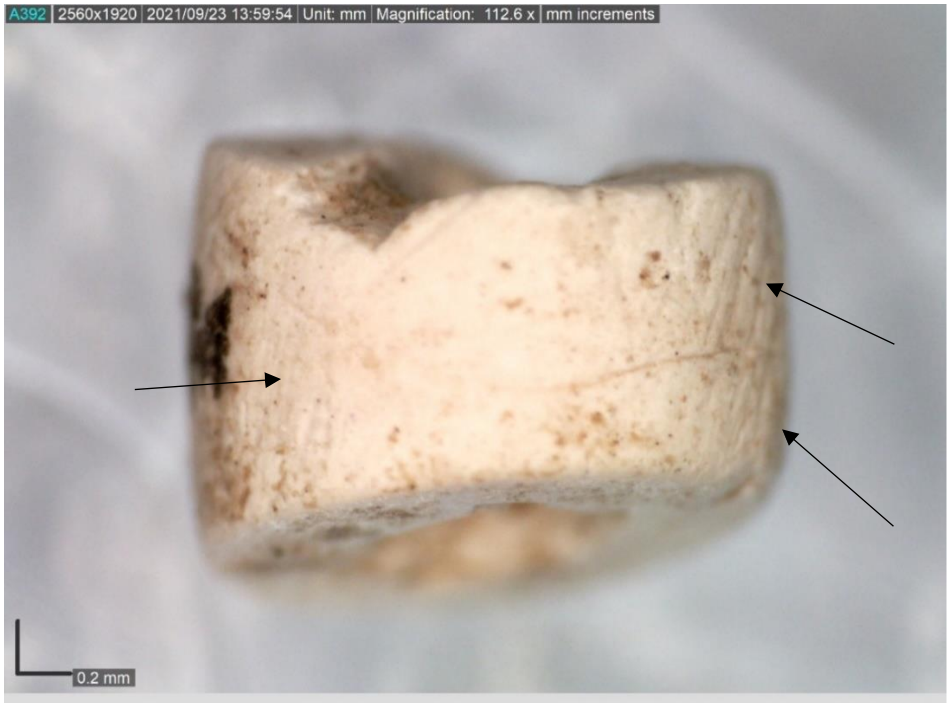


Figure 5.27 5108.001-002 with loose, closed, parallel, shallow, and obliquely oriented linear traces on the bead's profile.

5.2.3.2.2 Shaping and Surface Concavities

As with the beads from tomb 7, the assemblage from tomb 12 also exhibited some diversity in their final shape. Most beads were either carefully rounded with ends that were perpendicular to the axis (N=16, 39%) or carefully rounded but with ends that were not perpendicular to the axis (N=15, 36.5%). Less common were beads that had ends parallel to the axis but were not themselves round (N=12, 29.2%). Other (N=3, 7.3%) were neither rounded nor had ends parallel to the axis. Beads that were not completely circular varied widely in shape, from examples that were slightly elliptical, to examples with angular concavities (fig. 5.28).

Figure 5.28 5108.001-032 with an angular concavity.

Surface concavities were far more common on beads from tomb 12 than on beads from tomb 7, appearing in 10 instances (24.3%). These concavities typically appear as slight depressions that extend from one side of the perimeter to the other, crossing over the drill hole (fig. 5.29a). In each instance, these concavities appear on one side of the bead, with the other side appearing completely flat (5.29b). Less commonly, this same type of concavity appeared on only one side of the drill hole (fig. 5.30).

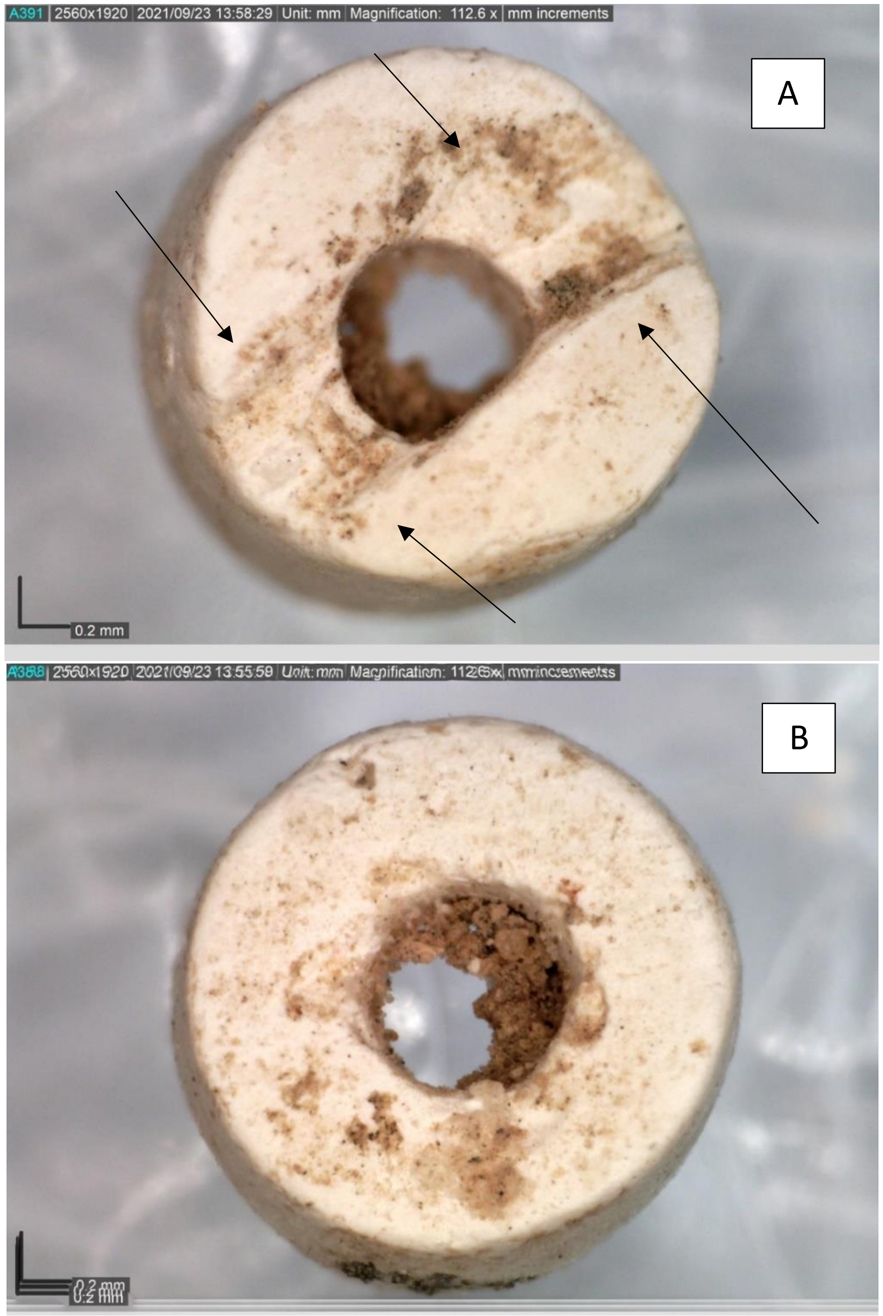


Figure 5.29 5108.001-002 (A) End with central concavity. (B) End with no concavity.

Figure 5.30 5108.001-020 with a concavity appearing on only one side of the drill hole.

5.2.3.2.3 Perforation

The patterns exhibited by the drill holes found in tomb 12 resembled those found in tomb 7 with roughly equally occurring instances of beads where both drill hole openings were circular (N=16, 39%), elliptical (N=11, 26.8%), or were mixed between circular and elliptical (14/41, N=34.1%). Chipping was commonly observed around the top of the drill hole (N=27, 64.8%) with most instances occurring on only one side of the bead, with no corresponding evidence for chipping on the other side of the drill hole (N=24, 57.5%) (fig. 5.31 a, b) This chipping typically took on the same form that was observed on beads from tomb 7, extending out from the drill hole. Thirty-six beads in the sample possessed plain perforations with the remaining five instances having a single cone shape with slight taper.

Figure 5.31 5108.001-026 (A) elliptical drill hole opening exhibiting chipping (B) circular drill hole opening without chipping.

5.2.3.2.4 Glaze

Not a single bead examined from tomb 12 preserved clear evidence for green glaze. In three instances, at least part of the solid outer glaze layer appeared to be at least partially covered by either a black splotchy (fig. 5.32a) or marbled layer (fig. 5.32b). One bead possibly preserved evidence of blue glaze found in one splotch on its profile (fig. 5.32c). Broadly, it is unclear if these layers are functions of post-depositional chemical processes, such as staining or the degradation of an originally green outer glaze layer, or an altogether separate glazing technique used to glaze beads from tomb 7. The outer preserved layer of 26 beads (63.4%) was the solid outer glaze layer, with the remaining 15 beads examined from tomb 12 retaining only their white transition layer with their outer glaze chipping off.

Figure 5.32 (A) 5108.001-001 with a solid outer glaze layer covered by a black film. (B) 5108.026 with a marbled layer above its solid outer glaze layer. (C) 5108.001-006 with concentrated area of potentially blue glaze indicated.

Glaze cracking of the same sort observed on beads from tomb 7 was observed in nearly half the beads from tomb 12 (N=17, 41.4%) (fig. 5.33a). While this cracking was often shallow and appeared only on the solid outer glaze layer, in other instances, the cracks found on beads from tomb 12 appeared to extend more deeply into the beads, affecting the integrity not only of their glazes, but also of their structures as a whole (fig. 5.33b). In some instances, areas of the bead that seem to have broken off were found to intersect directly with areas possessing these deeper cracks (fig. 5.33c). The deeper penetration of these cracks is highly suggestive that whatever the cause of glaze cracking, it continued to affect the deeper structural integrity of the bead after crazing off sections of glaze.

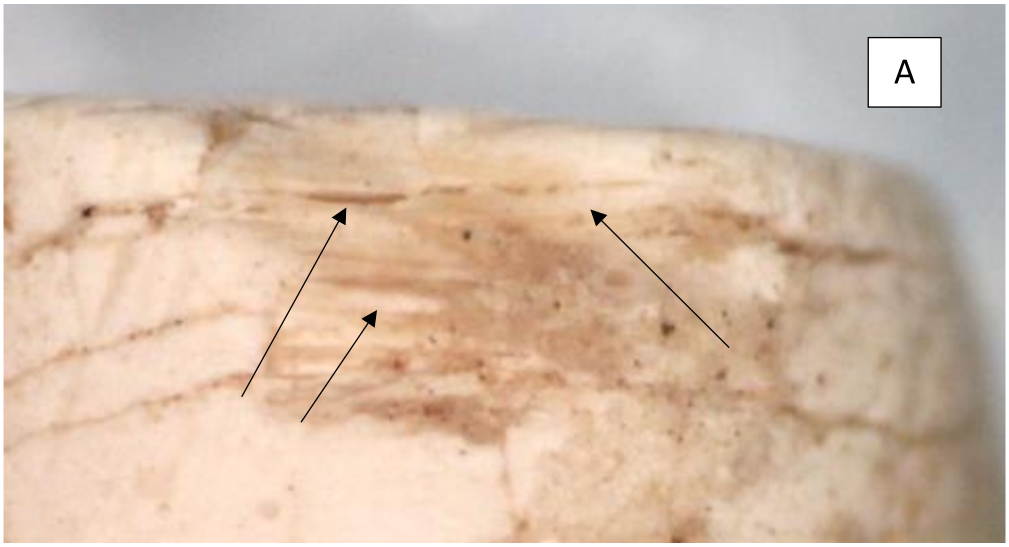
Figure 5.33 (A) 5108.001-011 with extensive cracking on its solid outer glaze layer. (B) 5106.002 with deep cracks affecting its structural integrity. (C) 5108.001-031 with deep cracks running directly into areas of the bead's glaze and surface that have fallen off.

5.2.3.2.5 Polish and Fibers

Polish appeared on only two beads from tomb 12 while no fibers were observed on beads from this tomb.

5.2.3.2.6 The Internal Matrix of Beads from Tomb 12

Whereas the unglazed steatite interiors of beads from tomb 7 had a homogenous appearance (e.g., fig. 5.13), the interiors of several beads from tomb 12 appeared to be made up of thin and long, stacked horizontal sheets (fig. 5.34a, b). This different matrix could possibly indicate that some beads from tomb 12 originated in a different steatite outcrop than observed on beads from tomb 7 (T. Olds, personal communication, October 10, 2021). This pattern was not universal throughout the entire sampled assemblage from tomb 12, with some beads exhibiting the homogenous interiors observed in tomb 7 beads (fig. 5.35).



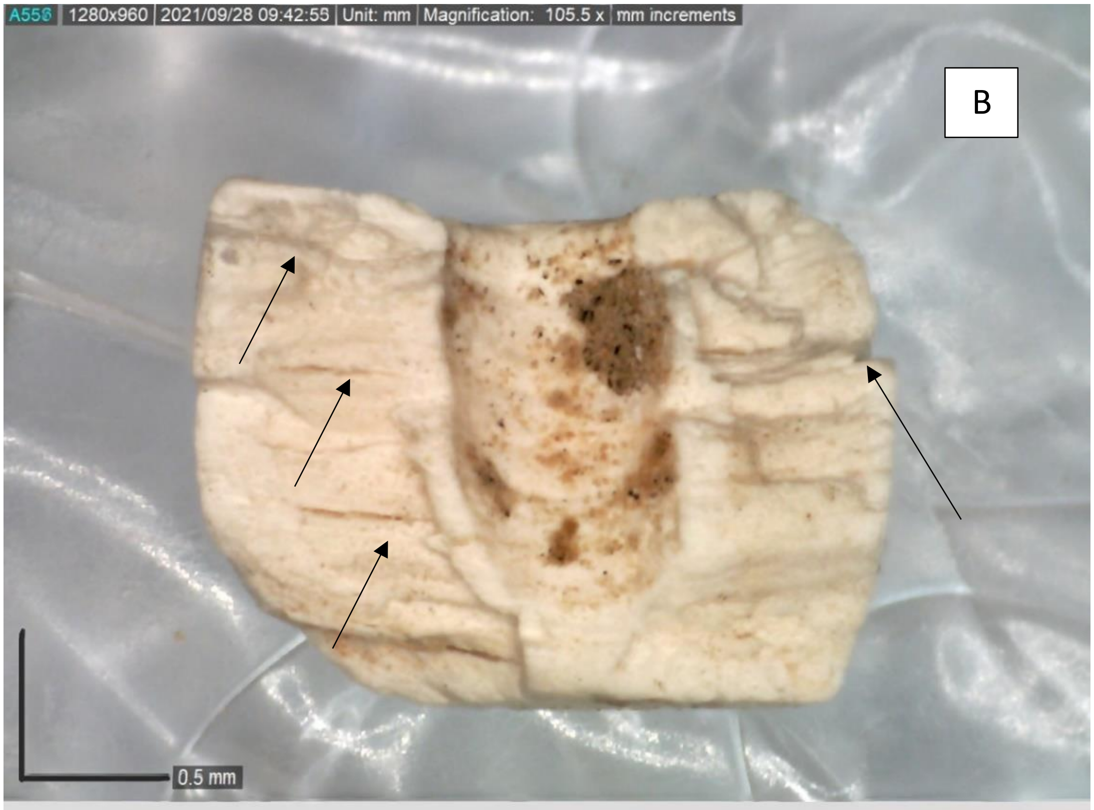


Figure 5.34 (A) 5108.001-031 with interior made up of stacked horizontal steatite bands. (B) 5108.001-037 with interior showing evidence for stacked horizontal steatite bands.

Figure 5.35 Bead 5108.001-034 with homogenous interior without evidence for horizontal bands of steatite.

5.2.3.2.7 Tomb 12 Use-Wear Summary:

Tomb 12's beads had several traits that differentiated them from beads in tomb 7. Firstly, linear traces were far more common on both the ends and profiles of beads from tomb 12. Tomb 12's ends also often exhibited a central concavity on only one of their ends, which was highly distinctive. Their perforations by contrast highly resembled those found on tomb 7's beads. Unlike tomb 7, no beads from tomb 12 possessed clear evidence for the preservation of green glaze. This, along with a much higher degree of glaze cracking and crazing suggests that the glaze from this tomb was of a different character than tomb 7's and was less durable. Polish was uncommon and no fibers were preserved. Lastly, in several instances, the inner matrix of several beads from tomb 12 appeared to be made up of stacked horizontal bands of steatite, a pattern not observed on beads from tomb 7.

5.2.3.3 Use-Wear Observations on Beads from Tomb 20

Only 14 beads were recovered from tomb 20, with three of these being fragments. As a result, every glazed steatite bead recovered from the tomb was examined. Despite being on the whole larger than tomb 7's beads (Fig. 5.1-5.3), use-wear on this assemblage largely resembled beads recovered from tomb 7.

5.2.3.3.1 Linear Traces

Evidence of grinding was observed in a few instances with one example observed on an end from tomb 20 and two examples observed on profiles. As with previously observed examples, the linear traces observed on bead's profiles were characterized by their parallel, oblique orientation (fig. 5.36). The central concavities that appeared on beads from tomb 12 were not observed on beads from tomb 20.

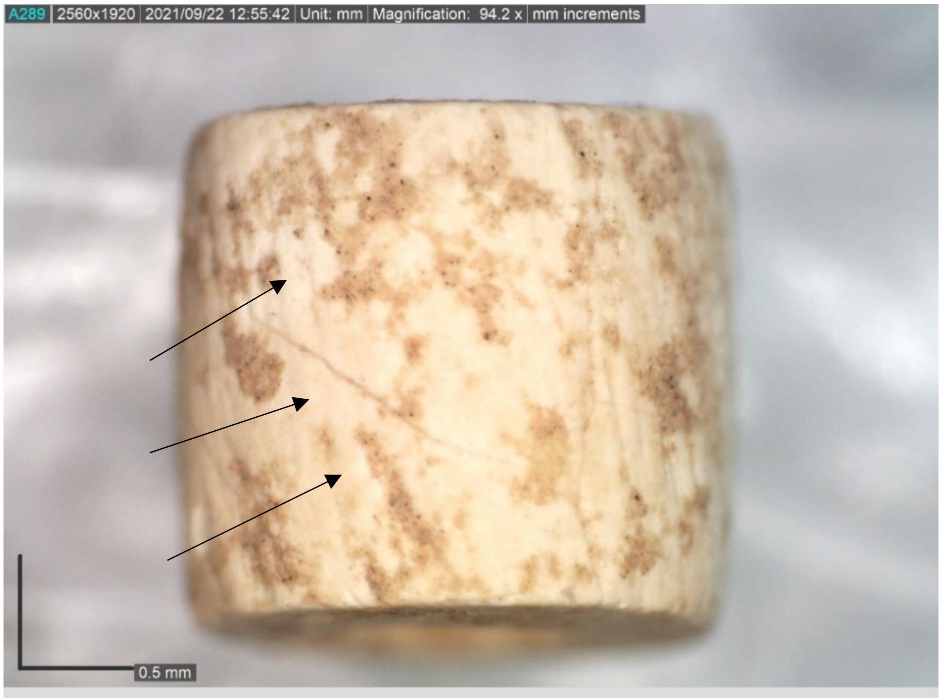


Figure 5.36 5101.004 with parallel linear traces on its profile highlighted.

5.2.3.3.2 Shaping

A very high proportion of the beads in the assemblage were both completely circular and had ends that were mostly perpendicular to the bead's axis (N=8, 72.7%). Of the remaining complete beads, two were circular but did not have perpendicular ends and one had perpendicular ends but was not entirely circular.

5.2.3.3.3 Perforation

Plain drill holes were the most common type observed on beads from tomb 20 (N=7, 50%), it is notable however that the remaining half of beads in the assemblage had either single or double cone perforations. This contrasted with beads from tombs 7 and 12 where plain perforations were much more common and single and double cone perforations much rarer. Only five beads had circular drill hole openings on both ends with the majority of examples (N=8) exhibiting at least one elliptical drill hole opening. In some cases, the elliptical openings at the top of drill holes had a high degree of ellipticity compared with the subtle asymmetry typically observed on beads from the other two tombs (fig. 5.37)

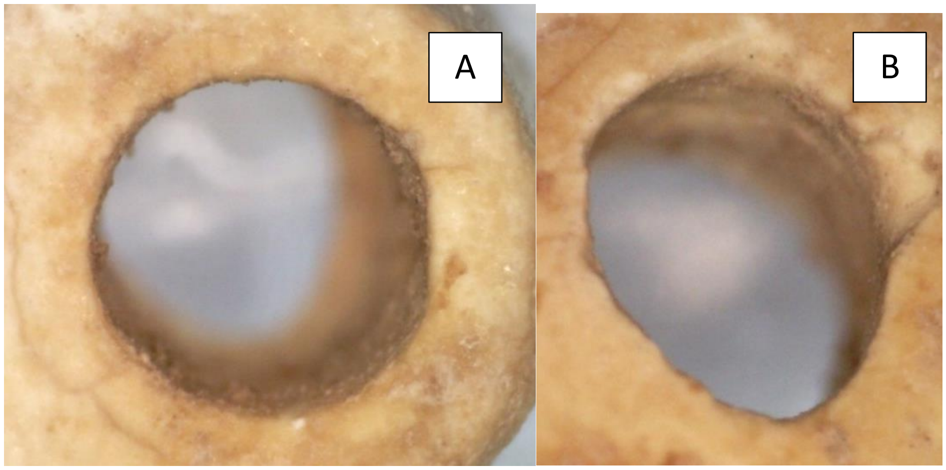
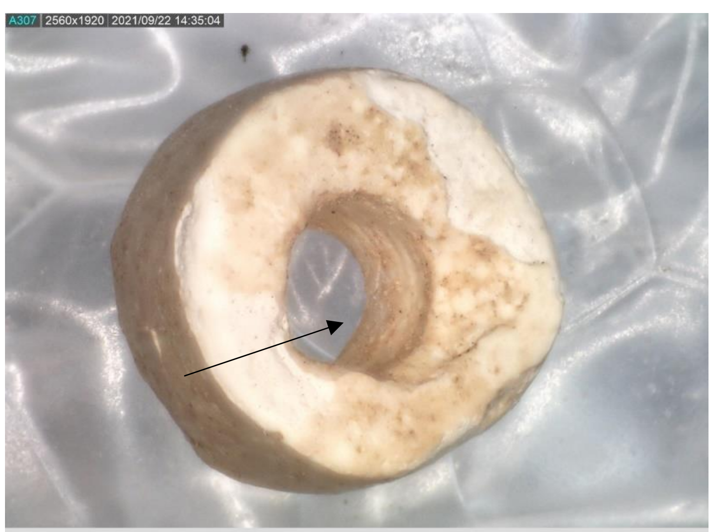


Figure 5.37 5101.005 with (A) one circular and (B) one elliptical drill hole opening.

Chipping at the top of the drill hole of the same type observed on beads from tombs 7 and 12 was very common, appearing on only one end in the majority of instances (N=6). Parallel striations were observed on the interiors of bead's drill holes at a far higher rate than observed in the other two tombs, with three beads from the assemblage demonstrating this feature clearly (fig. 5.38). By contrast with previously observed striations in bead's drill holes, the ones found in the drill holes of tomb 20 beads were deeper.



`Figure 5.38 5101.010 with clearly visible parallel striations inside of the drill hole.

All three of the bead fragments examined from the tomb had their entire drill holes visible. Notably, in each of these three instances, the drill hole's interiors were revealed to be double cone perforations, with very slight degrees of taper (Fig. 5.39).

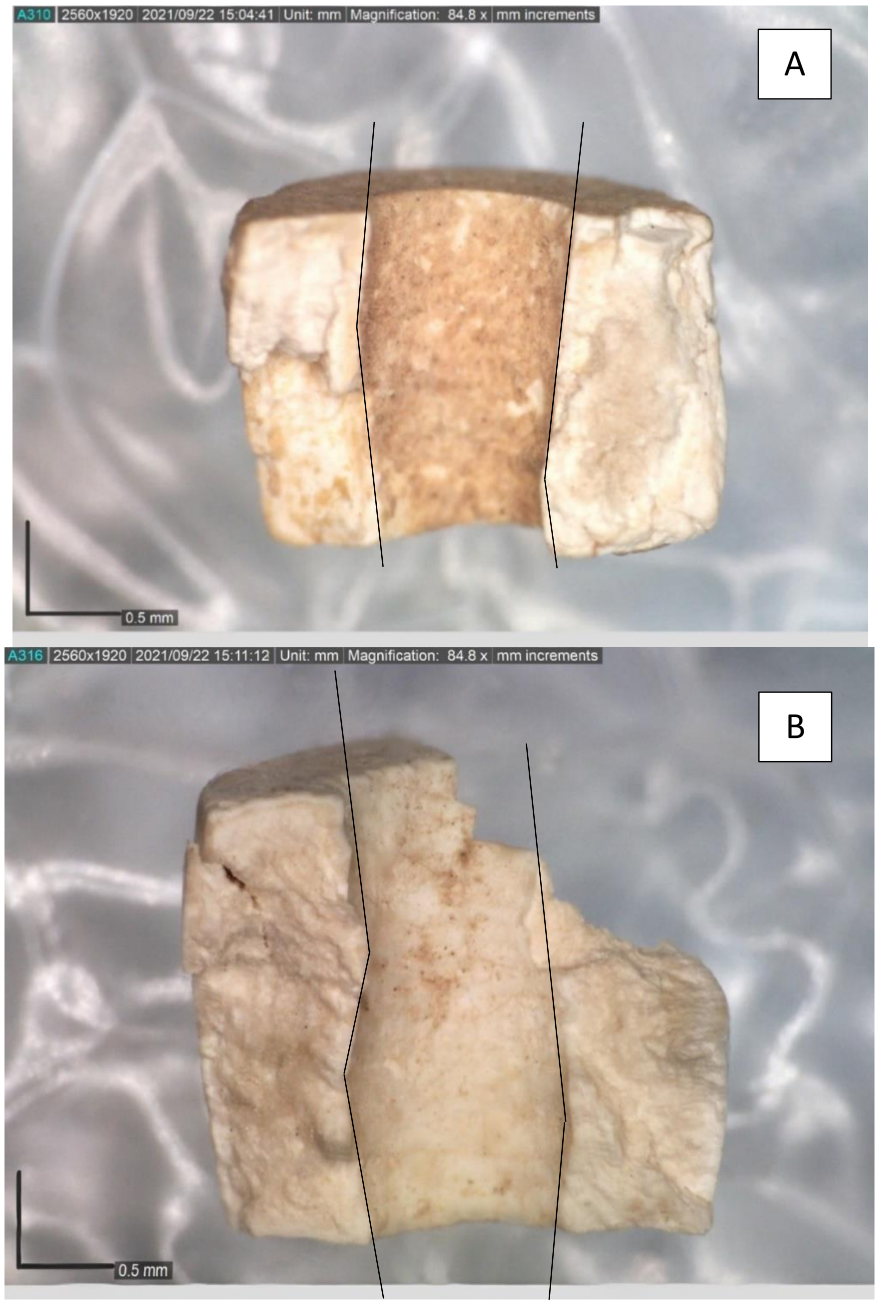


Figure 5.39 (A) 5101.011 with a double cone perforation (B) 5101.012 with a double cone perforation.

5.2.3.3.4 Glaze

Green glaze was preserved on one bead found in tomb 20. This glaze was visible on both ends of the bead, on its profile, and in its drill hole (fig 5.40). As with the beads from tomb 7, this layer clearly appears atop a white outer glazing layer. On this bead, the green glaze layer appeared was overlain by black splotches, not observed elsewhere. The glaze on beads from tomb 20 appeared to have been affected by two post-depositional processes. The first was the type of cracking observed on the solid outer glaze layers of tombs 7 and 12, which appeared on 11 beads from the tomb. Unlike some of the examples from tomb 12, this cracking never extended beyond the solid outer glaze layer. In several cases, the solid outer glaze layer appeared to be covered with sediment concretions that rendered their appearance rough and brown rather than white and smooth. Nonetheless, when these concretions affected the solid outer glaze layer, the white film transition layer appeared unaffected (fig. 5.41)

Figure 5.40 Bead 5101.001 with green glaze appearing on both its ends (A) and profile (B).

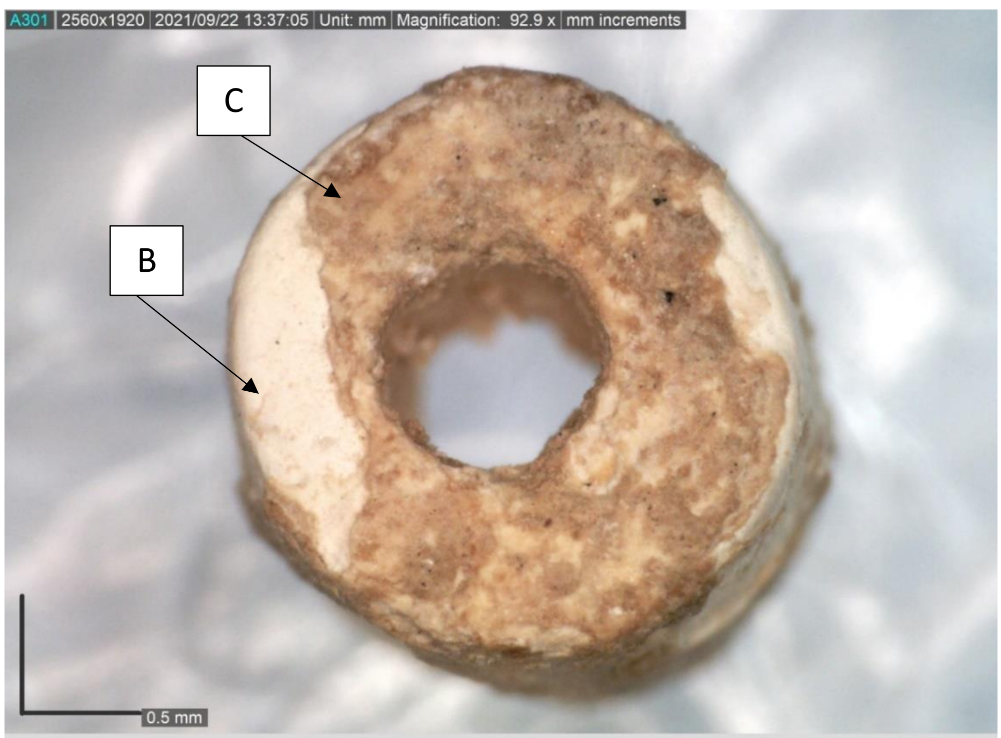


Figure 5.41 5101.008 with heavily denuded solid outer glaze layer (C) covering an unaffected white film transition layer (B).

5.2.3.3.5 Polish

Extensive polish was visible on the surfaces of three beads from the tomb 20 assemblage. On one bead, this polish was found on most parts of the bead's surface, and in particular around its drill hole (fig 5.42). No fibers were observed.

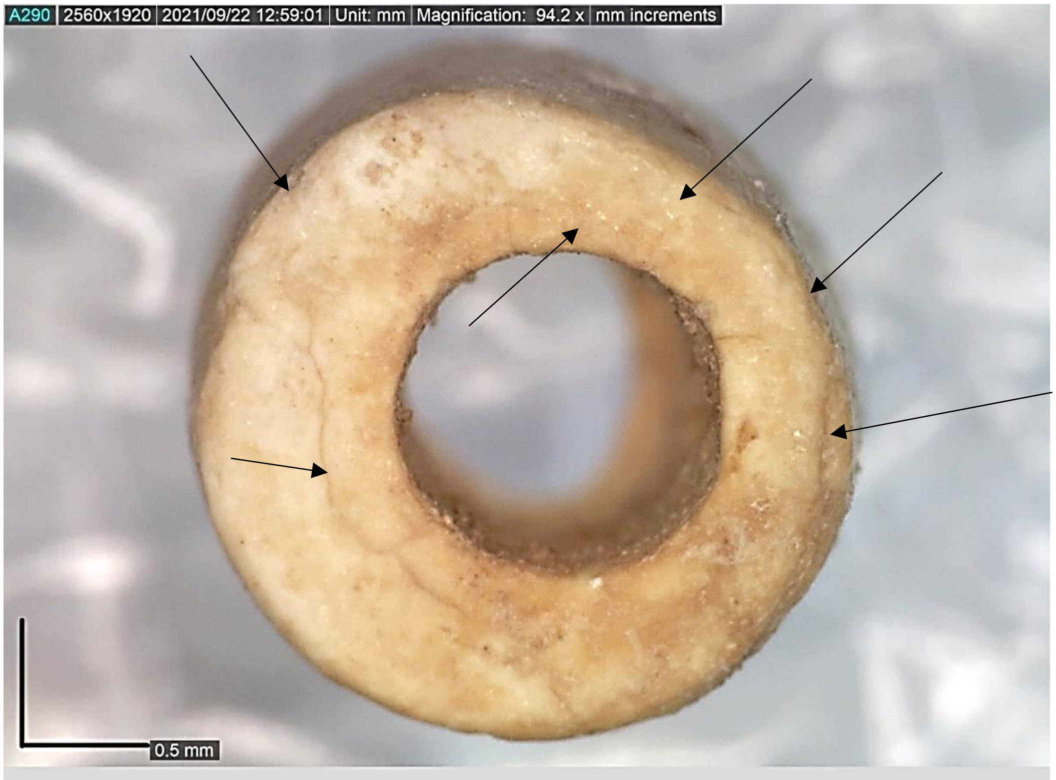


Figure 5.42 5101.005 with covering extensive polish.

5.2.3.3.6 Tomb 20 Use-wear Summary

Several traits differentiated the bead assemblage from tomb 20. Beyond being larger than the beads from tomb 7 and 12, beads from tomb 20 had a far higher degree of single and double cone perforations than observed in the other two tombs. These were chipped in most instances and had a high rate of ellipticity. In addition, parallel striations were far more common within the drill holes of tomb 20 than from the other two tombs.

These appeared quite deep in comparison with the types observed prior whose parallel striations were in many cases often barely visible. While green glaze was preserved on a bead from tomb 20, most beads had little evidence for green coloration. Glazes meanwhile seem to have been highly affected by post-depositional processes with the solid outer glaze layer of several beads absorbing sedimentary concretions. Lastly, polish was far more common on beads from tomb 20 than on beads from the other two tombs.

5.2.4 SEM Analysis

Due to the large number of fragmentary beads, as well as beads in varying states of preservation from each tomb, it was possible to use the SEM to image and interpret both the bead's glazed surfaces, their interiors, and their drill holes. It was hoped that the use of SEM would reveal the steatite's mineralogical matrix and suggest where clusters of different elements might appear on the beads.

Secondary electron images of bead's interiors from all tombs revealed their general homogeneity. Though no SEM images were taken of bead surfaces at quite the same magnification used to study the glazed steatite beads from the Chalcolithic burial cave at Peqi'in, images taken at 2.08 kx seem to reveal the same pattern of, "loosely packed elongated columnar crystals with no preferred orientation" found at that site (Bar-Yosef and Porat 2009: 113) (fig. 5.43). This is especially pertinent as this was the primary evidence used by those authors to suggest that their bead was made from a paste rather than carved and subsequently glazed (Bar-Yosef and Porat 2009: 113). The assemblage included some exceptions to this, with some beads' mineral structure appearing to be composed of long horizontal striated bands rather than randomly oriented (fig. 5.44).

Figure 5.43 SEM Sample 1 (Bead Fragment from Tomb 7 reg. #5076) with randomly oriented, loosely packed, steatite matrix.

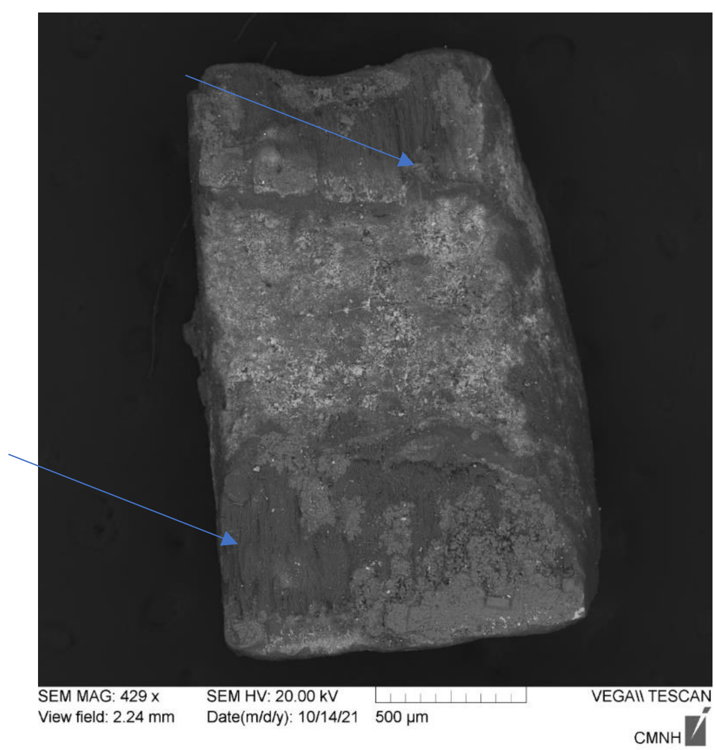


Figure 5.44 SEM Sample 6 (Bead 5108.001 from tomb 12) with areas of horizontal banding highlighted.

In most cases, the beads were covered with randomly placed agglomerations of salt crystals (fig. 5.45). These could be found on the outside of beads' glaze, in cracks in the glaze surface, in bead's drill holes, and on exposed unglazed bead surfaces. It would appear that these agglomerations can be associated with post-depositional exposure to salt, leeched from the local soil, or from exposure to saline water over an extended period of time.

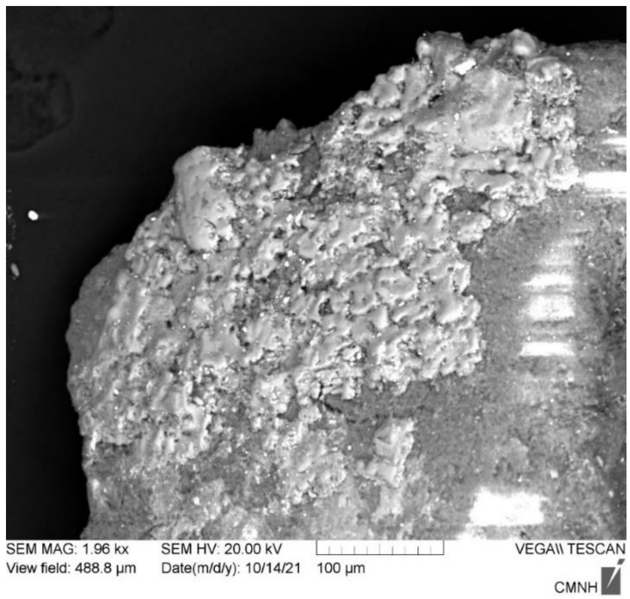


Figure 5.45 SEM Sample 4 (Bead 5108.001 from tomb 12) with extensive salt concretions on its surface.

Backscatter imagery revealed the general pattern of the solid outer glaze layer containing heavier elements than appear on their white film transitional layers (fig. 5.46). These concentrations of extremely heavy elements are focused most prominently on the glaze in bead's drill holes but are also found in the exterior glaze surrounding the drill hole (fig. 5.47). These concentrations do not appear uniformly throughout the bead and are mostly found on bead's solid outer glazing layers and not elsewhere. As the solid outer glaze layer was, in many cases, chipped or absent from part of a bead's surface, the full pattern of where these concentrations might be expected to appear was obfuscated. Whereas these agglomerations of heavier elements were observed both inside the drill hole and atop the glaze on beads from tomb 7 and 12, on beads from tomb 20, concentrations of heavier elements only observed atop the glaze and not in the drill hole (fig. 5.48)

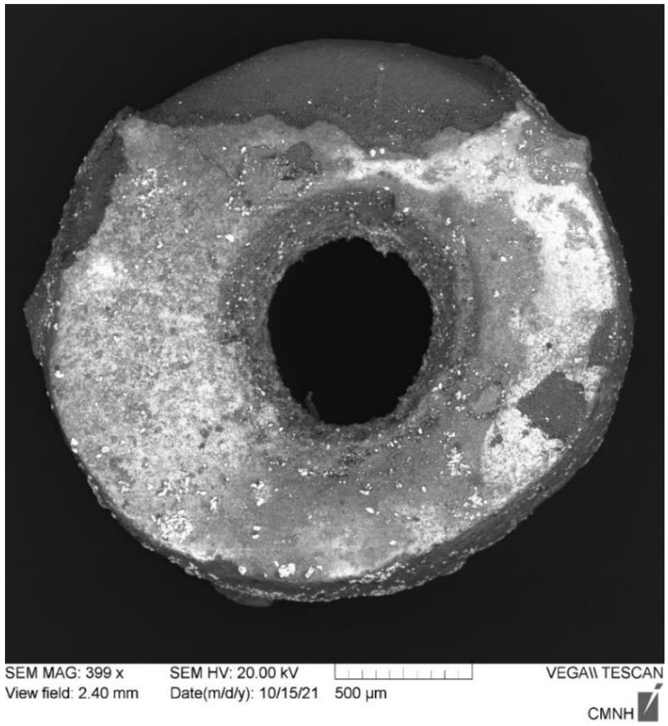


Figure 5.46 SEM Sample 20 (Bead 5070.004-125 from tomb 7) with solid outer glazing layer containing heavier elements than the white film transition layer.

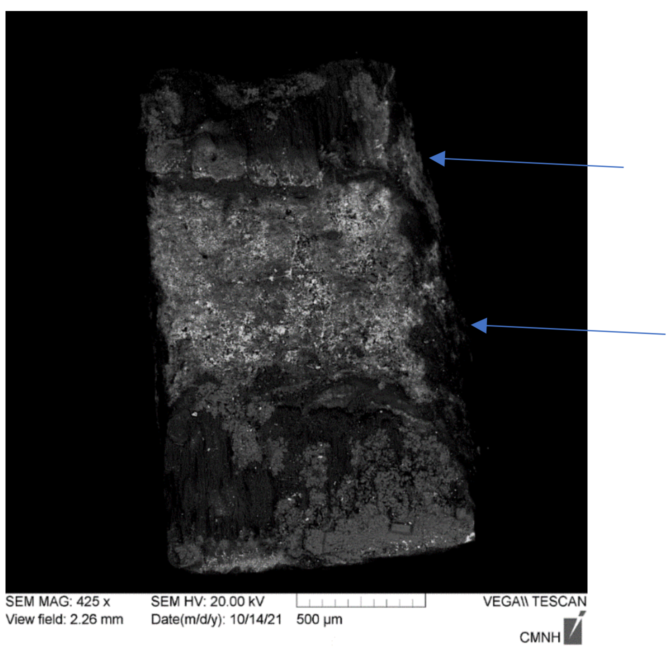


Figure 5.47 SEM Sample 6 (Bead 5108.001 from Tomb 12) backscatter image with concentrations of heavier elements found in the drill hole and at the intersection between the drill hole and bead end.

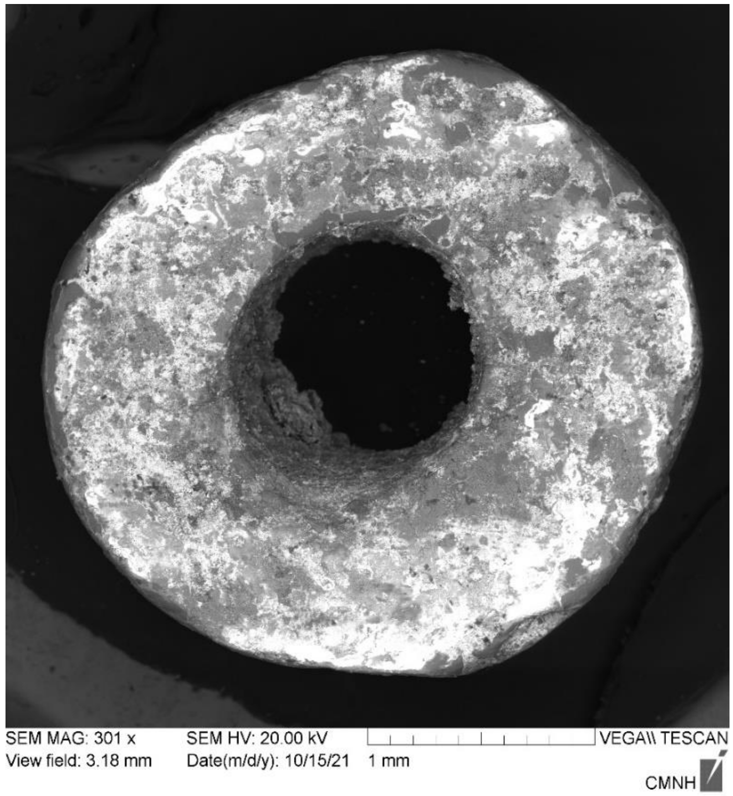


Figure 5.48 SEM Sample 16 (Bead 5101.001) backscatter image with heavier elements pictured atop the glaze, but not within the drill hole.

5.2.5 EDS (Appendix A)

5.2.5.1 Interior Readings

The semi-quantitative EDS readings taken of bead interiors uniformly revealed a chemical composition primarily made up of oxygen, magnesium, and silicon (fig. 5.49-5.50). Depending on the bead, regardless of its tomb of origin, minute amounts of iron, potassium, aluminum, and sodium were also present in the raw steatite. By contrast with the interior makeup of beads from tomb 7 and 12, vanadium was found in some of the beads from tomb 20 (fig. 5.49, 5.52.).

5.2.5.2 Glaze Readings

In all three tombs, glazes were copper based with variable amounts of copper detected on the solid outer glaze layer of each analyzed bead (5.51-5.53). Occasionally trace amounts of sodium and iron were found on bead's glazes. These however do not seem to have been major elements of the glazes on Fifa's beads. One bead from tomb 20 contained large quantities of aluminum, this trait however does not appear to be typical for other beads from that tomb. Beads that retained a visible green glaze layer did not exhibit greater amounts of copper in their glazes than beads whose exteriors appeared either completely white or which possessed only a greenish tint.

5.2.5.3 Chemical Concentrations Atop Glaze

EDS analysis revealed concentrations of chemicals located atop the glaze layers of beads from all three tombs. In all instances, these concentrations were primarily composed of phosphorus, calcium, and lead, but occasionally also exhibited greater concentrations of aluminum and iron than were found on the rest of the bead (fig. 5.49). Despite their visibility using backscatter imagery, these concentrations were not visible using optical microscopy and did not appear to correlate to a particular layer of the bead's glaze. Whereas in tombs 7 and 12, these elements were found on bead's ends and in their drill holes, on beads from tomb 20, they appeared only on bead's ends. On beads from tomb 20, these concentrations also, in some instances, included large amounts of vanadium. Vanadium was not found on any beads examined from tomb 7 or 12.

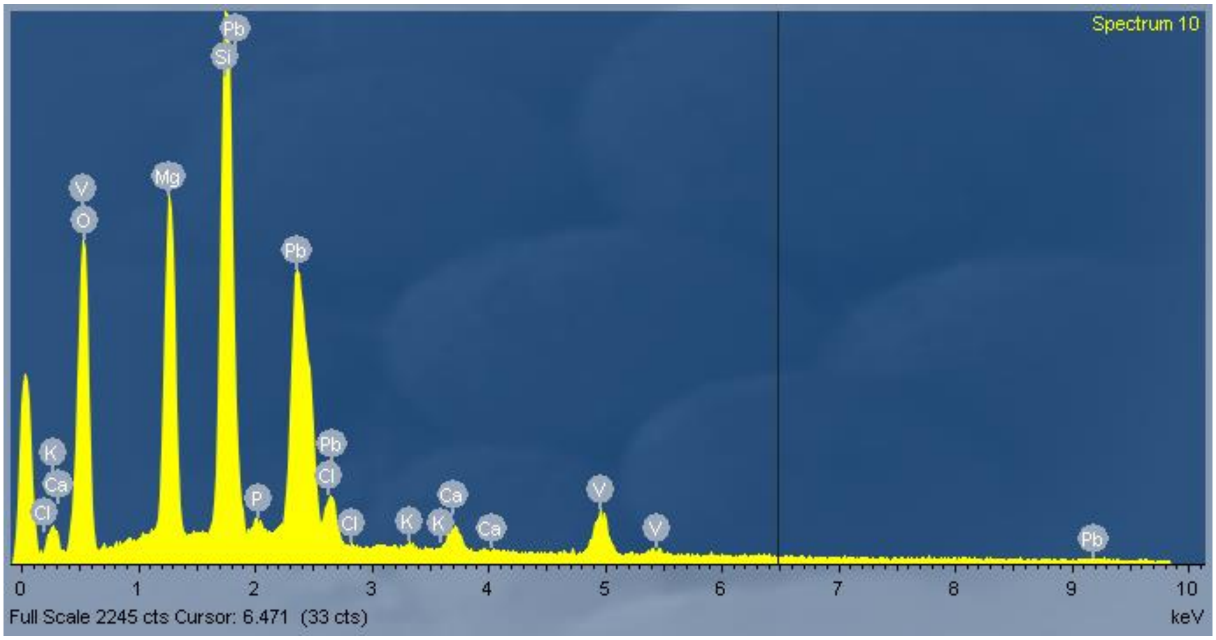


Figure 5.49 SEM Sample 7 (fragment from reg #5101, tomb 20) vanadium and lead rich zone.

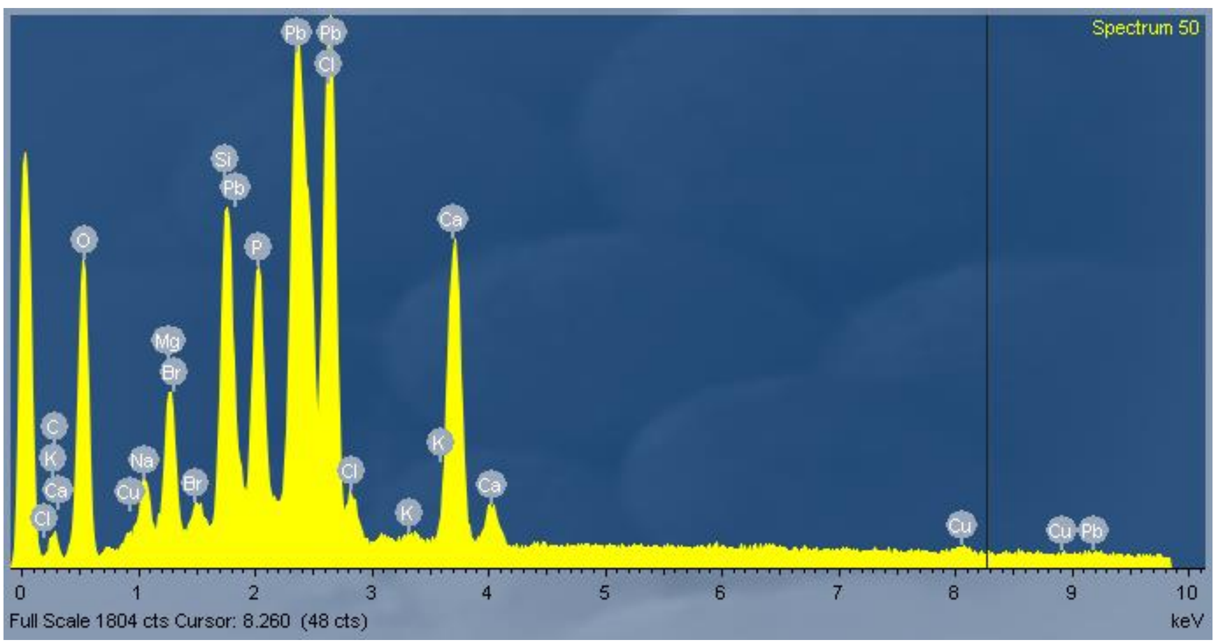


Figure 5.50 EDS reading of SEM Sample 2 (Bead fragment from 5070.004, tomb 7) drill hole. In addition to typical glaze materials such as copper, this reading contained large amounts of lead, calcium, chlorine, barium, and potassium.

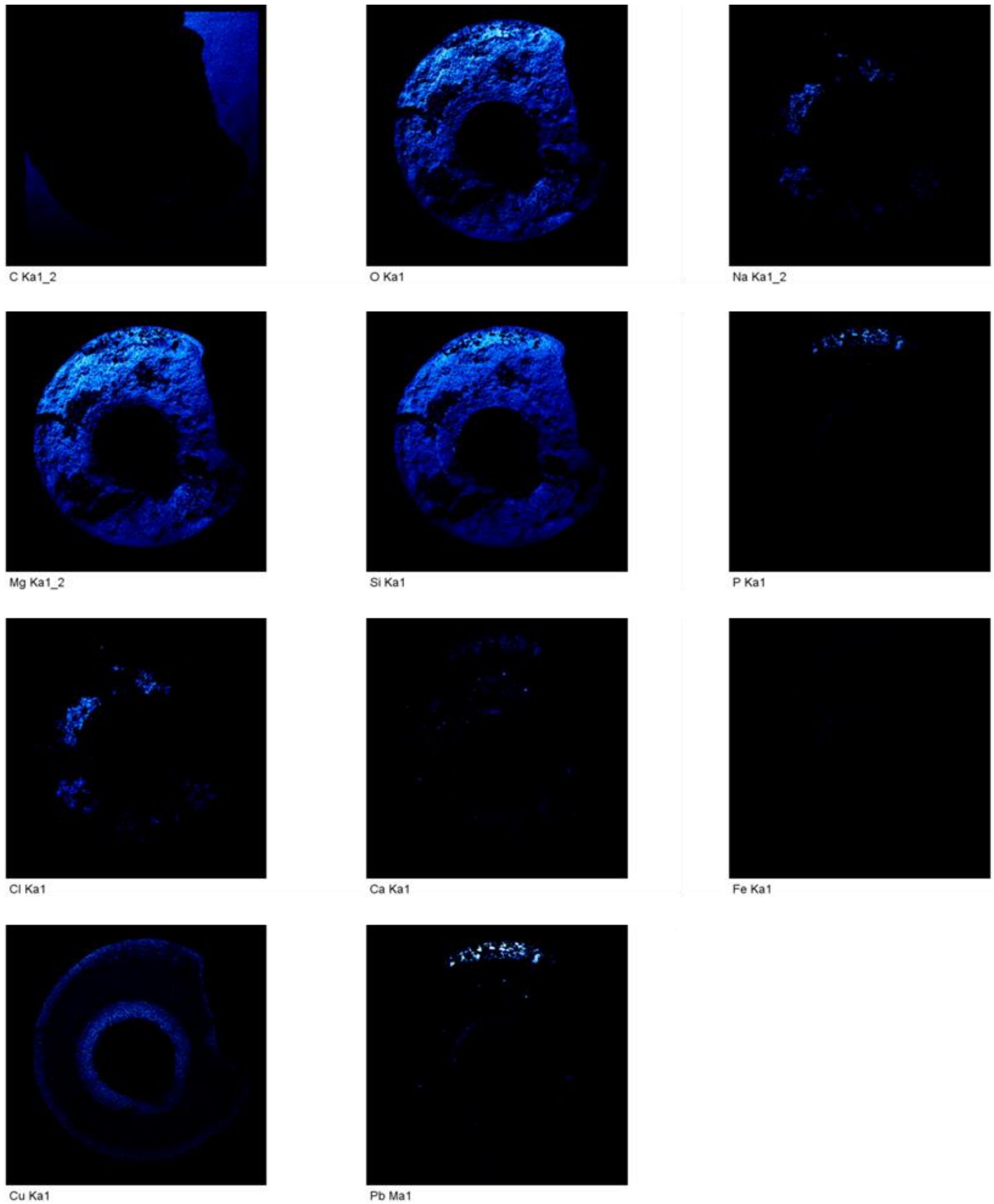


Figure 5.51 Element map of SEM Sample 13 (Bead 5076.010 from tomb 7) with body composed of oxygen, magnesium, and silicon clearly differentiated from areas with glaze, as indicated by the areas with high copper content. Lead, phosphorus, and calcium cluster, as do chlorine, and sodium. Iron is barely present.

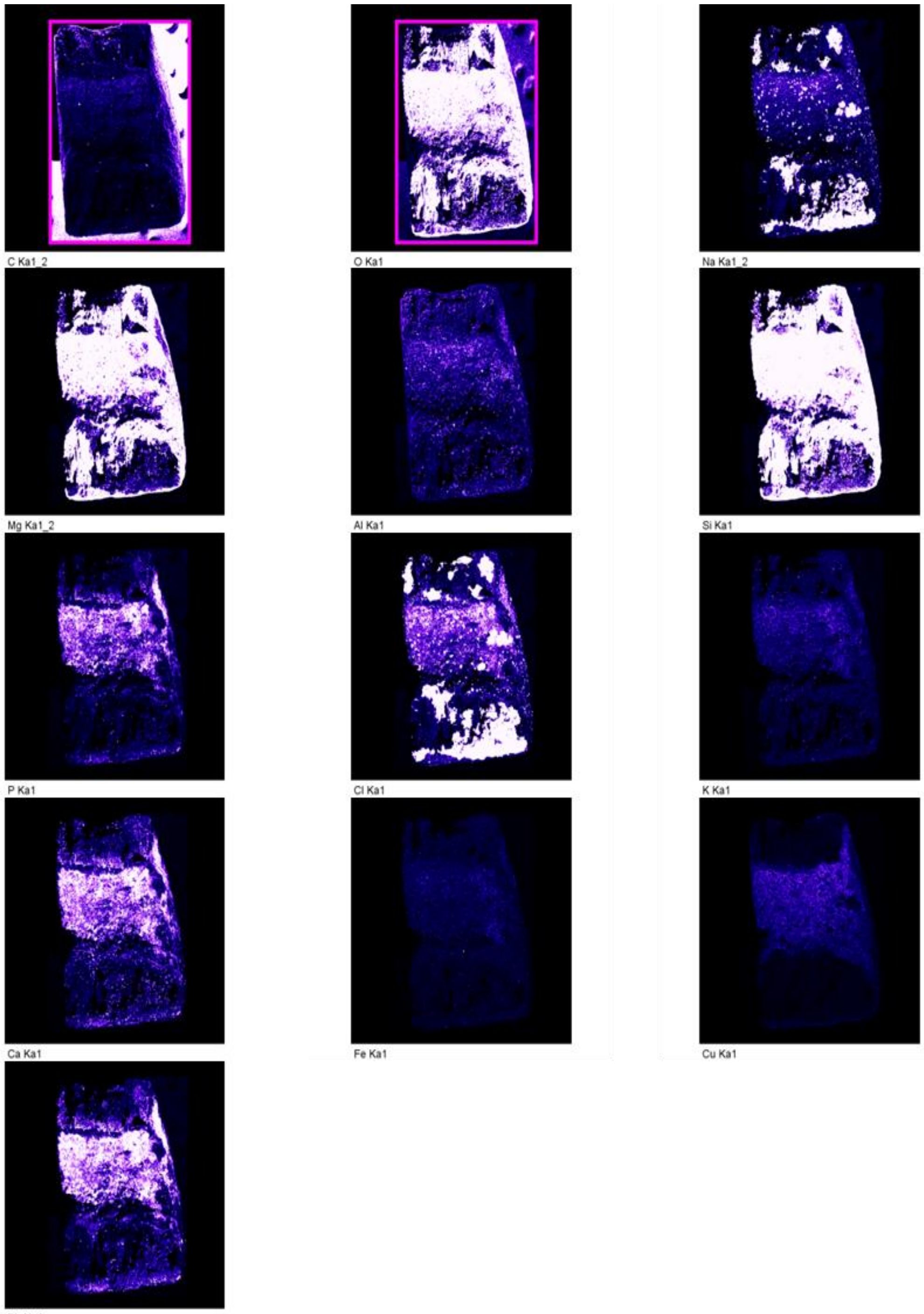


Figure 5.52 Element Map of SEM Sample 6 (Bead fragment 5108.001, tomb 12). By contrast with the element map taken for sample 13, several additional elements are found to be distributed throughout the fragment's body and glaze including aluminum, potassium, and iron. Copper meanwhile is only found in the fragment's glazed areas. As was found with the prior element map, the drill hole, and the area around the top of the drill hole contains lead corelating with calcium, and chlorine.

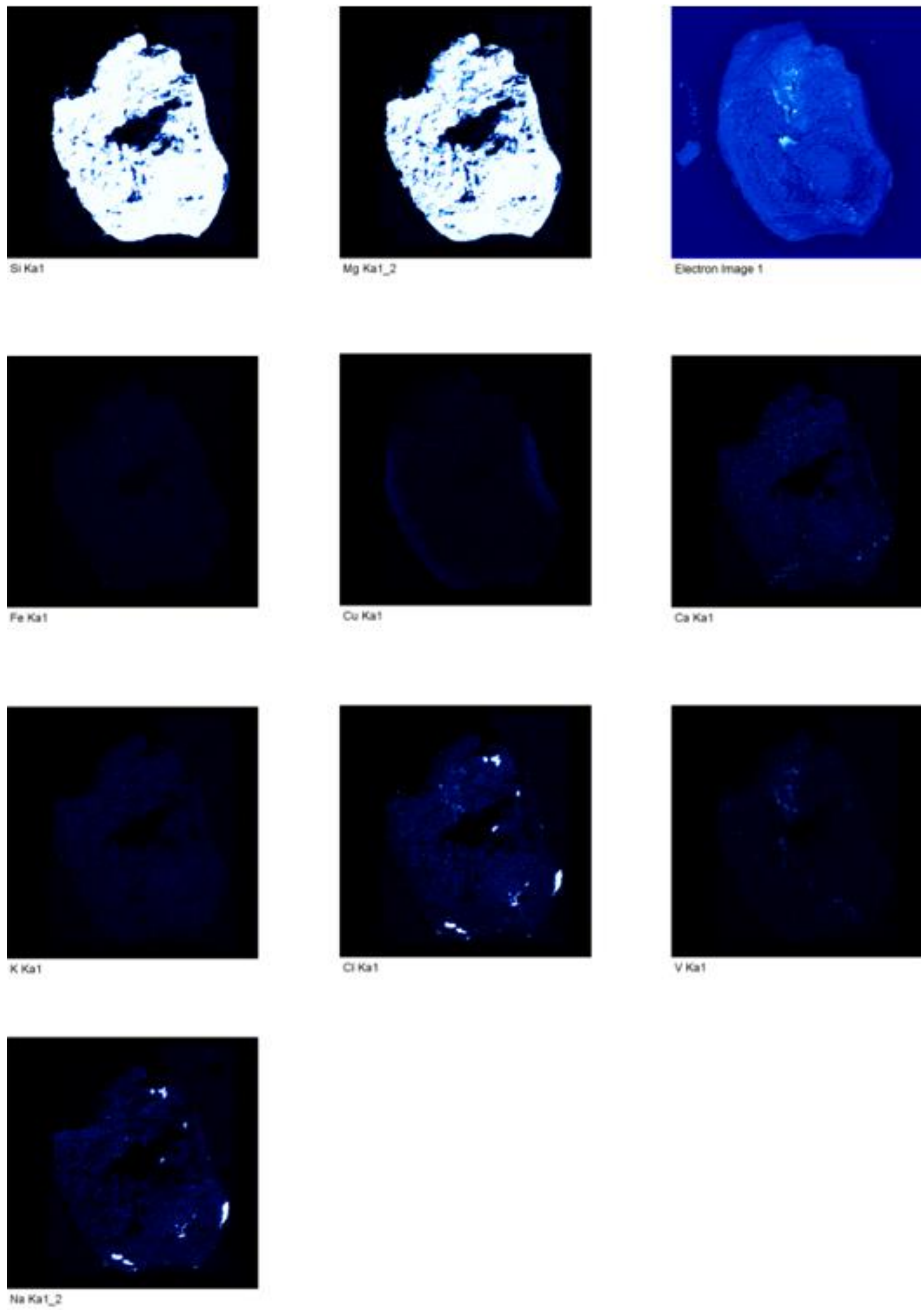


Figure 5.53 Element map of SEM sample 7 (Fragment from 5101, tomb 20) Steatite body composed of silicon and magnesium with minute amounts of iron and potassium. Copper meanwhile is found only in the fragment's glaze layer. Chlorine, sodium, and calcium correlate strongly, with smaller amounts of vanadium found in association with those elements. An additional concentrated patch of vanadium is located atop the steatite body.

5.2.5.4 Analysis of Experimental Glazed Beads

Lastly, EDS was used to compare the chemical composition of the experimentally glazed beads created for this thesis with the archaeological examples (fig. 5.54). While EDS revealed that the experimentally created bead resembled the archaeological examples in terms of its sodium, magnesium, aluminum, silicon, and chlorine content, it was also found to contain higher concentrations of iron than were observed on any archaeological example, as well as cobalt, an element that did not appear in any archaeologically observed example. It is unclear where these elements came from as only sodium carbonate, bicarbonate, water, and malachite were used as a glazing mixture, none of which would obviously contain the aforementioned elements.

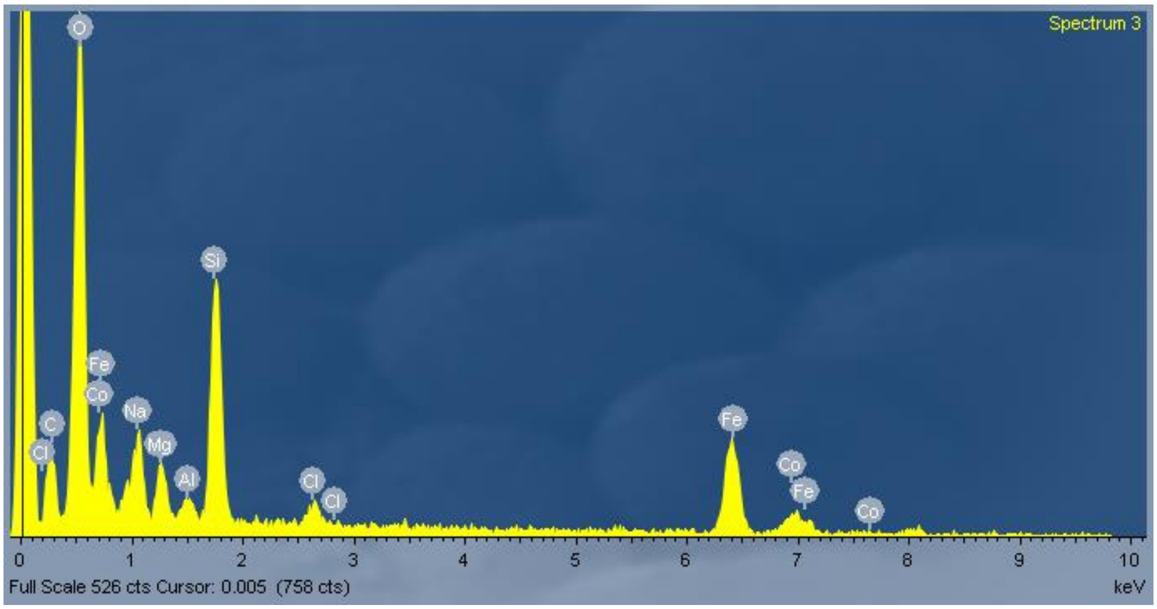


Figure 5.54 EDS Analysis of Hirsch 75 containing significant amounts of Iron.

5.3 Carnelian Bead Analysis

5.3.1 Descriptive Statistics and Morphometrics:

Figure 5.55 The carnelian bead assemblage from tomb 7.

Sixty-four carnelian beads were excavated at Fifa. Sixty-one of these were found in tomb 7 (fig. 5.55), one was found in tomb 8, and two were found in tomb 22. Since only three carnelian beads were found outside of tomb 7, measurements of beads from different tombs were not compared. Twenty-four carnelian beads were sampled from the broader assemblage and classified according to shape using the scheme published by Beck (1928). Whereas four beads were cylinder discs, the rest of the assemblage had short cylinder shapes. Measurements made using the Dino-lite's built in measurement software are presented in Table 5.7.

	Length	Diameter	Drill Hole Diameter
Mean	2.92	7.38	4.05
Median	2.96	7.6	4.29
Standard Deviation	.54	1.06	0.96
Range	2.12	5.34	3.68
Minimum	1.78	3.6	1.99
Maximum	3.9	8.94	5.67

Table 5.7 Descriptive statistics for Fifa's carnelian bead assemblage.

5.3.2 Carnelian Use-Wear

Use-wear analysis revealed the recurrence of several traits related to manufacture and wear from use. These traits are presented here in the order that they are thought to have taken place in. The sequence appears to largely resemble that presented by Kenoyer (et al. 1991) wherein a nodule is initially reduced using flint knapping and is further reduced and shaped through grinding before the bead is perforated and polished. The carnelian used to produce a bead may go through at least one stage of heat treatment, darkening their color and making them easier to flake. Below I present the hypothesized manufacturing sequence and the most notable aspects of use-wear.

5.3.2.1 Knapping

Evidence for knapping is discernable on numerous beads. Chipping was identified in cases where beads exhibited flaking scars and evidence for flake removal. Seventeen beads exhibited evidence of flaking on at least one of their ends (fig. 5.56a). Evidence for flaking was also observed on bead's perimeters (N=14, ~58%) (fig. 5.56b). Flaking was far less common on profiles, appearing on only six beads in the assemblage (figure 5.56c).

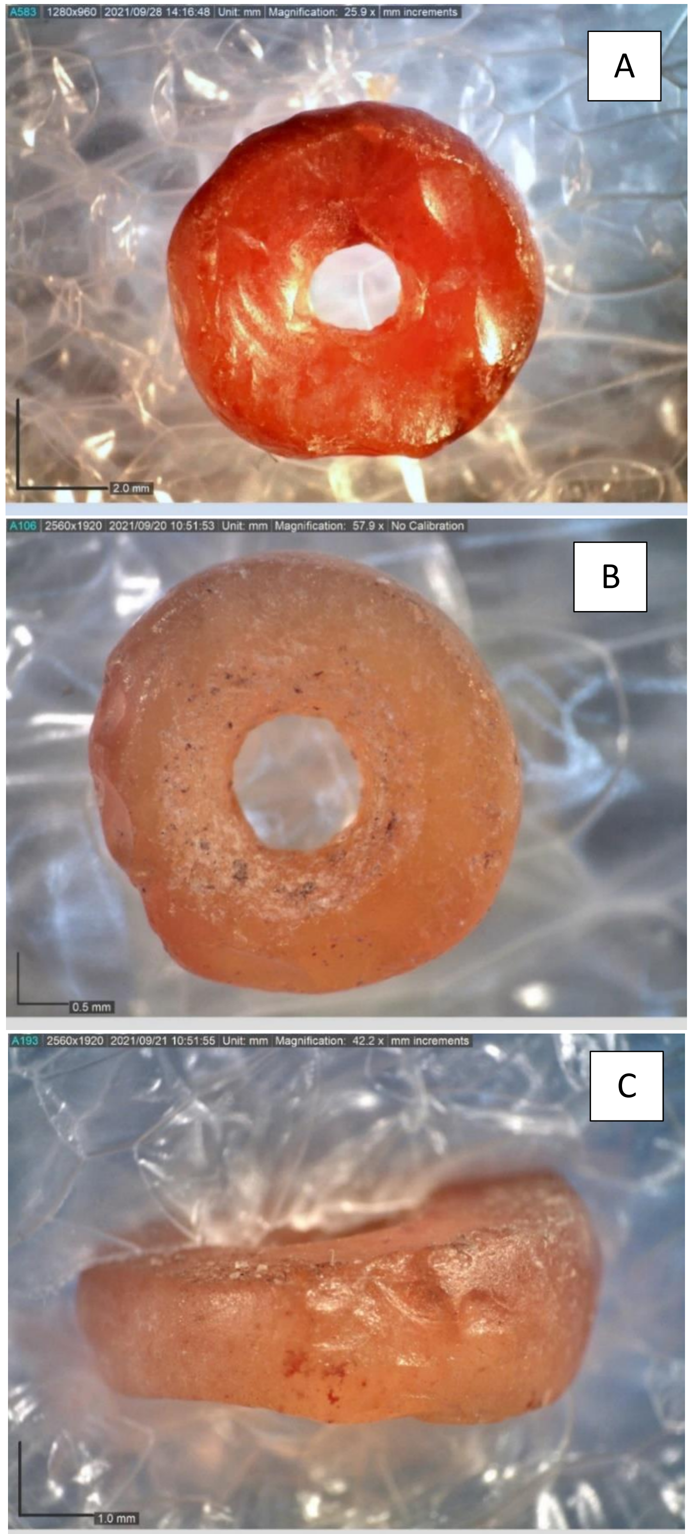


Figure 5.56 Chipping on (A) bead 5070.001-009 with chipping its end (B) bead 5016.001 with chipping on its perimeter, and (C) bead 5076.004 with chipping on its profile.

5.3.2.2 Grinding

By contrast, traces of grinding using a coarse abrasive for reducing the bead blank to the proper size and shape were relatively limited. While the striations associated with grinding were, in two cases, concentrated and shallow, making them somewhat difficult to see (fig. 5.57a), in the case of one bead from the assemblage, 5076.003 (fig. 5.57b), one end exhibited deep linear traces that appeared in a radial pattern on about a quarter of the bead's end.

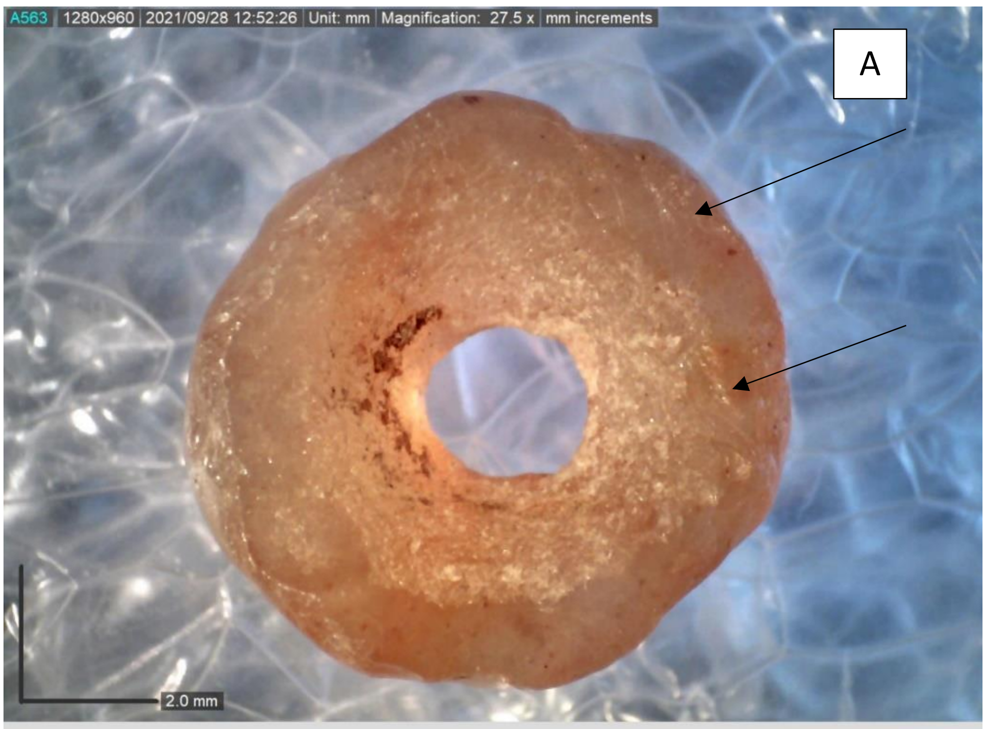


Figure 5.57 Coarse abrasion on (A) Bead 5070.001-002 end with concentrated, connected, deep, parallel grinding traces. (B) 5076.003 end with loose, closed, deep, radial linear traces.

5.3.2.3 Polishing

Fifa's beads exhibit extensive evidence for polishing in several successive stages. As discussed by Groman-Yaroslavski and Bar-Yosef Mayer (2015: 82-83) through several rounds of abrasion using materials of different coarseness, a bead's flaking scars and grinding marks are gradually erased leaving behind a smooth and reflective surface. While every bead end and profile in the assemblage exhibited some trace of polishing, as evidenced by the erasure of prior manufacturing wear on at least part of their surfaces, on 18 beads in the assemblage, at least one end was polished to the extent that all prior manufacturing traces were erased. The same pattern was true for the bead's profiles wherein 18 beads were also thoroughly polished enough to erase prior manufacturing traces. Two beads however, exhibited traces of an earlier, coarse polishing stage as indicated by shiny reflective grooves (fig. 5.58a), while the remaining twenty-two profiles were completely leveled, smoothed, and did not exhibit evidence of any chipping or grinding. This indicates that these beads underwent a more extensive fine polishing process (fig. 5.58b) (Groman-Yaroslavski and Bar-Yosef Mayer 2015: 82-83).

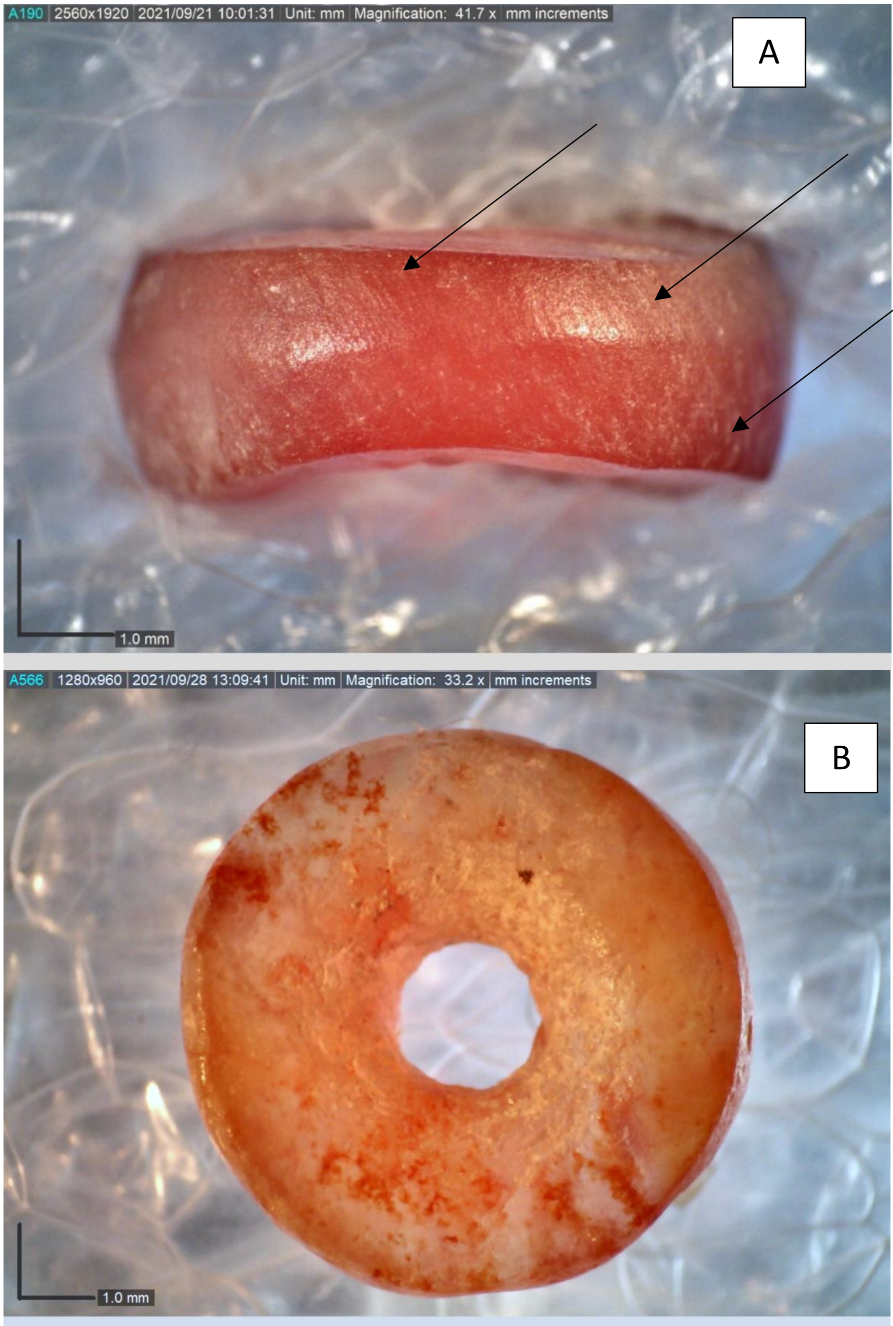


Figure 5.58 Different stages of polishing. (A) Bead 5076.003 with evidence for coarse polishing. (B) Bead 5070.001-004 with evidence for further stages of polishing, removing all prior wear traces.

5.3.2.4 Perforation

In every instance, beads exhibited a double cone perforation with a relatively wide opening on both sides that tapers to a smaller central hole. This “hourglass” perforation shape is characteristic of the pecking or percussion perforation technique (Kenoyer 1997: 270). When pecking is performed on a bead’s surface, it results in a characteristic form of scarring and microfracture (Chevalier et. al 1982: 57; Kenoyer et al. 2022: 21). This scarring was found on both sides on 16 of the 24 beads examined (fig. 5.59 a, b) and on one side on the remaining 8 (fig 5.60 a, b). As a result, the beads found at Fifa were variably pecked from one or both sides with the beads pecked from one side having their perforations completed through a single directed percussive blow through the drill hole (Chevalier et al. 1982). The presence of pecking scars superimposed above areas of the bead entirely surrounded by polished areas demonstrates that perforation would often take place after polishing (fig. 5.60a, 5.61).

Figure 5.59 5070.001-008 pecked from both ends as indicated by scarring on both sides A and B.

Figure 5.60 Bead 5070.001 with pecking scars on end A, but none on end B. Areas where pecking appears above polishing are also indicated.

Figure 5.61 Bead 5056.001 with evidence for pecking scars appearing above areas that have been extensively polished.

5.3.2.5 Heat Treatment

The assemblage was extremely variable in its coloration. This is likely evidence of heat treatment being used to oxidize the bead's iron content, darkening and reddening their color. On the other hand, as carnelian is naturally somewhat variable in color, some variation may simply be due to beads originating in darker or lighter nodules. Comparing the bead's color to Munsell color chips, two were light red (fig. 5.62a), three were reddish brown (fig. 5.62 b), 10 were red (fig. 5.62c), six were dark red (5.62d), and three were dusky red.

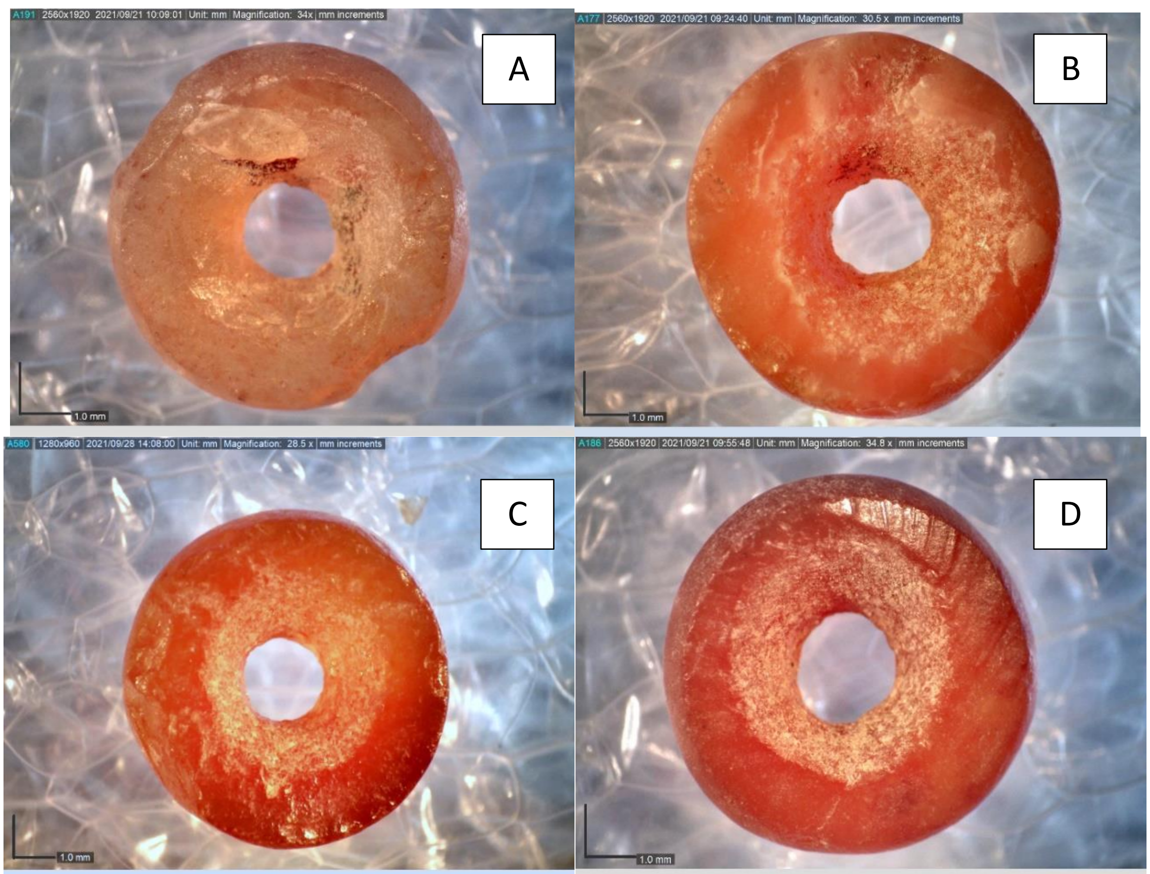


Figure 5.62 Variable coloration in carnelian assemblage with examples of (A) light red, (B) reddish brown, (C) red, and (D) dark red beads.

5.3.2.6 Polish From Use/String Polish

By contrast with manufacturing polish, which results in the erasure of prior wear traces, polish from use as an ornament or as an attachment to clothing increases the reflectiveness of carnelian beads' ends, profiles, and at the intersection of the bead surface and drill hole (Kenoyer 2017a: 162; Kenoyer et al. 2022: 13). Evidence for polish from use was extremely limited on bead ends. By contrast, many of the bead profiles examined showed evidence for the development of polish from being worn, especially on topographic highs located on their perimeters. Of the 20 bead profiles where polish was found on either one or multiple places, six beads had slight reflectiveness (fig. 5.63a), nine had moderate reflectiveness (fig. 5.63b), and four had high reflectiveness (fig. 5.63c).

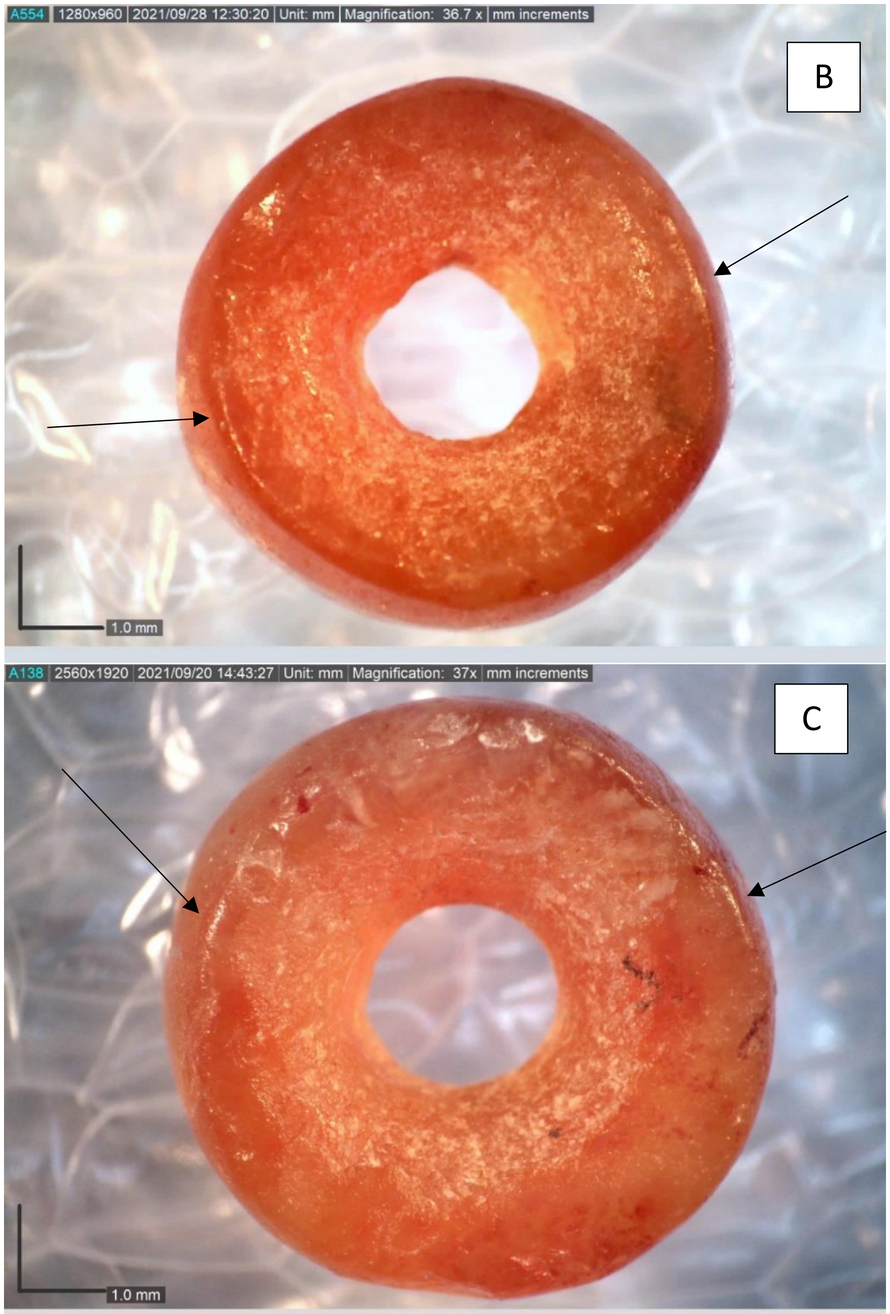


Figure 5.63 Variable polish on bead perimeters (A) 5056.001 with slight polish reflectivity (B) 5070.001-001 with moderate polish reflectivity (C) 5100.001 extensive polish reflectivity.

Eight (33.3%) beads exhibited evidence for string polish at the intersection between the drill hole and end. In six instances, this polish could be found in a concentrated area at the top of the drill whole (fig. 5.64a) while in two instances it was found in multiple areas (fig. 5.64b). In six instances, this polish was moderately reflective while in two instances, it was highly reflective.

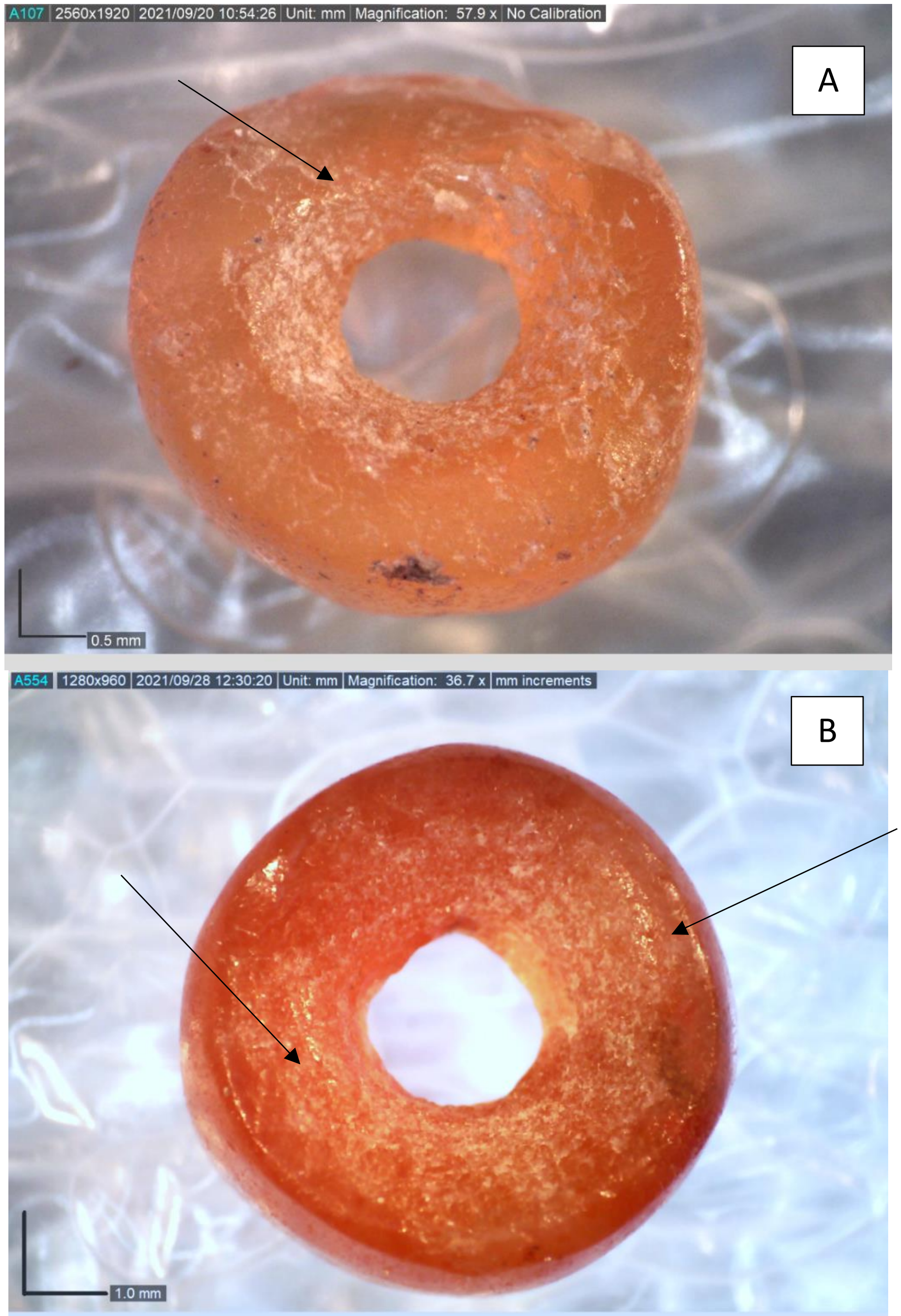


Figure 5.64 (A) 5016.001 with concentrated and highly reflective string polish. (B) 5070.001-001 with a loose and highly reflective polish.

5.3.2.7 Unexpected Wear Patterns:

Two observed wear-patterns merit further discussion. One bead in the assemblage possessed connected shallow linear traces that appeared in a concentric pattern around the top of the drill hole (fig 5.65). These appeared atop and around heavily polished areas of the bead suggesting that whatever the cause of these traces, they were produced following polishing, and possibly after the bead was pecked using perforation.

Another notable pattern that emerged was the regularity with which one side of a bead's surface might be extensively polished, while the other side retained visible chipping scars. This pattern was observed on nine of the examined (fig 5.66). If including surfaces with pecking scars made after a polishing stage, the number of beads with this pattern rises to 10. Five of these have chipping on a concentrated part of their surfaces with the remaining five possessing loose chipping.

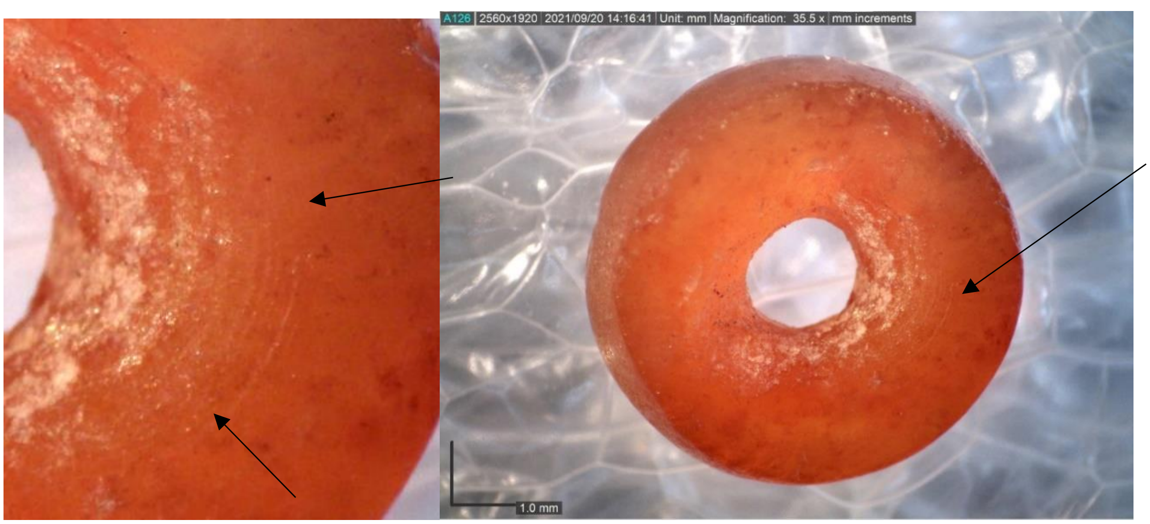


Figure 5.65 Bead 5056.002 with concentrated concentric striae by its drill hole.

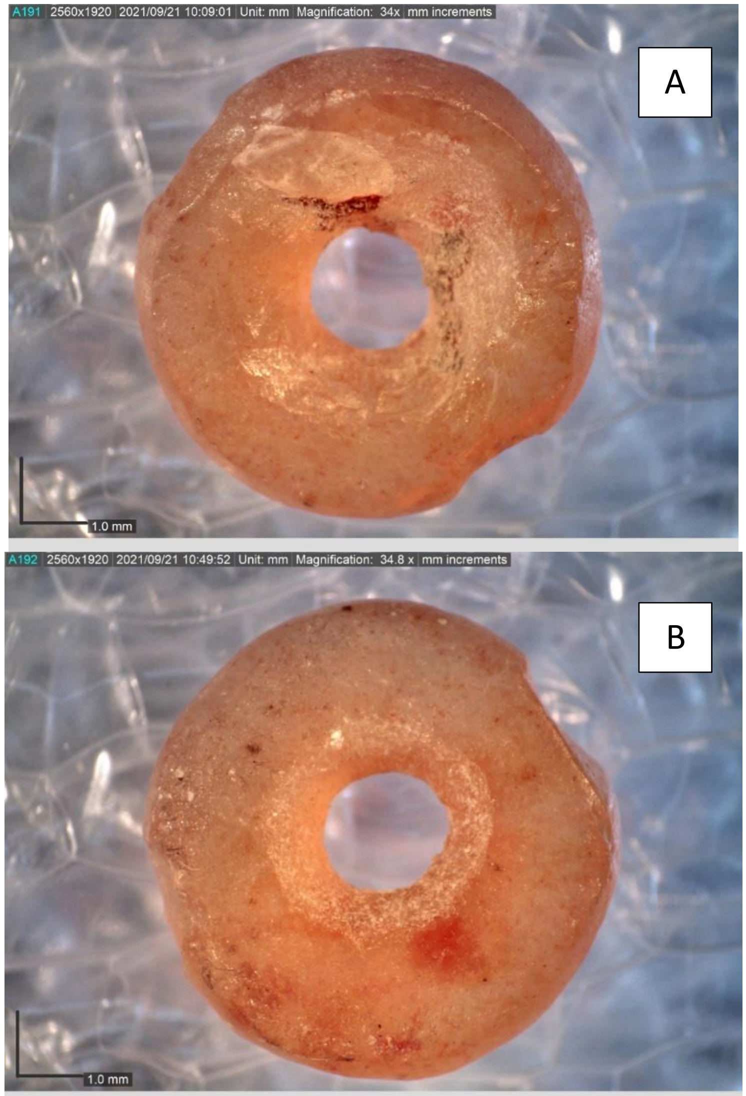


Figure 5.66 Bead 5076.004 (A) end with extensive chipping scars. (B) extensively polished end with no remaining use-wear connected to chipping.

5.3.2.8 Carnelian Use-wear Conclusion:

The assemblage of carnelian beads from Fifa retained manufacturing traces for their knapping, grinding, polishing, perforation, heat treatment, and polish from string and wearing. While several beads were well-polished, removing most prior manufacturing traces, Fifa’s assemblage is mainly characterized by its variability. While some beads were pecked from one side, others were pecked from both sides. This variability existed even on the same bead, with some beads' two ends being variably ground or polished.

5.4 Shell Identification and Use-Wear

Images of the three perforated shells and a single shell bead found in the excavated assemblage from Fifa were briefly examined by specialist Dr. Daniella Bar-Yosef Mayer. It should be stressed that proper identification of shells often requires in-person analysis and as a result, the identifications made here are simply preliminary and based on a first impression. In addition, in each instance, it seems that post-depositional processes such as exposure to saline soil denuded the surface of each shell, adding additional difficulty to their identification.

Figure 5.67 Bead 5070.002-001 made of an unidentified shell.

Bead 5070.002-001 (fig. 5.67) was only able to be identified as shell without further classification. This is in large part due to the considerable reshaping of the shell that transformed it into a bead. 5108.002-001 was identified as a bivalve mollusk, possibly of the order *Venerida*. Without additional information, however, the origin of the shell, including whether it came from a salt or fresh water source, remains unknown. 5108.002-002 was identified as belonging to the genus *Glycymeris*, as was 5108.002-003. In the latter's case however, Dr. Bar-Yosef Mayer suggested that the sample belonged to the species *Glycymeris nummaria,* originating in the Mediterranean Sea.

Bead 5070.002-001 shows clear signs of manufacture, with one of its sides clearly exhibiting evidence of abrasion with covering, connected linear traces with a parallel orientation (fig. 5.67). In addition, its slightly tapered single cone drill hole suggests anthropogenic perforation from one side. Lastly, the perforation rim, and some of the surface is covered with dull polish.

Due to constraints of the dino-lite digital microscope and the fairly large size of the shells, it was only possible to observe the three shells from at more than 20-30x magnification. The irregularity of the perforations in the case of each of the shells suggests that these were formed as a result of natural abrasion rather than anthropogenic manufacture (Bar-Yosef Mayer 1999: 28-29) (fig. 5.68 a, b). None of the typical signs of string wear on shell beads including polish on the perforation's rim, rim deformation, or rim rounding were identifiable at the scale employed (Falci et. al 2019: 776). Since string wear is only typically visible at a higher magnification (e.g., 100x for a flax thread, see (Bar-Yosef Mayer et al. 2020: Supplement. 20-25). It was not possible to conclude whether the beads were strung.

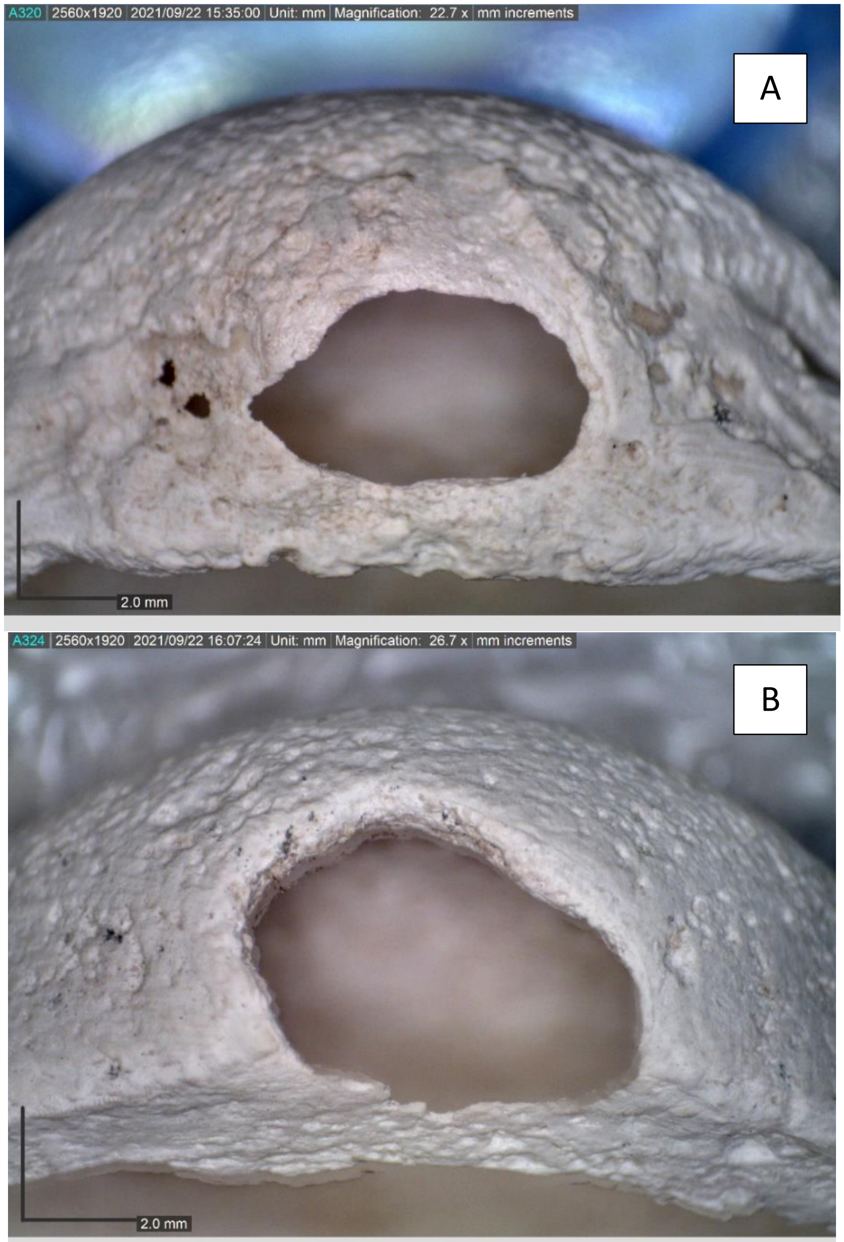


Figure 5.68 (A) Shell 5108.002-001 (B) 5108.002-003.

5.5 Database

5.5.1 Overview of Database Results (Appendix B)

Reviewing the published bead assemblages from 5th and 4th millennium sites in the Levant, 32 sites were assigned to the Chalcolithic, 21 to the EB IA, 34 to the EB IB, and 13 to EB I without further subdivision. Though this data will ultimately be useful for answering a number of questions, they are primarily used here to discuss the distribution of glazed steatite, carnelian, and shell ornaments in the Levantine Chalcolithic and EB IA.

	Unspecified Context	Domestic Context	Funerary Context	Foundation Deposit or Hoard	Ritual Contexts i.e., Shrines or Temples	Workshop
Chalcolithic	4	9	19		5	1
EB IA	1	8	10	1		3
EB IB	3	11	20	2	1	
EB I (Undifferentiated)		1	11			
Total	8	29	60	3	6	4

Table 5.8 Number of specific types of contexts available for study broken down by period.

The data collected for the database was biased in two primary ways. Firstly, as far more excavation has been carried out in the southern Levant, than either the northern Levant or the Sinai Peninsula, the database is largely made up of sites from that region. As a result, only three Chalcolithic, four EB IA, and one EB IB sites from the northern Levant could be included, compared with 28 Chalcolithic, 18 EB IA, and 32 EB IB from the southern Levant. Of the sites that could only be dated to EB I without further subdivision, 10 were located in the Sinai, and two were located on the Northern Levant compared with one located in the southern Levant.

The second primary bias in the data is that most recorded assemblages come from funerary contexts or foundation deposits. There are likely two primary reasons for this. Firstly, beads have generally been published far less systematically than other object categories such as pottery or lithics. Contexts where many beads were found in larger numbers, such as tombs are far more likely to be published than the few beads domestic contexts or other habitation sites (Baysal 2019: 5). The sparing use of wet and dry sieving in habitation contexts compared with tombs, especially historically, has further exacerbated this situation (Baysal 2019: 18). As a result, even if small numbers of beads may have been archaeologically deposited in habitation sites due to discard or misplacement, it is very possible that these objects accidentally found their way into dump piles rather than publications. This is borne out in the database created here where beads from only 7 Chalcolithic sites, 8 EB IA sites, 16 EB IB sites, and 1 undifferentiated EB I could be defined as coming from contexts other than tombs or foundation deposits.

In most instances, the beads published from these contexts are very few in number and represent lost or discarded items rather than complete pieces of jewelry or ornamentation. In fact, of all the assemblages investigated for the database, only one, from the site of Tell Abu al-Kharaz, could be described as a complete piece of jewelry found in a domestic context (Fischer and Hammer 2008: 387-389).[7] Nonetheless, these few examples of ornaments from domestic, workshop, or midden contexts are vital for fully fleshing out the life histories of EBA beads and pendants.

5.5.2 Chalcolithic Raw Material Choices for Ornaments:

By comparison with the succeeding EB IA, a wide variety of raw materials were utilized as ornaments during the Late Chalcolithic period. These include: actinolite, agate, amazonite, appetite, basalt, bone, calcarenite, calcite, carnelian, ceramic, chalk, copper, eilat stone, flint, fluorite, greenstone, gypsum, hematite, ivory, jasper, lapis lazuli, limestone, malachite, marble, mother of pearl, nephrite, obsidian, ostrich eggshell, quartz, rock crystal, sandstone, schist, serpentine, shell, steatite, and turquoise (fig 5.69). Though many of these materials have their origins outside of the Levant, locally, or regionally, available materials such as apatite, bone, calcite, chalk, limestone, and mother of pearl

[7] Ironically, the name of this site translates to 'mound of the father of beads.'

predominate (Bar-Yosef Mayer 2019: 72-81). Carnelian beads were not common in contrast to the EBA with only 31 carnelian beads from 9 sites identified. By comparison, 62 carnelian beads were recovered from Fifa tomb 7 alone. Further, whereas significant numbers of beads were found at non-funerary sites in the Chalcolithic period, in the EB IA, no bead assemblages of significant size have been found in non-funerary contexts.

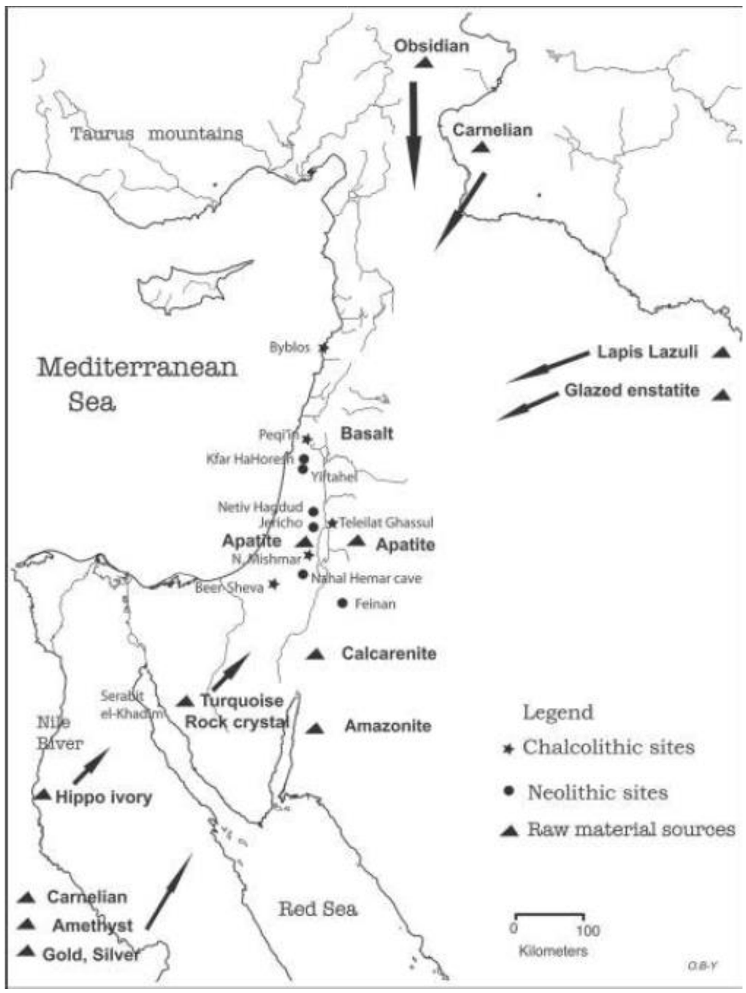


Figure 5.69 Map of the Levant depicting the likely raw material sources for beads found in the Levantine Late Chalcolithic (Reproduced from Bar-Yosef Mayer 2019: fig 1).

Glazed Steatite beads were both common and numerous at several Late Chalcolithic sites with thousands found at sites including the Nahal Mishmar Cave, Nahal Ze'elim Cave 32, Neve Noy, Peqi'in, the en-Gedi sanctuary, and Shiqmim (Bar-Yosef Mayer and Porat 2009: 119; Bar-Yosef Mayer et al. 2014: 270). Almost all of these beads were characterized by their small sizes, greenish tints, and short cylinder shapes (Bar-Yosef Mayer and Porat 2009). Between these sites, glazed steatite beads were found in varied contexts and were utilized in distinct ways.

While the beads from Nahal Mishmar were not published with enough contextual information to say a great deal about their original use, some of the nearly 12,000 glazed steatite beads from Nahal Ze'elim Cave 32 (the Cave of the Skulls) were sewn together to form what the excavator referred to as a purse of small white and green beads (Aharoni 1961: 15). Thousands of other glazed steatite beads found in the cave meanwhile were discovered wrapped in several linen bundles found throughout the cave (Aharoni 1961: 15; Bar-Yosef Mayer et al. 2014: 267; Joffe 2022) (fig. 5.70, 5.71). The beads in these bundles are thought to have been complete ornaments rather than loose beads (Davidovich 2022: 66). These finds are unique due to their preservation and serve as an important reminder that ornaments could be utilized for purposes other than jewelry such as being sewn onto clothing or other organic objects. In addition, the fact that the glazed steatite bead purse seems to have included both white and green colored beads, raises important questions over the original coloration of glazed steatite beads found in the Levant, which are typically thought to have all been colored green using a copper-based glaze (Bar-Yosef Mayer and Porat 2009).

The beads found at Neve Noy meanwhile were found in a subterranean chamber associated with the manufacture of copper objects (Elder and Baumgarten 1985: 138). Little else however can be said about these glazed steatite beads. The assemblage from Peqi'in was found together in association with the ossuary burials found in the cave (Bar-Yosef Mayer and Porat 2013) (fig. 5.72). The two glazed steatite beads found at the en-

Gedi sanctuary were specifically placed on the shrine's alter (Bar-Yosef Mayer et al. 2014: 270; Ussishkin 1980: 25). Lastly, though as of yet unpublished, a large cache of several thousand glazed steatite beads were found inside a ceramic churn which was itself located in a subterranean chamber was found at Shiqmim (Rowan and Golden 2009: 66).

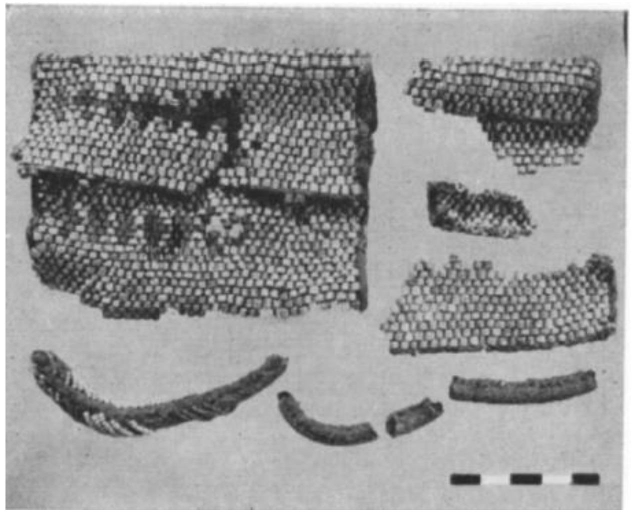


Figure 5.70 A purse made of glazed steatite beads from Nahal Ze'elim cave 32. (reproduced from Aharoni 1961: Plate 7A).

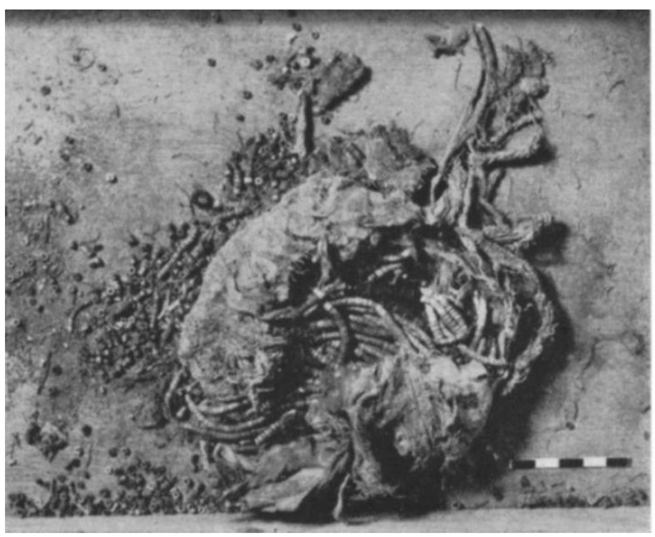


Figure 5.71 A linen bag with thousands of glazed steatite beads from Nahal Ze'elim cave 32 (reproduced from Aharoni 1961: Plate 7C).

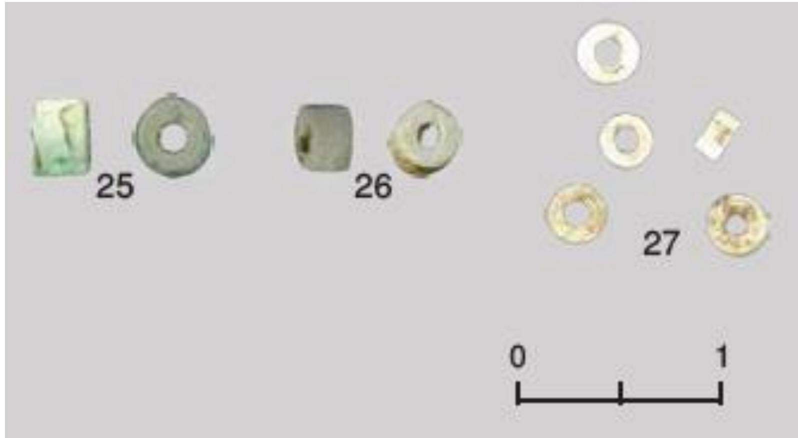


Figure 5.68 Glazed steatite beads from the Peqi'in cave. (Reproduced from Bar-Yosef Mayer and Porat 2013: Plate XI).

Whereas glazed steatite beads are generally thought to have been introduced to the Levant in the Late Chalcolithic Period (c. 4500-3700 BCE) (Bar-Yosef Mayer et al. 2004), a group of 32 glazed steatite beads uncovered in a tumulus tomb near Eilat have been assigned a Late Neolithic/Early Chalcolithic (c. 5300-4500 BCE) date. Though originally referred to as faience beads, later publications have revised this identification in favor of glazed talc/steatite (Avner 1990: 76; Avner and Horwitz 2017: 39).

If these beads do in fact date to the late 6th or early 5th millennium BCE, they represent a distinct aberration, appearing earlier than any other known example of glazed steatite in the Levant or even Egypt, where these objects are thought to have first appeared in the late 5th millennium. It is possible that these beads date later than assigned for several reasons. Firstly, the ten radiocarbon dates taken from the site were taken from hearths found *around* the tumuli rather than from the tumuli themselves (Avner et al. 1994: 273). Secondly, while these dates cluster around the mid-6th and early 5th millennium, one mean calibrated radiocarbon sample taken from the site returned a date of 4400 BCE, after the start of the Late Chalcolithic when other glazed steatite beads appear (Avner and Horwitz 2017: 53).

Lastly, it should be noted that none of the hearths that radiocarbon samples were taken from were actually associated by the excavator with Tumulus VII, the singular grave with glazed steatite beads and that this tomb also contained a fragment of a sandstone bowl with a raised zig-zag relief, an extremely rare find that happens to have a direct parallel at nearby Hujayrat al-Ghuzlan, a site mainly occupied between 4000 and 3500 BCE (Avner and Horwitz 2017: 64; Eichmann et al. 2009: 26). As a result of these factors, combined with the site's already accepted use for over 1250 years (Eshed and Avner 2018: 11), I argue that the Eilat burial ground was in fact used for a longer period of time than previously considered, and that the glazed steatite beads found in Eilat Tumulus VII date to the Late Chalcolithic, the transition between the Chalcolithic and EB IA, or even the early EB IA. This would fit them into the current understanding of when glazed steatite beads appeared in the Levant.

5.5.3 Carnelian Beads in the EB I

Tables 5.9-5.10 present the collated results for the number of beads found at different sites in the EB IA (table 5.9) and EB I undifferentiated (table 5.10). In all cases, sites are listed alphabetically with their regions and contexts also noted. Carnelian beads were found at 15 sites dating to the EB IA. Of these, nine are cemeteries, while the remaining sites are split between one workshop, four habitation sites, and a foundation deposit. Of these, the vast majority had either short cylinder or short barrel shape, closely resembling the beads found at Fifa.

Site Name	Site Region	Context Date	Context Type(s)	Number of Published Beads
Bâb adh-Dhrâʿ	Southern Levant	EB IA	Funerary	246
Byblos	Northern Levant	EB IA	Funerary	236
Tell el-Far'ah (N)	Southern Levant	EB IA	Funerary	1
Fifa	Southern Levant	EB IA	Funerary	64
Wadi Fidan 4	Southern Levant	EB IA	Courtyard	1
Wadi Fidan 100	Southern Levant	EB IA	Domestic/Uncertain	?
Gadot	Southern Levant	EB IA	Funerary	1
Hama	Northern Levant	EB IA	Domestic	1
Hujayrat al-Ghuzlan	Southern Levant	EB IA	Foundation Deposit	1
Jawa	Southern Levant	EB IA	Workshop	3
Jericho	Southern Levant	EB IA	Funerary	625
el-Judaidah	Northern Levant	EB IA	Domestic	2
Lachish	Southern Levant	EB IA	Domestic	16
Qiryat Haroshet	Southern Levant	EB IA	Funerary	2
Naq'	Southern Levant	EB IA	Funerary	?

Table 5.8 Summary of carnelian beads found in the Levant dating to the Early Bronze Age IA

Site Name	Site Region	Context Date	Context Type(s)	Number of Published Beads
Abu Halil	Sinai	EB I	Funerary	?
Ein Huderah	Sinai	EB I	Funerary	150
Ein Um Ahmed	Sinai	EB I	Funerary	?
El Abar	Sinai	EB I	Funerary	?
Gebel Gunna	Sinai	EB I	Funerary	95
Gunna 50	Sinai	EB I	Domestic	1
Mengez Necropolis	Northern Levant	EB I	Funerary	?
Nakb Hibran	Sinai	EB I	Funerary	?
Qarassa Dolmen Field	Northern Levant	EB I	Funerary	?
Al-Qasabat Dolmen Field	Southern Levant	EB I	Funerary	?[8]
Sawawin	Sinai	EB I	Funerary	?
Wadi Hebar	Sinai	EB I	Funerary	?
Wadi Nasb	Sinai	EB I	Funerary	?

Table 5.10 Summary of carnelian beads found in the Levant dating to the Early Bronze Age I without further differentiation.

The sole currently published carnelian bead workshop in the Levant dating to the EB IA is at Jawa, a walled town-site located in the northern Badia region of Jordan (Betts and Helms 1991: 161). There, a number of carnelian bead blanks, partially drilled beads,

[8]Though exact numbers are not provided, according to Ji (1997), the majority of the 1330 beads found in a dolmen were made of carnelian.

and finished carnelian beads were found together with flint microdrills (Betts and Helms 1991: 26, 147). Unfortunately, only three complete short cylinder carnelian beads were actually published from this 'workshop area,' while none of the aforementioned blanks are discussed further, making it difficult to evaluate how extensive bead production was at the site (Betts and Helms 1991: 358).

Though a large assemblage of beads, including several made of carnelian, were found in cave 1535 at Lachish, at least part of which dates to the EB IA, it is infeasible to effectively utilize this assemblage as the beads from this cave were all published together despite the tomb containing pottery dating to anywhere between the EB IA and Middle Bronze Age (Tufnell 1958: 73-74; Magrill 2006: 34-35). A later date for the carnelian beads found in Cave 1535 seems well supported as the materials and bead shapes in the cave are distinct from all other EB I contexts. For example, the assemblage's short barrel carnelian beads are far more sizable than any comparable example known from the rest of the EB I Levant (Tufnell 1958: Pl: 29).

As a result, presently, very few beads are actually recognized from EB IA habitation sites with these being found at Wadi Fidan 4, Wadi Fidan 100, and Hujayrat al-Ghuzlan respectively (Adams and Genz 1995: 16; Klimscha 2011: fig. 12; Notroff et. al 2014: 252; Wright et al. 1998). This stands in stark contrast to the well over 1000 carnelian beads dating to the EB IA that have been found in cemeteries.

Of the sites assigned a general EB I date, nine come from Nawami fields in the central Sinai Peninsula, one comes from a habitation site associated with one of the Nawami fields, and three come from rock-built tombs located in the Jordanian Highlands, northern Lebanon, and southern Syria respectively. Of these sites, the single excavated dolmen in the al-Qasabat Dolmen field near Iraq al-Amir stands out for the huge number of carnelian beads found inside. Though exact numbers are not provided, the excavator noted that the vast majority of the 1330 beads found inside of this funerary structure were made of carnelian (Ji 1997: 55). As a result, while publication bias may skew the exact number of beads listed in the database for the Chalcolithic and EB IA, it is clear that the availability or demand for carnelian beads rose considerably between the Chalcolithic and EBA.

5.5.4 Glazed Steatite Beads in the Early Bronze Age I

Whereas carnelian beads might be readily identified due to their vibrant orange and red color, the small size and white or green color of steatite beads have led to their being less reported in the archaeological record. The underreporting of steatite might be further exacerbated by two factors. First, as noted by several prior publications, steatite is commonly mistaken for faience (Bar-Yosef Mayer et. al 2004: 497; Vandiver 1983: A-64). Secondly, by contrast with scholars working in Egypt, until quite recently, glazed steatite was simply not on the radar of scholars working in the Levant who might instead refer to the beads using a diverse array of white materials including shell, bone, or ivory. In this section, I focus on the identification and reidentification of published bead assemblages that may include glazed steatite beads according to the criteria established in section 3.7.3. The results of this search through the archaeological literature for glazed steatite beads are presented in Table 5.11, while the reasons that these beads have been assigned as glazed steatite beads are presented in Table 5.12.

Site Name	Site Region	Period	Context Type(s)	Original Identification	Number of Published Beads
Bâb adh-Dhrâʿ	Southern Levant	EB IA	Funerary	Bone, Shell, Ostrich Eggshell, Green and white faience.	1433
Fifa	Southern Levant	EB IA	Funerary	'Talc/White'	832
Hujayrat al-Ghuzlan	Southern Levant	EB IA	Foundation Deposit	Steatite	?
Jericho	Southern Levant	EB IA	Funerary	Small white/very small white	462
Ma'ale Shaharut	Southern Levant	EB IA	Funerary	Faience	?
Naq'	Southern Levant	EB IA	Funerary	Steatite	
Abu Halil	Sinai	EB I	Funerary	Faience	?
Ein Huderah	Sinai	EB I	Funerary	Faience	480
Ein Um Ahmed	Sinai	EB I	Funerary	Faience	
El Abar	Sinai	EB I	Funerary	Faience	
Gebel Gunna	Sinai	EB I	Funerary	Faience	519
Gunna 50	Sinai	EB I	Domestic	Faience	7
Mengez Necropolis	Northern Levant	EB I	Funerary	Steatite	?
Qarassa Dolmen Field	Northern Levant	EB I	Funerary	Steatite	?
Sawawin	Sinai	EB I	Funerary	Faience	?
Wadi Hebar	Sinai	EB I	Funerary	Faience	?
Wadi Nasb	Sinai	EB I	Funerary	Faience	?

Table 5.11 List of possible glazed steatite beads discovered in Early Bronze Age I contexts.

In addition to Fifa's beads, confirmed by XRD to be made of glazed steatite, beads possibly made of glazed steatite could only be located at five additional EB IA sites in the Levant. These are at the other two cemeteries of the Dead Sea Plain, in Jericho's cemetery, in a tomb located near the 'Uvda Valley in the southern Negev, and in a foundation deposit buried beneath a shrine at Hujayrat al-Ghuzlan. This foundation deposit however may date to the transition between the Chalcolithic and EB IA, rather than the EB IA itself (Klimscha 2011: 189). In addition, glazed steatite beads were found in several general EB I contexts including Nawami burials and in the megalithic cemetery of Qarassa in Syria's Hawra region. As a result, it seems that Glazed Steatite beads in the Levant are primarily distributed in the Sinai, in the Wadi Arabah, and in cemeteries located on both sides of the Dead Sea.

Site	Morphology	Color	Published as Glazed Steatite
Bâb adh-Dhrâʿ (fig. 5.73)	Described as “very small white beads (Wilkinson 1989: 303).” Artifact drawings establish small diameters akin to the size of Fifa’s beads and plain perforations.	(Wilkinson 1989: 303, 306).	
Naq’			Suggested by Braun (2021).
Fifa			Identified here.
Jericho (fig. 5.74, 5.75).	Several beads described as very small (Kenyon 1965: 20). Artifact drawing showing short cylinder bead of proper size with a plain perforation (Kenyon 1965: fig. 6. 5B).	Description of several beads as “green faience (Kenyon 1965: 30-31).” Photographs of beads from Jericho reveal a greenish tint.	
Hujayrat al-Ghuzlan (fig. 5.76)			Published as glazed steatite on basis of visual comparison by Klimscha (2011) and Notroff (et al. 2014).
Ma’ale Shaharut (fig. 5.77)	Described as “tiny faience beads (Avner 1986: 62).	Visible in image published by Avner (2002: fig. 10:15).	
Abu Halil			Reidentified as glazed steatite by Bar-Yosef Mayer and Porat (2009: 119) and Bar-Yosef Mayer (2011). Unclear if reidentification assisted by microscopic or archeometric analysis.
Ein Huderah			Ibid.
Ein Um Ahmed			Ibid.
El Abar			Ibid.
Gebel Gunna			Ibid.
Qarassa Dolmen Field (fig. 5.78)			Published as glazed steatite by Steimer-Herbet and Besse (2017).
Sawawin			Reidentified as glazed steatite by Bar-Yosef Mayer and Porat (2009: 119) and Bar-Yosef Mayer (2011).
Wadi Hebar			Ibid.
Wadi Nasb			Ibid.

Table 5.12 Rationale for assignment of particular beads as glazed steatite.

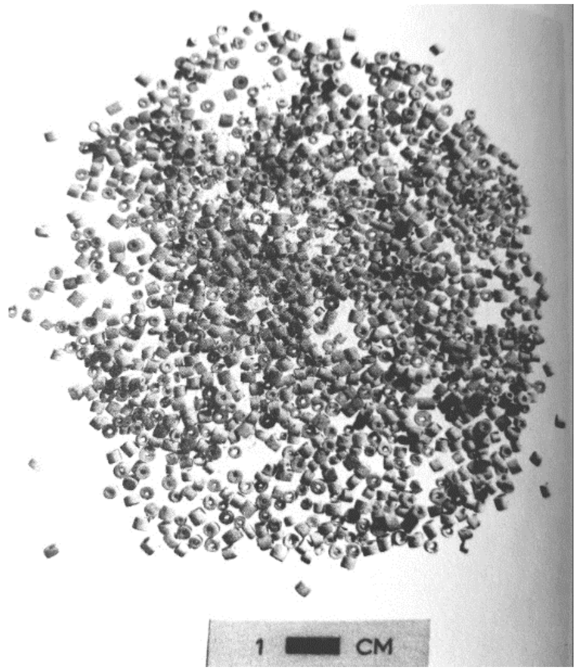


Figure 5.73 Potential glazed steatite beads from Bâb adh-Dhrâʿ (reproduced from Wilkinson 1989: fig. 176)

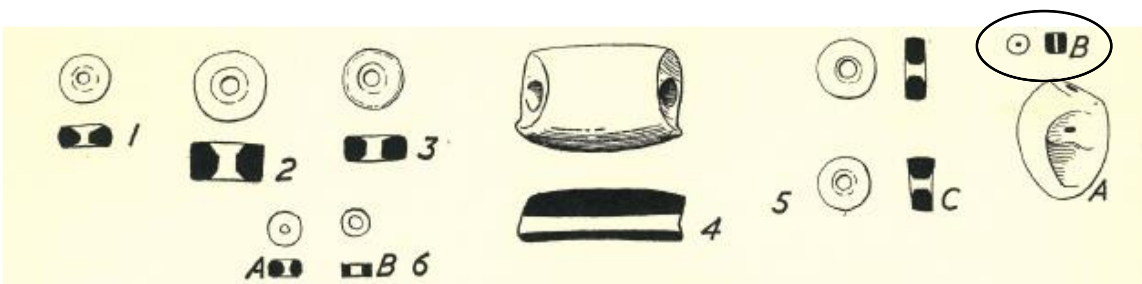


Figure 5.74 Beads from Jericho tomb K1 with potential glazed steatite bead highlighted (reproduced from Kenyon 1965: fig. 6)

Figure 5.75 Ornaments from Jericho tomb K1 with glazed steatite beads highlighted (https://collections.carlos.emory.edu/objects/22149/beads)

Figure 5.76 Foundation deposit from Hujayrat al-Ghuzlan with glazed steatite beads indicated (reproduced from Notroff et al. 2014: fig. 5)

Figure 5.77 Potential glazed steatite beads from the Ma'aleh Shaharut tombs (reproduced from Avner 2002: fig. 10:15).

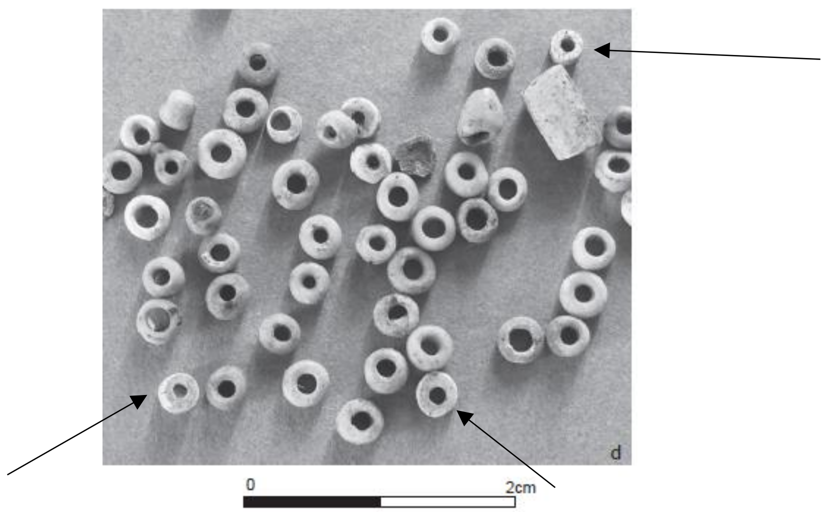


Figure 5.78 Presumed glazed steatite beads from Qarassa with possible examples of glazed steatite beads indicated (reproduced from Steimer-Herbet and Besse 2017: fig. 16).

5.5.5 Perforated Shells:

Perforated shells and shell beads are commonly found in EB I sites and cemeteries. Shells, some of which were ornaments are described as part of the assemblages of 11 of the examined EB IA sites, 18 of the EB IB, and 10 of the undifferentiable EB I sites. Many of these shells were found in funerary contexts including seven out of ten dated to the EB IA, 13 of 18 dated to the EB IB, and 9 of 12 from EB I sites that could not be differentiated. By far, the most extensive assemblages of shells are associated with sites in the Sinai

Peninsula or bordering the Red Sea, especially the Nawami burial grounds each of which had assemblages of over 1000 perforated shells (Bar-Yosef Mayer 1999). At present, there is no direct evidence for workshops or other contexts where shell beads were actually made (Bar-Yosef Mayer 2011: 191).

Regarding *Glycymeris* shells, (the genus two of the shells from Fifa were identified as) prior research has posited that during the EB I, this type of shell was often used as a foundation deposit placed beneath domestic floors (Bar-Yosef Mayer 2005: 46, 50). It is worth noting however that several other types of shell and mollusks beyond Glycymeris seem to have been used as foundation deposits or cultic offerings during the Chalcolithic and EB I (e.g., Notroff et al. 2014: 262; Ussishkin 1980: 16, 2015: 80).

5.6 Conclusion:

This chapter presented the results of the numerous forms of analysis applied to characterize and contextualize the bead assemblage from the Fifa cemetery. As the true material of Fifa's talc/white beads was uncertain, XRD analysis was conducted. This analysis found that in each instance, analyzed beads were made of glazed steatite. Morphometric analysis meanwhile revealed differences between the beads from tombs 7, 12, and 20. Use-wear analysis of the glazed steatite beads from these different tombs revealed that all three demonstrated differences both in how beads from each tomb were manufactured, but also in how well they were preserved. In addition, certain traits were found on beads from the different assemblages that differentiated them from beads found in the other two tombs. The beads from tomb 12 in particular exhibited different wear traces from those found in tomb 7 including the regular appearance of linear traces on their ends and enigmatic central concavities. SEM and EDS analysis was used to complement these results. In addition, this analysis uncovered an unexpected pattern involving the concentration of lead, calcium, and phosphorus in and around the top of the drill holes on beads from tombs 7 and 12, but only around the top of the drill hole of beads from tomb 20.

Use-wear analysis of carnelian beads meanwhile revealed the general manufacturing patterns used to make the assemblage. Some variation was observed in how beads were perforated. In addition, several unexpected traits were found such as beads with one side that remained chipped, while the other side was well polished. Use-wear analysis of the shell objects meanwhile established that very likely they had been naturally perforated but could not determine if the objects had in fact been worn.

Lastly, the database created for this thesis found that carnelian beads became far more common after the Chalcolithic period and that during the EB IA, these objects were found in large quantities in funerary contexts, but rarely elsewhere. While few glazed steatite bead from EB I assemblages were identified prior to the work of this thesis, using the bead’s small size as well as whatever additional information was available from excavation reports, several additional assemblages of glazed steatite beads were identified. In the EB IA, these clustered in three geographic areas: in the central and southern Sinai Peninsula, around Gulf of Aqaba, and around the Dead Sea. In the next chapter, these results will be combined to outline life histories for the various ornaments found in the Fifa cemetery.

Chapter 6: Creating Life Histories for Fifa's Beads

6.1 Introduction:

In this chapter, I will attempt to construct life-histories for the carnelian and glazed steatite beads found at the Fifa cemetery. These are created from the results of use-wear and SEM-EDS analyses, supplemented by the results of the database of beads from the Chalcolithic and EB I Levant, and by relevant literature related to the production, use, and exchange of carnelian and glazed steatite beads in southwest Asia during the late 5th and early 4th millennia BCE.

Both life histories begin with a proposed production sequence for carnelian and glazed steatite beads. This is followed by a discussion of variability, with a particular focus on traits found on beads that could be indicative of their originating in different workshops or other production contexts. A great deal of bead research has been devoted to defining criteria that may be used to suggest that different workshops were responsible for the production of different groups of beads (e.g., Blair 2016; Ludvik 2018; Roux et al. 1995). These frameworks argue that individuals in different production communities operate within unique and identifiable learned traditions called communities of practice. A community of practice is defined as a space of mutual engagement, joint enterprise, and shared repertoire (Lave and Wenger 1991; Wenger 1998: 152). Shared repertoire has in particular been explored by archaeologists with ethnographic data being used to support the idea that different workshops produce beads created with variable *chaînes opératoire* that vary from one another morphometrically (Ludvik 2018: 746).

Next, attention is devoted to suggesting where the different workshops responsible for producing Fifa's beads may have been located. Subsequently, I broach the topic of exchange, examining the materials that the groups who buried their dead at the cemeteries of the Dead Sea Plain may have had to exchange and the routes over which Fifa's beads may have travelled on their way from their places of origin to Fifa. In addition, I briefly touch on the question of whether the groups that buried at Fifa themselves may have acquired the material culture placed within their tombs directly over the course of their peregrinations.

I then discuss whether the beads at Fifa were used prior to being deposited in tombs, as well as any possible differences in the use of these beads by the different kinship groups that possessed them. Of particular interest are unexpected grouping of elements such as lead, phosphorus, and calcium above the glaze layers of steatite beads, which may indicate how the beads were used and their potential alteration after being acquired. I then turn to the actual deposition of beads in tombs, describing how they were placed.

While these discussions represent an attempt to understand the physical lives of the carnelian and glazed steatite beads found at Fifa, they largely bypass the cultural significance of carnelian and glazed steatite beads as imparted and understood by the people who made, moved, used, and thought about them. These aspects too are essential to giving meaning and contextualizing an object's journey (Dobres 2000: 32; Hodder 1987). As a palliative measure, in the case of each type of bead, I conclude by exploring the respective histories and contexts of glazed steatite and carnelian beads in southwest Asia during the 5th and early 4th millennia BCE with a particular focus on their unique histories, potential ideological significances, and possible meanings. These are then used to discuss why carnelian and steatite beads were specifically sought after by the group that buried their dead at Fifa and the reasons that they may have been included in burials.

6.2 Glazed Steatite Beads

6.2.1 The Question of Carved Beads vs. Beads Made from Powder

Several lines of evidence suggest that the glazed steatite beads found at Fifa were carved from blocks of steatite rather than created from a powder as proposed for glazed steatite beads found in Levantine Chalcolithic contexts (Bar-Yosef Mayer et al. 2004). Firstly, in the production sequence suggested for the creation of glazed steatite beads from powder, the final or penultimate step in production is the slicing of beads (Bar-Yosef Mayer et al. 2004; Bar-Yosef Mayer and Porat 2009). Whereas previously studied glazed steatite beads have, on occasion, exhibited regularly spaced long and deep linear traces across their surfaces that have been attributed to slicing marks (Damick and Woodworth 2015: 607), the assemblage from Fifa has no such traces. Instead, in a limited number of instances, linear traces, resembling grinding marks, remain visible beneath beads' glazes. Such traces would not be present if the beads were made from a powder as no grinding would be required to shape such beads. While this type of traces has in the past been attributed to thermal shock associated with removing beads from a kiln too quickly (Damick and Woodworth 2015: 606; Pickard and Schoop 2013: 6; Vandiver 1983: A-66), this explanation does not seem to explain these linear traces as the experimental beads glazed for this thesis exhibited no evidence for thermal shock despite their being removed quickly from the kiln.

Further, in the production sequence suggested for beads created from powder, perforation is a result of the beads being shaped around a central thin core possibly made of straw (Bar-Yosef Mayer and Porat 2009: 118). Such a perforation would however likely be either completely straight or somewhat sinuous and would certainly not produce the types of chipping scars and occasional parallel striations in the drill hole that may be seen on Fifa's glazed steatite beads. Lastly, the single and double cone shapes found on the insides of Fifa's beads may readily be explained by the use of a perforator, but not by the bead being formed around a core. As a result, it must be concluded that Fifa's beads were carved and subsequently glazed.

6.2.2 *Steatite Bead Manufacture:*

In line with the production sequence suggested by Vidale (1995) and replicated for this thesis, Fifa's beads likely began as steatite blocks that were then shaped into cuboids. Subsequently, these were rounded and sliced to make bead blanks. These blanks would be thinned by having their ends abraded against a flat grinding slab. In a number of instances, uneven pressure would be applied against the small bead's end as it was pressed into the abrading surface, resulting in angled ends relative to a bead's axis. This grinding left behind visible linear traces on the bead's ends while the resulting surface fissures would help to ensure that glaze adhered to the bead (Kenoyer 2021: 58). Perforation was likely carried out before the bead's diameters were reduced through abrasion as experiments showed that beads with smaller diameters were more likely to break during perforation. The concavities observed on beads from tomb 12 also would have been produced during this stage, though it is uncertain exactly how they were made. That they were intentionally produced is suggested by the fact that nearly 25% of beads from tomb 12 possessed this trait.

A pointed copper instrument was likely used for perforation. This best evidenced by the chipping observed at the top of beads' drill holes, which was typically found on only one side. This pattern matches up to the use-wear pattern observed on experimentally created beads perforated with copper (see section *4.2.1*). Although beads' perforations appeared plain or entirely straight from a top-down perspective, in the few cases that beads were broken, revealing the true shape of the inner drill hole, a very slight degree of taper was visible. The presence of this slight taper combined with the holes' narrow sizes and other matching use-wear traits suggest that perhaps the types of copper 'awls' found in 4th millennium contexts in Egypt, Sinai, and the Levant were used to perforate the steatite beads found at Fifa (Ilan and Sebanne 1989). The significance of perforating using this instrument will be discussed later on.

Following perforation, the beads were most likely placed on strings in large numbers and were abraded on their profiles to reduce their diameters. Several indirect pieces of evidence suggest this took place. Evidence for profile abrasion is provided by the parallel grinding marks that appear on profiles throughout the assemblage. As with the grinding traces found on beads' ends, these too may have been left for the purpose of helping glaze adhere to the beads. Without a doubt, stringing and grinding large numbers of beads was extremely efficient, allowing simultaneous reducing of beads' diameters while also rounding them. On the other hand, however, the technique would have reduced the precision with which each individual bead could have been rounded. As a result, though most beads at Fifa were completely rounded, beads that were slightly oval or that had a somewhat flattened side may demonstrate that they were abraded en masse rather than individually with extreme attention paid to each bead's shape. Since producing beads of a specific small size was clearly important to those producing the beads, it is likely that some kind of guide, which may have been a completed bead, or a stencil of proper diameter, would have been used in order to check that a batch of abraded beads conformed to a certain standard prior to their glazing. The slight variability that exists in the diameters of beads may be a result of only a few beads being checked for size before a batch of abraded beads was considered complete.

6.2.3 Glazing:

The fragmentation of some beads in the assemblage made it possible to observe the relationship between the glaze layer and steatite body of Fifa's beads. In all instances, glaze was revealed to be of uniform thickness with an interaction layer of variable thickness. This precisely matches up with signs associated with cementation glazing which is characterized by uniform glaze thickness as opposed to the other two techniques that produce glaze layers of uneven thickness (Tite et al. 2008b: 49). In addition, whereas application glazing typically produced drip or flow lines of glaze that remain on an object, no such traces were seen on Fifa's glazed steatite beads. Lastly, efflorescence glazing can apparently be spotted due to the presence of raised parts of an objects surface that are a result of contact with either the kiln floor or a mold during firing (Vandiver 1983: A-39). No such traces however were spotted on Fifa's beads.

As a result, it may be suggested that Fifa's beads were all glazed using the cementation technique wherein the beads were buried in a powder and then fired at roughly 1000 c before their removal. Though the exact recipe that would have been used for cementation glazing of Fifa's beads is unclear, some of the sodium observed on Fifa's beads may be from a sodium-based alkali flux. The bead's coloration meanwhile was provided by a copper bearing mineral, possibly malachite. Evidence for copper was found in the outermost parts of the glazes on every bead examined from each tomb. This was the case even on beads that preserved only limited evidence for green coloration and in particular, the glazed steatite beads from tombs 12 and 20. The use of cementation glazing is unsurprising as the technique allowed a large number of beads to be glazed simultaneously, without the need to individually coat or treat each object (Tite and Bimson 1989: 94).

6.2.4 Exploring Variability: One or Many Workshops

Past research has demonstrated that different workshops or other production loci often create products which differ from one another morphometrically and which utilize distinct *chaînes opératoire* (Ludvik 2018: 746). While some variability is to be expected when examining objects of such a small size produced using pyrotechnology, the combination of variability observed in size, use-wear, and glazes heavily suggest that the beads found in different tombs at Fifa were made by different producers.

Morphometrically, the beads from tomb 7 were smaller than those found in tombs 12 or 20. Shape-wise, meanwhile 98.6% (146/148) of steatite beads from tomb 7 were short cylinder beads. By comparison, the beads found in the other two tombs had more diverse shapes with 16.66% (7/41) of beads in tomb 12 being either standard or long cylinder and 25% (3/12) of complete beads in tomb 20 being standard cylinder.

Differences may also be indicated by use-wear recorded around bead's drill holes. In tomb 7, nearly 60% of beads had two circular drill hole openings, by comparison with 39% for tomb 12 and 35.7% for tomb 20. In the latter two tombs, drill hole shapes were far more likely to be either both elliptical or mixed between one circular and one elliptical drill hole. As observed in the experiments conducted for this thesis, an elliptical drill hole may develop if a bead is perforated on an angle, or if one needs to reposition a perforator to center a perforation. Lastly, a smaller percentage of beads from tomb 7 exhibited chipping around their drill holes than was observed in the other two tombs. This may be either a factor of skill or perhaps of the quality of perforator available to the people who made tomb 7's beads.

There are several indications that the people responsible for producing tomb 7's beads were either more skilled glazers or utilized a different glazing recipe than was used for tomb 12 in particular. In comparison with tomb 7, the beads from tomb 12 exhibited far more linear traces, both on their edges and on their profiles. When observable however, the linear traces found on beads from tomb 7, especially on their profiles, manifested in the exact same way as those found on beads from tomb 12. As a result, I suggest that while such traces were indeed left on beads in order to help glaze adhere to the bead's surface (Kenoyer 2021: 58), differences in their visibility can be attributed to different levels of skill in glazing that produced glazes of different thickness that have more or less successfully adhered to beads over time.

A difference in glazing skill is perhaps also borne out in the fact that roughly 9.5% of beads examined from tomb 7 had some level of their green outer coloration visible, while no such coloration remained visible on beads from tomb 12. Additionally, whereas roughly 85% of beads from tomb 7 did not exhibit glaze cracking on their ends, only 56% and 57% of beads from tombs 12 and 20 respectively showed no signs of cracking. These differences are even clearer when glaze cracking on profiles is examined with nearly 80% of profiles from tomb 7 being smooth, by comparison with the 51% and 78% of profiles from tombs 12 and 20 which exhibited glaze cracking. Lastly, differences in the skill level of the glazers may also be indicated by the variable number of parallel striations visible in the drill holes of beads from the different tombs with nearly three times as many beads in tomb 20 having visible parallel striations in comparison with beads from tomb 7. As a result, for whatever reason, it seems as though the glaze found on beads from tomb 7 was more durable than that found on beads from the other two tombs.

Another indication of variable manufacturing methods relates to the presence of a central concavity on beads' ends. This trait was particularly visible on beads from tomb 12, where nearly 25% of beads had either a central concavity, or a concavity on just one side of the drill hole. The presence of this trait on such a high number of beads combined with the fact that it always appeared on only one side suggests that it was intentionally produced by those who made tomb 12's beads. By contrast, just one of the beads examined from tomb 7 and none of those observed from tombs 8 or 20 possessed this trait. Though uncertain how these concavities would be produced or what their purpose was, their production would have involved another pre-glazing production stage.

There is some indication that the beads from the different tombs may have been created different outcrops that may not have been shared between beads from the different tombs. In the element map produced for tomb 7, the analyzed bead's raw steatite was primarily composed of silicon, magnesium, and oxygen with very low levels of iron present throughout the body. By contrast, the element map produced for tomb 12 revealed that in addition to those three elements, the body of the analyzed bead also contained iron, aluminum, and potassium. Lastly, the bead fragment analyzed from tomb 20 revealed, in addition to the aforementioned elements, vanadium distributed throughout its body. In addition, whereas a horizontal banded pattern was observed in the internal steatite core of beads from tomb 12, this raw material disposition was not observed on beads from the other two tombs. As a result, it may be concluded that the steatite used to make the beads from the three tombs may have come from different outcrops.

While it seems then that the beads from tombs 7, 12, and 20 were produced by different workshops or in other production contexts, it is more difficult to parse out the significance of their differences. The primary reason for this is the lack of chronological control relating to the sequence of the three tombs in question. Whereas the tombs excavated at Fifa all date to the EB IA, it is not certain when exactly the cemetery was established in that period or how long it was in use for. As a result, the differences observed between the different tombs may simply reflect the passage of time, with beads being made and glazed differently depending on exactly when they were made. Alternatively, if the three tombs were contemporary, it could signify that different kinship groups either had access to different, independent, and contemporaneously operating production sources of glazed steatite beads.

A precedent for changes in glazing recipes and differences in bead size over time is already recognized for beads produced in Upper Egypt during the Badarian and Naqada periods (Beck 1934: 74-75; Brunton and Caton-Thompson 1928: 57; Finkenstaedt 1983). As such, changes in glazed steatite beads found in Egypt or elsewhere may be the key to unlocking the significance of the differences observed in the three tombs. If beads resembling Fifa's are found in either well-dated stratified contexts or in tightly sequence dated predynastic tombs (Hendrickx 1999; Petrie 1901), it may be possible to more firmly date Fifa's glazed steatite beads, and by extension, the tombs they are found in.

While possible that Fifa's glazed steatite beads came from different, contemporary production sources, the fact that the beads from tombs 7, 12, and 20 had unique morphometric, chemical, and use-wear signatures that did not extend to the other tombs makes it more likely that these beads were made at different times. This should be contrasted with the carnelian beads from tomb 7 (see below), which seem to have been made by different producers that operated coevally, as indicated by variation within that tomb's assemblage that showed that beads were perforated using two methods. As a result, I suggest that differences in use-wear, size, and glaze composition between the beads seen in different tombs indicate chronological differences rather than differences in the quality or types of glazed steatite beads available to the different kin groups who buried their dead at Fifa.

6.2.5 Locating the Workshop

Several lines of inferential evidence, combined together, suggest that Upper Egypt was the most likely place of origin for all of Fifa's glazed steatite beads. Unfortunately, at present, none of the workshops responsible for producing the glazed steatite beads found in Egypt have yet been uncovered, making it uncertain what exact site Fifa's beads could have been made at in the region.

A comparison between the EDS readings from Fifa and those available from 5th and 4th millennium Anatolia, Egypt, and India reveal that the Fifa bead's copper-based glazes broadly resembles those observed in both Egypt and Anatolia (Appendix A). While the atomic percentages observed at Fifa seem more similar to Egyptian readings, on account of the impreciseness of EDS, it is not possible to point more definitively to either source. It may be stated however, the glazes observed in India had a higher aluminum content compared with Fifa's beads, which typically had little aluminum. Therefore, India may be ruled out as a source.

Measurement data are also not fully conclusive with regard to suggesting an origin for Fifa's beads. When the beads from tombs 7, 12, and 20 are compared with available measurement data from 4th millennium contexts in Anatolia (Pickard and Schoop 2013), Sinai (Bar-Yosef Mayer and Porat 2009), Egypt (Brunton and Caton-Thompson 1928: 57), and the Indus Valley (de Saizieu and Bouquillon 1994), those from tombs 12 and 20 overlap with examples from both Anatolia and the Nawamis with the beads from the Indus Valley being far too large. The beads from tomb 7 are smaller than those from any 4th millennium context yet identified with the exception of the Naqada I (c. 3700) bead measured from Badari whose diameter and drill hole diameter match up quite well.

Site/Conext	Region	Length	Diameter	Hole Diameter
Nawamis	Sinai[9]	1.92 (±.4)	2.45 (± .37)	.78 (±.17)
Çamlıbel Tarlası IV	Anatolia	1.88 (±.74)	2.56 (± .43)	1.07 (± .21)
Mehrgarh III	Indus Valley	2.7	3.8	.9
Badari (Badarian Period)	Upper Egypt		1.98	.76
Badari (Naqada I)	Upper Egypt		1.82	.88
Tomb 7	Southern Levant	1.22 (± .26)	1.96 (± .26)	.87 (± .1)
Tomb 12	Southern Levant	1.77 (± .38)	2.31 (± .27)	.93 (± .13)
Tomb 20	Southern Levant	1.92 (± .3)	2.57 (± .21)	1.04 (± .14)

Table 6.1: Comparative measurements of glazed steatite beads. *Measurements from: (Bar-Yosef Mayer and Porat 2009; Pickard and Schoop 2013; de Saizieu and Bouqillon 1994; Brunton and Caton-Thompson 1928)*

Analyzing the sites where glazed steatite beads are found in the EB IA southern Levant, as revealed by the database of Chalcolithic and EB I, beads may also assist in understanding where Fifa’s beads came from. Glazed steatite beads are found across the Sinai in Nawami tombs, at Hujayrat al-Ghuzlan and the Eilat Tumuli on the gulf of Aqaba,

[9] It is generally assumed that these beads were made in and exchanged from Upper Egypt (Bar-Yosef et al. 1986: 137).

in a tomb at Ma'aleh Shaharut close to the Arabah Valley, and lastly at the cemeteries of the Dead Sea Plain and Jericho. No glazed steatite beads were identified at sites north of the Dead Sea. As a result, a possible route of transmission may be traced if the beads came from Upper Egypt to the Dead Sea Plain via Sinai, the Gulf of Aqaba, and the Wadi Arabah.

By contrast with the considerable evidence that glazed steatite beads were travelling northwards, there is little evidence for a southwards route of transmission from either Anatolia or Mesopotamia, where steatite beads were manufactured and are found in great numbers in 4th millennium BCE contexts (Ekman et al. 2020; Mallowan 1947: 159; Pickard and Schoop 2013). Of all the sites examined in the northern Levant that dated to the 4th millennium, glazed steatite beads were only found at the Qarassa Dolmen field in Southern Syria (Steimer-Herbet and Besse 2017: 105). While the limited scale of excavation in southern Syria (Akkermans and Schwartz 2003: 182) might obfuscate any north to south exchange, the fact that no EB IA glazed steatite beads were found north of the Dead Sea, despite considerable excavation of EB IA contexts there in both Israel, Jordan, and the Palestinian Territories suggests that these beads did not travel further north than the Dead Sea during the EB IA.

The conclusion that Fifa's beads were travelling northwards rather than southwards may be strengthened by examining images of glazed steatite beads that date to the 4th millennium and comparing them with Fifa's. Examination of contemporary beads from Anatolia revealed several differences. Firstly, images of the interiors of drill holes of beads reveal prominent parallel striations (Pickard and Schoop 2013: 8) in contrast to the almost complete lack of evidence for parallel striations in the drill holes of Fifa's beads. Secondly, by contrast with Fifa's beads, which exhibited obliquely oriented linear traces on their profiles, those from Çamlıbel Tarlası were oriented vertically. Lastly, images of fragmented beads found at the site revealed a homogenous composition without the type of layering observed on Fifa's beads between the bead's raw material and its glaze (Pickard and Schoop 2013: 8). This must be contrasted with beads found in Egypt, which are noted to exhibit layering between their interiors and glaze layers (Vandiver 1983: A-67-68), a trait commonly observed on Fifa's assemblage.

In conclusion, Upper Egypt emerges as by far the most likely place of origin. No more accurate site can, at this time, be suggested as no glazed steatite bead production loci have yet been uncovered. It must however be acknowledged that the available data for beads from different regions is highly variable and as a result, additional research will be needed in the future to strengthen these conclusions.

6.2.6 Exchange and Acquisition:

If Fifa's glazed steatite beads were indeed made in Upper Egypt, then how would they have made their way to the Levant? If the beads travelled overland, it seems clear that they did not enter the Nile Delta. This is borne out by the lack of recognized trade connections between Upper and Lower Egypt prior to the second half of the 4th millennium, as well as the absence of glazed steatite beads at contemporaneous Delta sites including Heliopolis (Debano and Mortensen 1988: 34-37), Wadi Digla (Rizanka and Seeher 1990: 91-93), and Maadi (Rizkana and Seeher 1988: 54-55, 1989: 13).

One scenario is that Fifa's beads travelled overland from Upper Egypt to the Sinai Peninsula, and eventually to Hujayrat al-Ghuzlan, a site considered by several scholars to have been an entrepot of exchange between mobile and sedentary groups across a wide area (Abu-Azizeh 2013: 170; Klimscha 2011; Manclossi and Rosen 2022: 99). In this scenario, it is not fully clear how many times the beads would be exchanged before reaching Hujayrat al-Ghuzlan and who would have been responsible for those exchanges. While most scholars believe the Sinai Peninsula and Nawami tombs were primarily utilized by an indigenous pastoralist group that occupied the Peninsula year-round (Bar-Yosef Mayer 2011), others have grouped Sinai's pastoralists with those who lived in the Negev (Rosen 2017), making it possible that group's mobility patterns extended into both the Negev Desert, the Sinai Peninsula, and perhaps further afield. It has even recently been argued that Nawamis were built by pastoralists from the Nile Valley (Ben-Marzouk 2020: 215-216). As a result, if the beads travelled overland, it is unclear whether Nile Valley pastoralists were themselves responsible for transporting the beads to Hujayrat al-Ghuzlan, or if they exchanged them with a different group in the Sinai Peninsula who included glazed steatite beads in their burials, and who were responsible for transporting them there.

Alternatively, a sea route from the Red Sea coast to Hujayrat al-Ghuzlan cannot be ruled out. While no evidence currently exists for the 5th and 4th millennium occupants of the Nile Valley participating in seafaring (Savage 2011: 121-122), the location the entrepots of Tell al-Magass and Hujayrat al-Ghuzlan on the Red Sea is highly suggestive that these sites were at least to some degree engaged in maritime-based exchange (Klimscha 2011: 201; Notroff et al. 2014: 264). Regardless, the glazed steatite beads found at Ma'aleh Shaharut (Avner 1986: 62) and the large number of glazed steatite beads found in and around the Dead Sea region are highly suggestive that these beads made their way from the Red Sea coast, up the Wadi Arabah, and eventually to the Dead Sea Region. Connections between the Red Sea Coast and the cemeteries of the Dead Sea Plain are already documented through the use of lambis shell bracelets, a variety of object known to have been made at Hujayrat al-Ghuzlan (Eichmann et al. 2009: 29).

While the full range of commodities exchanged by the groups who buried their kin at the cemeteries of the Dead Sea Plain is unclear, there is little doubt that they included both salt and bitumen, both of which are thought to have been highly valued (Abu-Azizeh 2013: 170; Milevski 2011: 168). In addition, if Anfinset (2010)'s argument that Levantine mobile pastoralist groups exported copper ore and objects to Upper Egypt is correct, it is possible that the groups that buried their dead at Fifa were actively involved in copper exchange. The full significance of this possibility is explored in a subsequent section. Whereas there is abundant evidence for the southern movement of copper ore to Hujayrat al-Ghuzlan (Pfieffer 2009), somewhat less evidence is available to attest to the southwards movement of these other commodities. One exception however can be found in a tomb at Biq'at Nimra, a site near the gulf of Aqaba. There, a jar was uncovered that contained bitumen, a result confirmed through residue analysis (Avner 1991; Sebbane and Avner 1993: 39).

The Biq'at Nimra tomb also contained a juglet whose shape and loop handle parallel examples from Bâb adh-Dhrâʿ (Sebanne and Avner 1993: 35). An even closer ceramic parallel is found in the nearby EB IA tomb at Ma'aleh Shaharut where fragments of a red slipped, and burnished jar was found that resembled examples known from Bâb adh-Dhrâʿ (Avner 2002: 141; Avner 2018: 41). These parallels are extremely significant as the pottery styles found in the Dead Sea Plain's tombs are extremely distinct and are otherwise unknown outside of that region (Braun 2006). Though the vessels from Biq'at Nimra were produced using clay found in the Negev Desert (Sebanne and Avner 1993: 34), they do not resemble the local pottery family of other nearby and contemporary sites such as Hujayrat al-Ghuzlan or the Feinan sites of Wadi Fidan 4 and Wadi Fidan 100 (Kerner 2009: 26). The similarity that existed between the vessels found in these tombs and those that were found on the Dead Sea Plain invites the possibility that these tombs could have been used by individuals who belonged to the same groups that buried their dead in the Dead Sea Plain's cemeteries.

Beyond the presence of this pottery, the possibility that these tombs were utilized by members of this community is also suggested by the presence of bitumen, likely from the Dead Sea Region and by the presence of glazed steatite beads in the tomb, which is especially pertinent in light of my argument that these objects travelled up the Wadi Arabah before making their way to a restricted group of cemeteries around the Dead Sea. While unclear why members of this community would have been left buried away from the Dead Sea Plain, the presence of these grave goods provide further evidence for connections between these tombs and those surrounding the EB IA Dead Sea.[10]

Based on these lines of evidence, I suggest that at least some members of the different kinship groups who buried their families close to the Dead Sea were themselves involved in the movement and exchange of resources south across the Wadi Arabah to the Gulf of Aqaba. While these groups may also have occupied parts of the Sinai Peninsula on a temporary basis, facilitating exchange and the movement of goods across the Peninsula, at the moment, no clear evidence exists either way. Regardless, it may be suggested that the reason that certain kinship groups had access to beads was simply a result of their participation in a broader exchange network whose fulcrum was at Tell al-Magass and

[10] Fifa is located approximately 122 km from Ma'aleh Shaharut and 140 km from Biqat Nimra.

Hujayrat al-Ghuzlan. However, it is unlikely that this is the sole explanation as lambis shell bracelets are also thought to have been made at those sites but were not found in all of Fifa's tombs that contained glazed steatite beads.

6.2.7 The Use of Glazed Steatite Beads at Fifa

The two primary indications that Fifa's glazed steatite beads were used for any period of time prior to their deposition comes from the occasional preservation of fibers in their drill holes and the development of polish from use. This type of polish was observed, albeit rarely, on beads from tombs 7, 12, and 20. As observed in prior studies and in the experiments carried out for this thesis, polish from use or string polish forms when beads come into contact with other bead's surfaces, textiles, or skin (Falci et al. 2019: 792). My experiments (see section 4.5.1) found that glazed steatite beads worn as a necklace slowly develop a slight polish on their ends and profiles after being worn for two weeks. By comparison, in that time, no polish developed on bead's profiles. As polish was not widely observed on Fifa's glazed steatite beads, regardless of the tomb the beads came from or the state of glaze preservation, it is possible that Fifa's beads were used only for a short period of time, perhaps a few weeks, if not days. It is important to note two caveats, however. Firstly, the experiments conducted for this thesis examined polish development on beads glazed using application, rather than the cementation glazing technique I argued was used for Fifa's beads. Secondly, it is unclear how extensively the post-depositional processes which so profoundly affected Fifa's glaze may have affected the preservation of polish.

Polish was far less common on beads' profiles than on their ends. While this matches the pattern observed on experimental beads worn as a necklace, the possibility should not be discounted that at some point, the glazed steatite beads at Fifa may have been sewn onto either a piece of clothing or some other article. Chalcolithic antecedents to this may be found in the purse made of beads excavated at Nahal Ze'elim Cave 32 in the Judean Desert (Aharoni 1961: Pl 7; Bar-Yosef Mayer et. al 2014: 270; Davidovich 2022; Joffe in Preparation). A later example of glazed steatite beads being sewn onto clothing are the beads found in an Intermediate Bronze Age burial at Yehud which are thought to have been sewn onto a shroud draped over the deceased (Bar-Yosef Mayer 2015). Thus, while experiments were not conducted here to evaluate the polish that develops in connection with beads being sewn onto clothing or some other article, it is not at all infeasible that Fifa's beads were at some point in their life histories.

Turning to the bead database, a comparison of the contexts in which glazed steatite beads are found during the Chalcolithic and EB IA perhaps indicates that in the EB IA, these beads were used either exclusively for burial, or perhaps only during a group's peregrination to the place of burial (Chesson 2001: 105). Whereas examples of glazed steatite beads are known from non-funerary contexts in the Chalcolithic and in the transition between the Chalcolithic and EB IA (e.g., Aharoni 1961; Bar-Yosef Mayer et al. 2014; Klimscha 2011: 189; Ussishkin 1980: 25), presently, glazed steatite beads have been found only in EB IA funerary contexts. This could indicate that glazed steatite beads were associated with and only used in relation to burial during the EB IA.

Beyond their use as funerary ornaments, it seems that the individuals who used the glazed steatite beads altered them, intentionally, after receiving them and before they placed their beads in tombs. Perhaps the most enigmatic trait revealed by SEM-EDS analysis of Fifa's beads were concentrations of lead, calcium, phosphorus, and occasionally vanadium located mostly within bead's drill holes, but also on their ends in the areas around the drill holes. As of yet, this trait has not been observed on any previously studied assemblage of glazed steatite beads despite the application of SEM-EDS to examine beads from the Levant (Bar-Yosef Mayer et al. 2004; Damick and Woodworth 2015), Egypt (Tite and Bimson 1989; Vandiver 1983), Anatolia (Pickard and Schoop 2012; Ekmen et al. 2021), and the Indus Valley (de Saizieu and Bouquillon 2001). This suggests that these elements came into contact with Fifa's beads after they were produced and exchanged. SEM-EDS heat maps reveal that rather than these elements being part of the bead's glazes, they are instead located atop the glaze layer as a separate entity (see section 5.2.5.3).

In tombs 7 and 12, the lead, calcium, and phosphorus are typically found in both the drill hole and atop the glaze layer. Importantly, these elements are only found on top of the glaze in restricted areas of bead's ends rather than atop the entire area of the glaze. As it would make little sense to implicitly place some medium containing these elements into the drill hole, it must be concluded that these elements originally came from another source, leaving behind lead, phosphorus, and calcium as a byproduct of its presence. Due to the locations where these elements are found, it seems most likely that these elements were originally on the fiber used to string the glazed steatite beads found in tombs 7 and 12. The exact reason that a string should be coated with these elements is unclear. One possibility is that the glazed steatite beads were strung on a fiber colored using a lead-based pigment. The fibers that are preserved on beads from tomb 7 however do not seem to be colored, while no special pigmentation was observed on the areas where lead was deposited on the bead surface.

Coincidentally, the earliest known lead object yet uncovered in the Levant was a spindle whorl dating to the Chalcolithic (Yahalom-Mack et al. 2015). This spindle whorl however cannot clearly be connected to phosphorus or calcium. This, as well as the large amount of lead found on the bead's ends and drill holes makes it unlikely that the source of these elements was a fiber that was simply spun on a spindle whorl made of lead. Instead, it must be concluded that somehow and for some purpose, the fibers that were in contact with the glazed steatite beads found in tombs 7 and 12 were intentionally treated with lead. No other evidence however has yet been found on textiles from the Levant for treatment with lead (Joffe in Preparation.).

By comparison, the beads examined using SEM-EDS from tomb 20 were found to have a combination of lead, calcium, phosphorus, and vanadium on their ends, but not in their drill holes. While heat maps showed that this layer too was separate from the broader glaze, the presence of these elements on the object's ends but not drill hole suggests that these elements were applied directly to the bead's exteriors rather than being applied to a fiber as seems to have been done for the beads found in tombs 7 and 12. This demonstrates that the kinship group who used tomb 20 utilized their beads in slightly different ways than the kinship groups who used tombs 7 and 12.

Lead found in the Levant in the 5th and 4th millennia BCE is thought to have come from Anatolia (Yahalom-Mack et al. 2015), but contemporaneous glazed steatite beads found in Anatolia have, as of yet, not revealed any association with lead on their surfaces or drill holes (Ekmen et al. 2021; Pickard and Schoop 2013). As a result, it must be concluded that the individuals who buried their kin at the Fifa cemetery somehow had access to lead ore which they used to make a substance that was applied either to a fiber as in the case of the beads from tombs 7 and 12, or directly to the object, as in the case of the beads from tomb 20. Regardless, this trait provides evidence that those who buried their dead at Fifa altered their beads after they acquired them and suggests that different groups within the broader community had different practices for how the beads were meant to be properly worn, used, or treated prior to their final deposition in tombs. This resembles the findings from Bâb adh-Dhrâʿ where different kinship groups were observed to have had unique ornamental traditions. It is hoped that future study will be able to expand the sample size observed for beads from each tomb that manifested these traits.

After being worn or used for a short period of time, perhaps during the period of encampment at Fifa prior to the funerary ceremony, Fifa's beads were made ready for placement in a tomb. As no evidence of burial shrouds, clothing, or objects made of beads were found in Fifa's tombs, or the tombs of the other EB IA cemeteries of the Dead Sea Plain, it must be assumed that if Fifa's beads were attached to some article, they were detached prior to their placement in the tomb.

At some point in the funerary ceremony, these beads would have been interspersed amongst the bones of the deceased. In the case of tomb 12 however, the glazed steatite beads were placed, as a necklace, around the neck of an articulated infant burial. The second group of beads found in that tomb were also found in close association to the skull of a second subadult skeleton. Whereas the interspersed bone piles of tombs 7 and 20 make it difficult to associate the beads found in those tombs with specific persons, the glazed steatite's particular placement in exclusive association with subadults in tombs 8 and 12 may suggest that broadly, these beads were associated at Fifa with pre-adult individuals as every tomb where these beads were found also contained subadults (Littleton 1990). The association of adolescents and infants with beads is a phenomenon observed both ethnographically where they are often utilized for protective purposes (e.g., Miller 2009;

Popper-Giveon et al. 2014) and archaeologically where it is often argued that beads played protective and symbolic roles (de Beauclair 2010; Benz et al. 2020; Cristiani and Boric 2017: 61; Dunham 1993: 241).

6.2.8 The Meaning of Glazed Steatite Beads, Regenerating the Dead Connecting the Living:

In this section I argue that the glazed steatite beads found at Fifa were symbolically charged objects that drew significance from their particular histories in both the Levant and Egypt as well as the processes involved in their manufacture and circulation. These, I argue, vested glazed steatite beads with power that could be harnessed for magical purposes. I then argue that the kin groups who used glazed steatite beads drew on these symbolic and magical powers in order to assist in the successful reincarnation and rebirth of infants and other subadults at Fifa.

6.2.8.1 Glazed Steatite Beads as Magical Items and as a Nexus of Relationships

Glazed steatite first appeared in the Levant during the Chalcolithic period in tandem with a broader set of metallurgical technologies (Bar-Yosef Mayer et al. 2004: 499). While it has long been recognized that these technologies were used to craft ritual paraphernalia (Bar-Adon 1980), a growing number of scholars have, in recent years, argued that metallurgical production was itself a locus of ritual and religious practice with smiths operating as ritual practitioners (Amzallag 2019; Gošić and Gilead 2015a, b). These rituals, they argue, were tied to the human life cycle, a central focus of Chalcolithic religion, with every step of copper production connected to aspects of birth, life, death, and eventually rebirth or reincarnation (Ben-Marzouk 2020: 185 Ilan and Rowan 2012: 105-106; Ilan and Rowan 2019) (see section 2.2).

Though much of this theology may have arisen in the Chalcolithic period, some scholars argue that it had much older roots in the Late Natufian when copper bearing green minerals began to be used for ornaments that may have symbolized health and fertility while possessing inherent apotropaic and pharmacological properties (Bar-Yosef Mayer and Porat 2008; Ben-Marzouk 2020: 69). As ornaments glazed using copper bearing minerals that required temperatures analogous to those used in copper smelting, glazed steatite beads can be seen as microcosms of these broader belief systems, combining together the importance of green ornaments that dated back to the Natufian period with the theology of life cycle and transformation that arose in the Chalcolithic period.

As discussed in section 2.11, glazed steatite beads emerged nearly contemporaneously in various regions across southwest Asia during the mid-5th millennium BCE. While some argue that the technology was independently invented in different regions (Tite et al. 2008a: 35), others see its spread as directly connected to technological diffusion associated with the emergence of copper working (Bar-Yosef et al. 2004: 499). In this understanding, pyrotechnological knowledge and familiarity with copper was transferred to Egypt directly from the Levant (Killick 2009: 404).

Although the somewhat regular exchange of objects and resources between the Levant and Egypt in the 5th and 4th millennium BCE is widely discussed (Bar-Yosef Mayer 2002a; Chłodnicki 2008; Harrison 1993; Hartung 2013, 2014), far less research has been devoted to understanding the exchange of ideas, comparative worldviews, and personal relationships that existed between individuals living in the Levant and Egypt in this period. In particular, relationships between people living in the Levant and Upper Egypt are hardly discussed with most arguing that in the early 4th millennium BCE, connections between these regions were extremely limited (Hartung 2014: 110). Recent research however has begun to challenge this.

Drawing on the evidence for visitors from Upper Egypt to the Gilat Shrine (Levy 2006), the westward facing entryways of Nawami tombs, thought to connect to Egyptian funerary beliefs (Bar-Yosef Mayer 2011: 190; Bar-Yosef et al. 1983: 56), and the sudden emergence of malachite and other greenstones in 5th and 4th millennium BCE graves in the Nile Valley (Horn 2014; Wengrow 2006: 51), Ben-Marzouk (2020: 190, 196) has argued that the pastoralists that occupied Upper Egypt in the 5th and early 4th millennium BCE may have shared some body of beliefs or worldview with the inhabitants of the Chalcolithic Southern Levant. These, she argues, were in turn, directly connected to the process of copper production and exchange, a process that she argues regularly integrated individuals from both regions into one another's lives (Ben-Marzouk 2020: 208).

If this argument is correct, it is possible that Upper Egyptian pastoralists and southern Levantine individuals possessed a shared understanding of the significance and meaning of glazed steatite beads. As Horn (2014: 61) has argued, these meanings would have revolved around regeneration, rebirth, and both medicinal and magical protection. These shared understandings of the material's significance meanwhile may be responsible for glazed steatite's prominence in burials in both regions and in Nawami burials, a role that could have regularized the exchange of glazed steatite beads from Egypt to the Levant beginning in the mid-5th millennium BCE (Bar-Yosef Mayer et al. 2004: 500). This exchange may then have acted as a regular memento of the historical process by which copper objects and its production technologies had been introduced from the Levant into

Egypt with its exchange facilitating the continuation of social relationships between people living in both regions (Costin 1998: 6).

Glazed steatite beads may also have assumed some of their symbolic meanings and powers during production. As previously discussed, scholars have argued that copper production in the Levantine Chalcolithic was a ritualized process (Gošić and Gilead 2015a) wherein the gradual transformation of copper from ore to complete metal objects, which were eventually recycled, were understood to reflect the human life cycle starting at birth, going through life, and culminating in eventual rebirth (Ben-Marzouk 2020: 151-163). Egyptologists, meanwhile, relying on 3rd millennium hieroglyphic texts, have argued that the malachite, the primary colorant for glazed steatite's glaze, also possessed magical significance in the 4th millennium BCE (Horn 2014; Wengrow 2006: 51). Therefore, it is possible that the production of glazed steatite beads, which involved the use of copper bearing minerals and the transformation of the stone's hardness and appearance, was a ritualized process with the resulting objects possessing inherent magical connotations related to aspects such as transformation, regeneration, and both pharmacological and magical protection (Ben-Marzouk 2020: 196). This conclusion is also borne out by the esoteric knowledge and considerable skill that was required to make glazed steatite beads of proper shape, size, and appearance (Spielmann 1998: 153). The proper production of glazed steatite beads both from a physical and ritualistic standpoint then would have been vital for investing these objects with their full powers (Costin 1998: 5).

The first inkling of the special status of glazed steatite beads is offered by their uniquely small size, which sets them apart from all other contemporary ornaments within the Levant, none of which match glazed steatite beads in either size or appearance. Though steatite beads may be reduced more easily through abrasion than most other materials, the reduction and shaping of glazed steatite beads to their final size and shape would have still required considerable investment of time and labor. The absence of skeuomorphs that could be produced without the need for an extensive heating and glazing process equally suggests that glazed steatite, and only glazed steatite beads of a certain size were understood as being able to fulfil their intended function. In light of this, steatite's remarkable quality of transformation from an incredibly soft and malleable material to a hard stone after heating was also likely viewed as central to its significance and unique role.

Another aspect crucial to understanding the significance of glazed steatite relates to the possible necessity of Levantine participation for their creation. Whereas sources of both steatite and copper bearing minerals are present in the Egyptian Eastern Desert (Aston et al. 2000: 59; Ogden 2000: 150), clear evidence for their exploitation begins only at the end of the 4th millennium (Abdel-Motelib et al. 2012: 8). This, coupled with the fewer than 10 copper objects known from Upper Egypt that date from before the Naqada II period (c. 3600 BCE) has led some scholars to argue that copper ore and objects found in Egypt before that date originated in either the southern Levant or Sinai (Anfinset 2010: 145-146, 161). The few copper objects known from Upper Egypt contrast with the many thousands of 5th and early 4th millennium BCE glazed steatite beads thought to have been created there (Harrell 2017). These would have required copper ore for their coloration and furnaces that could reach above 900 degrees centigrade for their proper hardening and glazing. Thus, if it was indeed the case that glazed steatite beads produced in Egypt utilized copper ore mined in the Levant, it would mean that the exchange of glazed steatite beads did not simply act as a memento of a historical process, but also engendered mutual dependencies between the geographically disparate groups who vested glazed steatite with significance and relied on one another in order to create glazed steatite beads.

The relationships furthered by this dependency may also have been more deeply entrenched and regularly revitalized by the use of copper borers for steatite perforation. As demonstrated by the analysis of use-wear on the experimentally created bead assemblage created for this thesis, it is highly likely that a copper implement was utilized to perforate the glazed steatite beads found in Fifa's tombs (see section *4.2.1*). Scholars have long suggested that copper awls, borers, and needles found in predynastic tombs and Nawamis (e.g., Anfinset 2010: 14-146; Baumgartel 1960: 2; Needler 1984: 290; Petrie 1917: 52) were used to create the small and plain perforations observed on glazed steatite beads (Brunton and Caton-Thompson 1928: 41; Payne 1993: 204). Their use for this purpose can perhaps be confirmed archaeologically by the EB II copper awl found at Sheikh Mukhson in the Sinai, which was found in-situ penetrating a bead (Beit-Arieh 2003: 36) Thus, Anfinset's (2010: 161) suggestion that these objects originated in the southern Levant may be extremely relevant (fig. 6.1).

Figure 6. 1 (A) Naqada I-early Naqada II copper needle from Kom el Ahmar (Needler 1984: 290-291) (B) Naqada I loop handle awl from Naqada (Petrie and Quibell 1896: Pl. LXV, 15), (C) EB I awl from Small Tel Malhata (Ilan and Sebanne 1989: fig. 5.1), (D) EB I awl from Azor (Ilan and Sebanne 1989: fig 5.2). Not to Scale.

Steatite may easily be perforated by a variety of materials (Stocks 2003: 111-112), many of which would have been readily available in the Nile Valley. The use of exceptionally rare copper perforators originating in the Levant then must have been a highly intentional act with the producers of glazed steatite beads considering such perforators the only acceptable medium to use for the task. This adds to the evidence that the production of glazed steatite beads may have been a ritualized process that obeyed very particular rules for how the beads had to be produced. The use of copper ores and objects with origins in the Levant or Sinai then also may have been vital to assuring their full potency. Thus, beyond their inherent symbolic and magical properties, glazed steatite beads were also a nexus around which groups, living some distance apart, maintained their relationship, using the objects not only as a reminder of their shared historical past, when glazed steatite was first introduced, but also as a means of ensuring the continuation and regular revitalization of their connections.

6.2.8.2 The Meaning and Purpose of the Glazed Steatite Beads at Fifa:

Having now suggested and explored some of the possible symbolic meanings carried by glazed steatite beads based on their history, their production, and their exchange, what then was their function at Fifa? Firstly, glazed steatite beads may have signaled that the kinship groups that possessed them had unique knowledge of and connections to distant areas, primarily the distant Nile Valley (Helms 1993: 91, 101). Some precedent for this interpretation exists in the ornaments found in contemporary predynastic Egyptian tombs. There, scholars argue that the concentration of exotic materials around the body of a deceased individual provided a tangible expression of that person's mobility in life, knowledge of and connection to distant locales, and command over social space (Stevenson

2009: 186-187; Wengrow 2006: 70, 122). Whereas this formulation was conceived for discussing the funerary practices of Nile Valley pastoral peoples, if most EB IA groups, including those who buried their kin around the Dead Sea, practiced some level of mobile lifestyle and regularly aggregated and dispersed as some scholars suggest (Greenberg 2019: 29; Nicolle and Braemer 2012), it is possible that ornaments found in EB IA tombs may be understood similarly.

Other than this though, it must be asked whether the glazed steatite beads found at Fifa carried the same meanings they did during the Chalcolithic. Whereas scholars generally argue that EBA peoples largely divested themselves from Chalcolithic religion, ideology, and symbols (Joffe 2022; Yekutieli 2014, 2022), the continuity of certain types of material culture between the two periods (Braun 2011b, 2013) raises questions over whether or not this divestment was more or less complete for certain EB I communities.

Besides glazed steatite beads, the cemeteries of the Dead Sea Plain in particular possess several grave goods with Chalcolithic antecedents including lambis shell bracelets, basalt bowls, and anthropomorphic figurines (Shaub and Rast 1989: 554). The presence of anthromorphic figurines at Bâb adh-Dhrâʿ (Ludwig 1989; Schaub 2008b) is particularly relevant in light of Yekutieli (2014)'s argument for an 'aniconic revolution' between the Chalcolithic and EB IA. These figurines remain the only known anthropomorphic imagery dating to the EB I. In light of these connections and especially the considerable aberration of Bâb adh-Dhrâʿs figurines, it is not inconceivable that some elements of religious or other cultural expressions that emerged in the Chalcolithic continued at the cemeteries of the Dead Sea Plain in the EB IA, especially if these cemeteries were indeed established early in the period (Schaub and Rast 1989: 553). This is not to say that the kin groups who buried at the cemeteries of the Dead Sea Plain practiced completely unchanged Chalcolithic traditions, but rather that whatever traditions they did practice, several of them may have been adapted or appropriated from Chalcolithic antecedents (Hobsbawm 1983: 5-6).

If some continuity was indeed present, Schaub and Rast’s (1989: 553) offhand suggestion that the shaft tombs at Bâb adh-Dhrâʿ operated in the same way as Chalcolithic ossuaries is perhaps extremely relevant to understanding the worldviews of the people who buried their kin on the Dead Sea Plain as well as the possible function of glazed steatite beads. This connection is perhaps further borne out by the shared emphasis on secondary burial in both contexts with a particular focus on the deposition of long bones and cranial elements (Ilan and Rowan 2019: 250). Using the centrality of clay to later Mesopotamian creation mythologies and their anthropomorphic features, Ilan and Rowan (2019) recently argued that Chalcolithic ossuaries were understood as vehicles for the reincarnation for those buried within them. As such, it may also be possible that the cist tombs of Fifa and shaft tombs of Bâb adh-Dhrâʿ were also understood as vehicles for reincarnation, at least for some of the individuals buried within them.

The groups that practiced secondary burial at the cemeteries of the Dead Sea Plain went to great lengths to collect and maintain the good condition of all of the bones of their deceased kin regardless of whether the deceased was a fetus, newborn, child, adolescent, or adult (Chesson 2016: 47). While most members of these different biological groups could be variably represented in a tomb by anywhere from a few bones to their complete skeletal remains (Frolich et al. 2008: 230), the remains of late-term fetuses and newborns were treated slightly differently with special attention devoted to the collection, curation, and careful deposition of their small bones (Chesson 2016: 58).

Demographic studies of the burial population in Bâb adh-Dhrâʿ's EB IA tombs revealed that 27.4% of the burials belonged to either fetuses or infants while another 26.3% of the burials belonged to children under the age of 12 (Frolich et al. 2008: 234). The high degree of infant and childhood mortality (Frolich et al. 2008: 235) led Chesson (2016: 53) to argue that, "since birth and death often went hand in hand, anxiety likely accompanied pregnancy, birth, and early childhood." The inclusion of fetal and infant bones in the community's cemetery rather than in a separate burial context such as an intramural jar burial (e.g., Eisenberg et. al 2001: 39), or their exclusion from the cemetery at large, is highly suggestive that at least to some extent these were considered to be community members. The different treatment of infant and fetal bones from the broader burial population, however, could indicate that these groups may have been thought to have a different after-life experience, the nature of which might in part be suggested by their association with glazed steatite beads.

While siltation has undoubtedly affected the contexts in which Fifa's glazed steatite beads were found, largely mixing them with the broader bone pile, in tomb 12, it is possible to associate the two sets of glazed steatite beads with two persons. One of these was an articulated infant who had a group of beads around its neck. The other group was associated with the skull of a subadult skeleton of currently unknown age whose bones were scattered throughout the tomb. In either case, at least in this tomb, it seems as though some association may have existed specifically between glazed steatite beads and persons who passed away before reaching adulthood. Subadult skeletons were also present in every other tomb at Fifa where glazed steatite beads were found, with tomb 8 having only subadult skeletons. Associations between beads and subadults, often infants, have been widely observed in the archaeological record and it is often argued that beads fulfilled an apotropaic role (de Beauclair 2010; Benz et al. 2020; Cristiani and Boric 2017: 61; Dunham 1993: 241).

Numerous responses to coping with pregnancy loss, infant mortality, and childhood death have been recorded cross-culturally by anthropologists (e.g., Cecil 1996; Einarsdóttir 2021; Scheper-Hughes 1985; Shaw 2013). These often vary somewhat from cultural norms of bereavement or burial for other community members (Tarlow 1999). While such responses are highly variable based on cultural understandings of personhood and the time at which a biological entity assumes that status, the special treatment of infants and fetuses at the cemeteries of the Dead Sea Plain highly suggests that their deaths were emotionally charged events that were accompanied by a different set of grieving strategies and coping mechanisms. Here, I suggest that glazed steatite beads did indeed have a special connection to subadults at Fifa and that they formed a special means of coping with subadult mortality for the kinship groups who had access to them. Unfortunately, the contextual information from other EB IA cemeteries is currently too limited to extend this association to other sites.

If the suggestion that the tombs at the cemeteries of the Dead Sea Plain functioned similarly to Chalcolithic ossuaries (Schaub and Rast 1989: 553) is accepted, it could suggest that the groups who buried on the Dead Sea Plain believed that at least some members of their community would be reincarnated. The fact that adult skeletons were often co-mingled and could include anywhere between 50-95% of an individual's bones (Frolich et al. 2008: 230) might suggest that these people were understood as having lived full lives and could transition into some kind of afterlife. By comparison, the special focus on including the whole skeletons of infants and fetuses, including the smallest and most delicate bones, could reflect a belief that their inclusion was vital to the successful reconstitution and reincarnation of the deceased. This focus on the inclusion of as many bones as possible would, in-effect, possibly mirror the anthropomorphic elements of Chalcolithic ossuaries which Ilan and Rowan (2019: 262) argue were vital for reconstituting the bones buried within them.

Since glazed steatite beads were not found in every tomb, it is clear that they were not essential to the successful reincarnation of the deceased. Nonetheless, as symbolically and magically charged objects that several scholars (Ben-Marzouk 2020: 190, 196; Horn 2014) have argued were associated with transformation, revitalization, and protection, for the families who had access to them, glazed steatite beads may have served as funerary amulets that helped to assist with the successful reconstitution and reincarnation of their children. Whereas some kinship groups, such as those who buried in tomb 7, had access to larger assemblages, the fact that other groups felt that it was worthwhile to bury their deceased kin with as few as one glazed steatite bead could point to the immense power these objects were understood to possess.

The presence of such ornaments would be especially vital considering the inherent risk of failure that are thought to have existed in the funerary rituals carried out by the groups who buried at the Dead Sea Plain's cemeteries (Chesson 2016: 60). The use of beads in similar context is recorded in later 1st millennium BCE Assyrian texts where the combination of particular stones and incantations are recorded as being thought magically protect of infant burials ensuring a successful afterlife (Dunham 1993: 240-241). The inclusion of glazed steatite beads with infant and child burials then may have been thought to assist in their successful reincarnation. Their protective qualities, meanwhile, may have been thought to help ensure greater longevity and well-being after their reincarnation. Though the transformative qualities associated with glazed steatite by Ben-Marzouk (2020: 190, 196) may be used to further the argument that these beads assisted in reincarnation, the possibility also exists that they were simply meant as protective ornaments given to the most vulnerable members of the group that buried their dead on the Dead Sea Plain.

Lastly, whereas it is unclear how long a time the glazed steatite beads deposited in Fifa's tombs were used for prior to their deposition, the alteration of the beads by the kin of the deceased as well as their possible use of those beads may have established an anchoring connection between the deceased and their vital, living kin, a connection that may have further facilitated successful reincarnation, rebirth, and future longevity for the deceased. This particular connection may have been furthered by the unique traditions of bead use that existed between different families as indicated by the differently located element concentrations found on beads from tombs 7, 12, and 20.

6.3 Fifa's Carnelian Beads

6.3.1 *Carnelian Bead Production*

The carnelian bead assemblage from Fifa retained a great deal of information valuable for reconstructing their manufacturing sequence. Abundant evidence exists for the reduction of the bead through knapping, including various flake scars and concave areas where small flakes were removed.

The dark red colors of some of Fifa's beads suggest heat treatment, but hues are highly variable possibly as a result of natural variation in the carnelian pebbles used to make Fifa's beads. It is possible that certain beads were heated more or less than others, while other beads were not heated at all.

After heat treatment, the roughouts were gradually thinned and rounded through an extended process of grinding. This was perhaps carried out using either a flat grinding slab with a high asperity alone or in combination with a grooved stone slab used to help shape the carnelian bead (e.g., Janz et al. 2020: 155). Evidence that a flat grinding slab was used on the bead's ends is provided by the long linear grinding traces observed on Fifa's beads. These would likely have been produced by a craftsperson rubbing the roughout reciprocally (fig. 6.2)

Figure 6.2 5076.003 with visible linear traces from grinding.

Beads would then go through a variable number of stages of further grinding and polishing. In many instances, the carnelian beads' ends, and profiles would be polished to the extent that evidence for the prior stages of chipping and grinding was entirely erased. In some instances, however, beads only went through a course polishing stage, leaving behind shiny and extremely shallow linear traces. In other cases, part of a bead's end would be thoroughly polished, removing evidence for prior traces while another part of the same end was not polished thoroughly enough to remove chipping scars. Lastly, on some of

Fifa's carnelian beads, one end of a bead would be extensively polished while the other end would be either polished to a much lesser extent, or not at all. Different stages of grinding and polishing were likely accomplished using different materials of different hardness. Whereas initial grinding was likely done using a hard stone such as basalt sandstone, or granite, subsequent polishing was likely carried out by a softer stone like limestone before a final polishing stage was carried out with an organic material like a wooden board (Groman-Yaroslavski and Bar-Yosef Mayer 2015: 86).

The reasons for the observed variability in polishing and grinding on Fifa's beads are unclear. For example, while it makes a great deal of sense that parts of the bead's surface with deep flake removals would not be completely ground down due to the amount of time it would take to level the rest of the bead's end, in some instances, flake scars are quite shallow and seemingly may have taken less time to remove. Equally, the pattern of one end of a bead being well polished while the other retained chipping scars is also difficult to explain.

Two suggestions however can be put forward. The first is that the beads that made their way to Fifa came from a hodgepodge of different workshops or other production contexts, each of which devoted a different amount of time or number of stages to the production of their carnelian beads. For example, carnelian bead workshops of several different sizes and types are known from Khambhat, India (Kenoyer et al. 1991; 1994). These different workshops have slightly different production processes, involving more or less time intensive processes of materials selection, heat treatment, and knapping (Kenoyer et al. 1991). This might explain variability in how many times the beads observed at Fifa were ground and polished or whether they were heat treated.

Alternatively, it might be suggested that in order to ensure that a certain number of beads were efficiently produced within a certain amount of time, craftspeople would devote a discrete amount of time to each bead, moving on to another object despite leaving behind some chipping scars and grinding marks. This would also explain the carnelian bead in the assemblage whose end is partially extremely well-polished and partially covered by deep radial grinding traces (fig. 6.3). Such a bead may also suggest that some beads in the assemblage were abraded one section at a time using a hand stone rather than a single flat slab which was used to simultaneously polish an entire end.

Figure 6.3 5076.003 with variable grinding and polishing across its end.

The pecking method was used to perforate all the carnelian beads in this assemblage. This is attested through the assemblage's hourglass shaped perforations and the universal presence of the distinctive scarring that develops as a result of pecking. Whereas two-thirds of the investigated assemblage were pecked from two sides, the remaining third of beads were pecked from one side with their perforation being completed with a single percussive blow directed through the drill hole. Whereas beads pecked from both sides had scarring on both sides, those perforated by pecking on one side only had it on just one side, with the other half of the drill hole being shallow, and without scarring. The full possible significance of this pattern will be explored in the next section.

By contrast, no evidence was found for the use of rotary drilling. While one bead had concentric linear traces at the top of its drill hole, I suggest that these are the remnants of a microdrill being twisted in order to remove raw material pecked away from the drill hole. These marks, as well as the regular appearance of pecking scars on top of well-polished parts of carnelian beads attest to the fact that this stage would in some cases take place after beads were ground and polished. This in turn suggests that perforation may have been carried out by a separate group of craftspeople, perhaps operating within their own workshop or at least independently of the workshop responsible for knapping, grinding, and polishing.

6.3.2 The Question of One or Several Workshops:

Several aspects of the carnelian bead assemblage from Fifa are highly suggestive that multiple sources were responsible for their production. Firstly, while all the carnelian beads examined for use-wear were perforated through pecking, it is important to emphasize that pecking from one and two sides are in fact relatively different techniques. While both require precision in order to ensure that beads do not break, it would have required considerable skill in order to generate the exact amount of percussive force needed to complete a pecked perforation from just one side. In order to strengthen the case that beads pecked from one or two sides came from different workshops, their lengths and diameters were compared (fig. 6.4). While overlap exists for both categories, comparison revealed that beads pecked from both sides on average had larger lengths, but smaller diameters than beads pecked from one side only. Lastly, though only a single carnelian bead was found in tomb 8, it should be noted that this bead was considerably smaller than any other in the assemblage and was an outlier both in terms of length and diameter. As a result, it may also be suggested, less confidently, that this bead too comes from another production source.

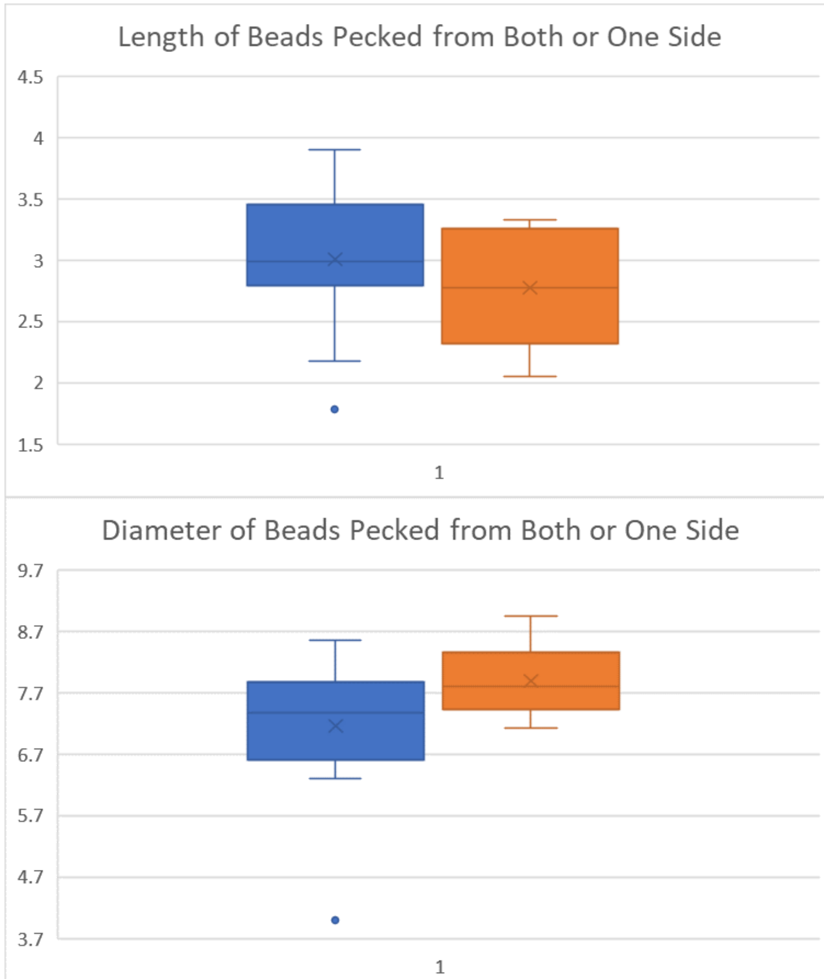


Figure 6.4 Lengths and diameters of beads pecked from both sides (Blue) and one Side (Orange) compared.

6.3.3 Locating the Production Sources of Fifa's Beads

Recent research has revealed that outcrops of carnelian from different areas do, in fact, carry unique chemical signatures. In particular, the signatures for the carnelian from Tayma and Hierakonpolis do not overlap, lending a high degree of confidence to whether a bead may have been produced in Arabia, Egypt, or elsewhere (Haibt 2019: 72; Kenoyer et al. 2022: 8). As a result, it is hoped that in the future, Fifa's beads may be subjected to trace element analysis in order to conclusively uncover their origin. Nonetheless, several aspects of evidence from the assemblage and from known production sources may be used to inferentially suggest where they came from. This task is unfortunately made more difficult due to a lack of comparative use-wear data available from beads known to originate in various 4th millennium workshops. In addition, while measurements were taken for short cylinder beads found at Abydos, these beads were found in a 2nd millennium context (Ludvik 2018: 722-723). No measurements meanwhile area available from the beads uncovered at Hierakonpolis. Very little information is available regarding the bead workshop at Jawa, the only 5th or 4th millennium BCE production site of carnelian beads yet uncovered in the entire Levant. Based on the limited description available for bead manufacture there however, it appears that the scale of production there was quite limited (Betts and Helms 1991: 147).

Generally, the 5th and 4th millennium BCE short cylinder carnelian beads that are ubiquitous throughout the Levant, including at Fifa, are thought to have come from Upper Egypt (Milevski 2011: 173). Several sources of carnelian are known throughout the Egyptian desert and several workshops that produced short cylinder carnelian beads, identical to those known from the Levant, have been identified in Egyptian 4th millennium BCE contexts. In addition, recent archeometric analysis has revealed that beads produced at one of these workshops, that located at Hierakonpolis were sometimes produced through pecking, sometimes through rotary drilling, and sometimes through a combination of both techniques (Nagaya 2016: 11-12). This is particularly relevant as no evidence for rotary drilling was found on Fifa's beads (fig. 6.5).

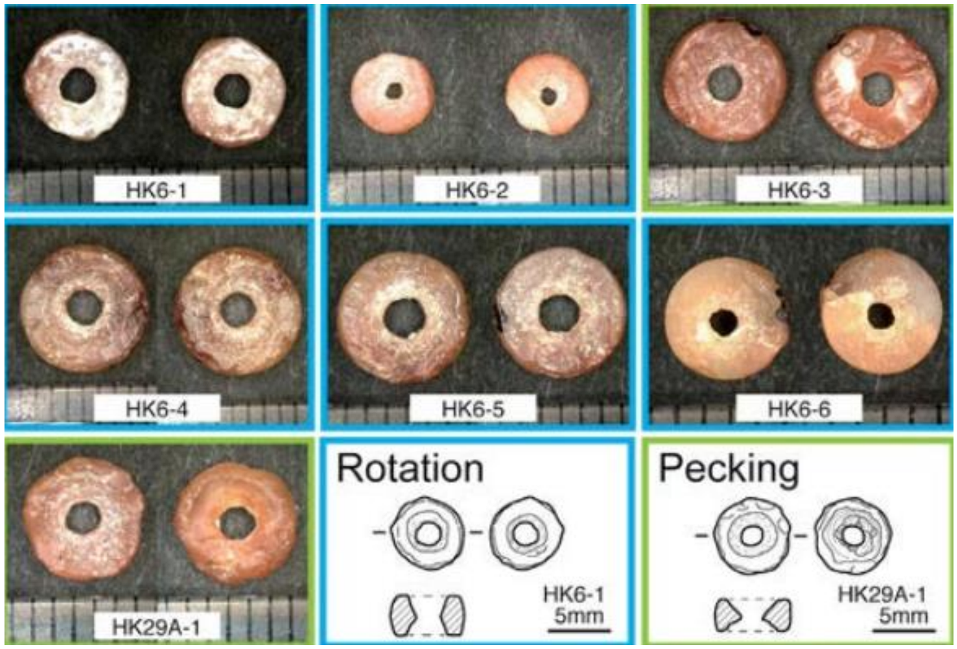


Figure 6.5 Carnelian beads produced using pecking and rotary drilling from 4th millennium Hierakonpolis (Nagaya 2016: 11).

It remains possible however that some of Fifa's beads were produced at Hierakonpolis as the beads studied by Nagaya (2016) were associated with the workshop at Hierakonpolis dated to between 3450 and 3325 B.C.E, which possibly postdates the use of Fifa's cemetery (Hikade 2004: 192). While no earlier workshop has yet been identified, such a production source may have existed. Further, the presence of carnelian beads across Sinai in Nawami burials (fig. 6.6) has been used to suggest that these beads were exchanged between Egypt and the Levant (Bar-Yosef et al. 1977: 74-75). In addition, Ludvik (2018: 762) established that the beads produced at Abydos were created using percussion suggesting that different workshops throughout Egypt utilized different *chaînes opératoire*, meaning that while Hierakonpolis' beads do not match Fifa's, those from another site very well could.

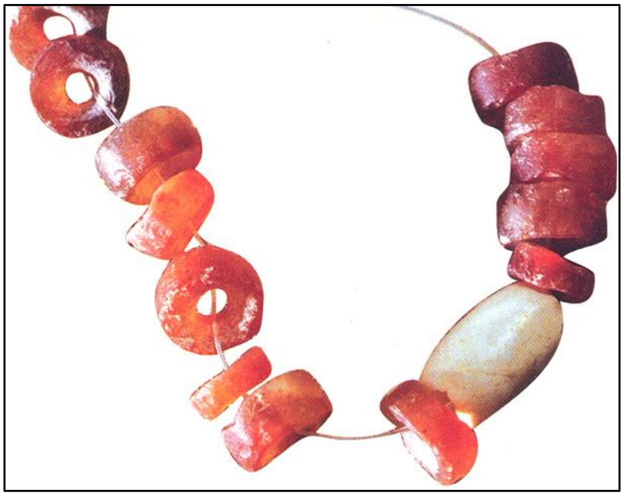


Figure 6. 6 Carnelian beads from Nawami tombs in Sinai (Goren 2002).

The possibility that Fifa's carnelian beads were made at Tayma (Arabia), on the other hand, is extremely compelling for several reasons. Currently, scholars argue that production of short cylinder or 'discoid' carnelian beads began at Tayma in the 4th millennium, and possibly in the early 4th millennium BCE (Haibt 2018: 7, 15). According to the results of my database, this corresponds to the transition between the Chalcolithic and the EB IA, when the number of carnelian beads found throughout the Levant increases dramatically. Throughout its use as a production center for carnelian bead, possibly over the course of two millennia, it is estimated that over 110,000 carnelian beads were made at the site, a scale of production far exceeding any other known contemporary production source (Haibt 2018: 93). The small number of complete beads (18) found at Tayma combined with the copious amounts of production waste suggests that the beads created there were made for export (Haibt 2018: 129). The lack of evidence for local use contrasts with the workshops known in Egypt which supplied the large numbers of carnelian beads found in the surrounding cemeteries (Petrie and Quibell 1896: Pl. LVIII; Petrie et al. 1913: Pl. XIV, 80).

The study of production waste dumps from Tayma suggests that the site was home to multiple carnelian bead workshops of different sizes that perhaps operated contemporaneously (Haibt 2018: 107, 109, 113). These workshops received bead roughouts knapped in separate, perhaps domestic, contexts and were involved in smaller, more fine-tuned flake removals, grinding, and, polishing (Haibt 2018: 121-122). Perforation meanwhile appears to have been the last step in carnelian bead production at Tayma and may have been carried out in a different, possibly domestic context (Haibt 2018: 115).

Examination of the flint microdrills found in different contexts at Tayma revealed slight differences in their use. Comparing two production areas, it was found that on average the drillers in one area used 3.62 drills per perforation while drillers in the other used 2.38 per perforation (Haibt 2018: 112). While this was attributed to differential discard patterns, related to preferences for resharpening (Haibt 2018: 113), I suggest that it is actually reflective of the two production contexts engaging in two different methods of perforation, mainly, pecking from one or two sides. Though efficiency studies for pecking beads have not been conducted, it stands to reason that the greater number of blows required to peck a bead from both side would wear down a microdrill more rapidly, requiring a greater number of perforators than pecking from one side wherein the perforation is completed with a single directed percussive blow.

A key issue related to whether or not the carnelian beads from Fifa came from Tayma relates to whether or not the beads at Tayma were perforated using pecking at all. While some scholars contend that the beads at Tayma were drilled rather than pecked (Haibt 2018: 95), other scholars disagree entirely (Ludvik 2018: 722). In this regard, it is very important to note that the drill holes of beads broken during perforation were described as hourglass shaped (Haibt 2019: 24), the typical drill hole shape that emerges from pecking. In addition, images of some broken beads from Tayma appear to show pecking scars within their perforations (Purschwitz 2017: 295) (fig. 6.7). As a result, I suggest that the carnelian beads made at Tayma were in fact pecked.

Figure 6.7 Bead blanks from Tayma broken during perforation using the pecking technique. Pecking scars are highlighted (Purschwitz 2017: 295).

Measurements taken from bisected beads that broke during perforation equally suggest a connection between Tayma and Fifa's beads. These had diameters between 8 and 10 millimeters and lengths between 2 and 3 millimeters. Fifa's carnelian beads by comparison had average diameters of 7.38 and lengths of 2.92. If these measurements are again broken down by beads pecked from one and both side, it turns out that beads pecked from one side have average diameters of 7.88 millimeters and lengths of 2.77 millimeters, which is very close to the size of beads reported from Tayma. While the beads pecked from both sides were somewhat divergent from the number reported from Tayma with an average length of 3 millimeters and an average diameter of 7.1 millimeters, this hardly rule out Tayma as a possible place of origin as the site had multiple workshops, and it is unclear whether the measurements offered for the broken beads from Tayma come from one discard area or many.

In conclusion, while there is no reason to doubt that some beads from Fifa may have come from workshops in Egypt, an origin at Tayma seems more likely for several reasons. Firstly, while some carnelian beads, possibly of Egyptian origin, are known from 5th millennium BCE contexts in the Levant, the relatively small number of these beads suggests that carnelian export from Egypt to the Levant, at least at that time, only took place at a limited scale. This contrasts with Tayma whose establishment as a major center of bead production in Arabia in the early 4th millennium BCE seems to match the sudden florescence of carnelian beads in the Levantine EB I. Secondly, whereas beads produced in Egypt in the 4th millennium were used in large numbers locally, mainly in graves (Wengrow 2006: 80), the vast majority, if not the entirety of beads produced at Tayma are thought to have been made for export (Haibt 2018: 129). Lastly, while difficult to directly compare the beads from Egypt to those from Tayma due to a lack of archeometric studies and measurements, in terms of size, appearance, and technology, Fifa's beads appear to match up quite well to those produced at Tayma.

6.3.4 From Tayma to Fifa: Exploring Exchange

Assuming that Fifa's beads did indeed come from Tayma, questions remain as to how beads created at Tayma made their way to the Dead Sea Plain and elsewhere. Several factors are important to consider. Firstly, it is unclear if 4th millennium Tayma was occupied permanently. While some scholars believe the site was home to a fully sedentary community (Haibt 2018: 120), others believe the site was occupied by mobile communities taking up seasonal residence for the purposes of viticulture and carnelian bead production (Hausleiter and Eichmann 2019: 42; Purschwitz 2017: 302). In the model of carnelian bead exchange imagined for Tayma as a sedentary community, mobile, and possibly pastoral communities, would, on occasion, visit the oasis at which time they would exchange animal products and other commodities for carnelian beads. Alternatively, in the model where Tayma's community was mobile and seasonal, it may be imagined that the groups who produced beads were also responsible for their dissemination. This model would make carnelian beads very similar to fan scrapers, which are also thought to have been produced on a seasonal basis by mobile groups, at isolated production sites located distantly from where their products would end up, and in large numbers (Abu-Azizeh 2013: 167; Purschwitz 2017: 302).

While the vast majority of remains from 4th millennium Tayma are either waste from carnelian bead production or waste from microdrill production and use, some evidence does exist at the site for connections with the Levant and possibly even the Dead Sea Region. Palynological evidence suggests that grapes were grown at Tayma beginning in the 5th millennium (Dinies et al. 2016: 70). In all likelihood, this technology was disseminated from the Southern Levant where viticulture emerged in the 5th millennium BCE (Purschwitz 2017: 302; Stager 1985). Fan scrapers are also known from Tayma, tying the site into the broad exchange network responsible for their dissemination from the desert to sedentary settlements across the southern Levant and beyond (Purschwitz 2017: 292). It also seems likely that some of the few metal fragments and tools known from the site may have originated in the Levant due to a lack of evidence of local metallurgy or native copper exploitation in Arabia at large until the start of the 3rd millennium BCE (Haibt 2018: 120; Hausleiter and Eichmann 2019: 16; Magee 2014: 71). Lastly, bitumen was found in some of the 4th millennium BCE contexts associated with bead production (Haibt 2018: 108). Sources of bitumen around the Dead Sea were exploited and exported as distantly as Lower Egypt in the 4th millennium (Connan et al. 1992; Milevski 2011: 165).

Without a better idea of where the peoples who buried their kin on the Dead Sea Plain came from, it is somewhat difficult to reconstruct what they might have exchanged for carnelian beads, and where they acquired them. Some suggestions are possible based on the results of the database of Chalcolithic and EB I beads in the Levant and Sinai. While several thousand carnelian beads have been found in southern Levantine EB IA funerary contexts, carnelian beads were only identified at three southern Levantine EB IA habitation sites. These are Hujayrat al-Ghuzlan on the gulf of Aqaba, and Wadi Fidan 4 and 100 in the Arabah Valley. This pattern suggests that Fifa's carnelian beads may have originally been exchanged at Hujayrat al-Ghuzlan, a site scholars argue served as an entrepot for the exchange of objects and raw materials between Egypt, Sinai, and the Levant (Notroff et al. 2014). From there, they might have travelled up the Wadi Arabah past or through the Wadi Fidan sites before making their way to the Dead Sea Plain.

Those burying their kin at the cemeteries of the Dead Sea Plain likely would have had access to resources such as salt, bitumen, and possibly copper that could be exchanged for beads. In addition, they may have had access to several organic and animal products that could also be exchanged. As argued earlier, it is possible that some members of the community who buried their dead on the Dead Sea Plain were themselves travelling down the Wadi Arabah and possibly down to Hujayrat al-Ghuzlan in order to conduct exchanges for their grave goods.[11] That some but not all kinship groups who buried at Fifa had access to large numbers of carnelian beads could suggest that only some kinship groups participated in this exchange. Groups whose tombs had fewer carnelian beads meanwhile perhaps acquired their beads from those groups who participated in the exchange and possessed more. How exactly beads made their way from Tayma to the gulf of Aqaba however is less clear and could have involved either exchange via intermediaries (Harrison 1993), or via groups from Tayma whose mobility patterns could have extended from the site up through Northwest Arabia towards the gulf of Aqaba.[12] Regardless, the presence of beads pecked variably from one or both ends demonstrates that both production methods were used contemporaneously with the resulting beads also being exported at the same time.

6.3.5 From Acquisition to Deposition:

The appearance of polish around the perimeter and drill holes of Fifa's carnelian bead assemblage attests to the fact that these beads were worn for some period of time. Unfortunately, the rate at which polish develops on carnelian beads is not currently known and as a result, it is not fully clear how much time would have passed between the bead's acquisition and final deposition. Equally unclear is whether Fifa's carnelian beads were worn before they arrived at the cemetery, or if their first use was during the period of encampment at Fifa prior to their inclusion in burials.

[11] Fifa is approximately 160 km from the gulf of Aqaba.
[12] Tayma is approximately 400 km from the gulf of Aqaba.

As revealed by the database, carnelian beads were found at only four non-funerary EB IA sites those being: Jawa, Hujaryat al-Ghuzlan, Wadi Fidan 4 and Wadi Fidan 100. In all cases, the number of recovered carnelian beads from these sites was extremely low (n=5+?) and no complete jewelry articles that included carnelian have yet been found in non-funerary contexts. Several factors may, of course, be responsible for this including lack of recovery during excavation due to differential use of sieving (Baysal 2019: 18) or that the highly mobile nature of beads meant that any individuals abandoning a site would likely have been able simply take their beads with them leaving behind only lost or discarded objects for archaeologists to recover. Nonetheless, the sheer disparity between the many thousands of beads found in funerary contexts and the few found in other contexts may indeed suggest that carnelian beads possessed a special significance connected with funerary ritual (Milevski 2011: 173). Such ritual objects created specifically for certain ceremonies or events have been observed in various ethnographic studies (e.g., Davenport 1986).

In this case, it may be imagined that those who brought their dead kin to Fifa for burial may have adorned themselves with carnelian beads once they arrived at the site or during their procession to the site (Chesson 2001: 105). This would resemble the use of pottery that eventually made its way into the tombs of the Dead Sea Plain, which was made locally, used during the period of encampment, and was eventually placed in tombs (Rast and Schaub 2003: 97-100). Just as the individuals who buried their kin on the Dead Sea Plain refrained from making or using this type of pottery at the other sites they occupied, either permanently or temporarily, so too, they may have refrained from using the carnelian beads until they arrived at their kinship group's traditional burial site. These objects would then have formed part of an extended ritual process that took place prior to burial during which they would be worn by the kin of the deceased prior to their transference to the deceased themselves. The specific and intentional use of material culture that was eventually placed in graves would in that way have served to create deeper connections between the community of the living and the community of the deceased with the two effectively mirroring one another during the liminal period of encampment and burial.

Once the initial set of rites conducted during the encampment was concluded, the carnelian beads were placed in the family tomb along with the secondary remains of the deceased and the other grave goods. While the 61 beads placed in tomb 7 may have formed a strung-up necklace or bracelet that was placed either on or between the bones of the deceased, the single bead found in tomb 8 and the two beads found in tomb 22 were likely placed on or within the tomb's bone pile individually. In all instances, as opposed to at Bâb adh-Dhrâʿ where the beads of Cemetery A were placed in jars at a distance from the bones, at Fifa, carnelian beads were quite literally combined together with the skeletal remains. Such combinations of ornaments and individuals have been observed in ethnographic studies (Miller 2009). Based on the available information, it was not possible in any instance to associate carnelian beads with particular bodies in the tomb and there is no clear association between the presence of carnelian beads with either male, female, or subadult skeletons such as infants or neonates.

6.3.6 The Significance of Carnelian Beads at Fifa and Beyond

Previous research on the cemeteries of the Dead Sea Plain have elucidated that a set of community wide rules or customs governed what objects were permissible to place within tombs (Chesson 2001). What then was the significance of carnelian beads and what function might they have performed?

Whereas a number of carnelian beads have been found in Chalcolithic contexts, these pale in comparison to the many thousands of carnelian beads that appear in EB IA burials. Although this stark increase may be correlated with the establishment of Tayma as a major center of bead production in the 4th millennium, it is unclear whether the widespread Levantine predilection for carnelian beads arose in response to an increased supply, or if conversely, Tayma's production was a response to demand for carnelian beads from the Levant and elsewhere. The fact that Tayma's beads were created entirely for the purpose of export is highly suggestive that carnelian beads took on an increased significance to a greater number of individuals in the Levant towards the end of the Chalcolithic and at the start of the EB IA and that this increased significance drove demand and production at Tayma.

In the Chalcolithic period while carnelian beads were uncommon, many beads were made from locally available materials such as chalk, limestone, bone, apatite, and mother of pearl. These are all but absent in the EB IA (contra. Albaz 2018; Wilkinson 1989). While several of these materials were available locally to the Dead Sea Plain and were, in fact, used to make beads found in later periods at the habitation sites of Bâb adh-Dhrâʿ and Numayra (Broeder and Skinner 2003; 2020), they were not utilized to make ornaments found in the region's EB IA cemeteries. This absence is even more striking when considering the long history of making ornaments from local materials in the region (Benz et al. 2020; Wright et al. 2008) and by the fact that limestone was used to make maceheads found in the cemeteries of the Dead Sea Plain (Beebe 1989) but was apparently not an acceptable material for the beads buried with the dead.

While carnelian beads are one of several material culture categories that show some continuity in use from the Chalcolithic (Braun 2011: 164-172), their florescence at the same time as the decline of many materials used to make Chalcolithic ornaments suggests a deliberate and widespread break from Chalcolithic ornamental traditions in favor of a new ornamental tradition, one that emphasized carnelian. Indeed, in many ways, it might be said that carnelian replaced these materials, signaling that the individuals and communities who utilized them had, at least partly, intentionally broken with the Chalcolithic order of the past in favor of the new worldview of the EBA (Yekutieli 2022). The use of carnelian, a material already used, albeit in limited quantities for Chalcolithic ornaments, is unsurprising as newly established traditions often base themselves in already familiar materials or customs (Hobsbawm 1983: 6).

It may be significant that many of the materials that went out of use were colored white, in deep contrast to carnelian's rich red and orange color, which in the past has been argued to cross-culturally represent blood and the heart (Bar-Yosef Mayer 2019: 85). It might then be concluded that wherever they came from, the individuals who buried their deceased kin at Fifa were part of the wider southern Levantine social milieu who underwent social changes between the Chalcolithic and EB IA, eventually adopting some of the new customs that emerged with the onset of the EBA. Wearing carnelian beads then might have signaled the community's intentional detachment from some aspect of the Chalcolithic order, making the wearing of carnelian beads a deeply ideological, if not political act. This might further be signaled by the fact that whereas large numbers of ornaments are known from Chalcolithic settlements and sanctuaries, in the EB IA, significant numbers of beads have only been found in funerary contexts, suggesting that these were the primary locus for the newly emergent ornamental tradition. Nonetheless, as discussed, the presence of anthropomorphic figurines along with several other types of material culture known from Chalcolithic burials might suggest that even if the population at Fifa rejected part of the Chalcolithic ideological scaffolding or socio-political order that revolved around temples and sanctuaries, it may have retained some of its religious scaffolding.

Despite there being no contemporary textual record to elucidate the possible meanings of carnelian, later texts from 2nd millennium Egypt highlight that beads were viewed as possessing inherent magical properties defined by both their color and material (Ludvik 2018: 291). Apparently, even single beads were thought to be magically potent with one author arguing that carnelian beads may have been understood as apotropaic amulets with significance in both life and the afterlife (Ludvik 2018: 292-293). In Pharaonic Egypt, carnelian was also connected to the restoration of life, energy, dynamism, and power with the Book of the Dead stipulating its use for the heart amulet (Andrews 1994: 72; Bar-Yosef Mayer 2019: 85).

Though there can be no certainty that these later significances can be grafted onto Fifa's carnelian beads, several aspects of the assemblage are highly suggestive that they may have been understood in similar terms to hardstone beads in 2nd millennium Egypt. Firstly, the households who buried their dead at Fifa were explicitly concerned that the red colored beads that found their way into tombs were specifically made of carnelian. No skeuomorphs, such as limestone beads colored red with ochre or red colored limestone (e.g., Benz et al. 2020: 98), are known from the cemetery, or for that matter the rest of the

EB IA southern Levant, suggesting that carnelian, and only carnelian beads would do for the purpose they were understood as fulfilling. Secondly, while it may have indeed been preferential to possess a greater number of carnelian beads, whatever function they were thought to have could be fulfilled by even one or two beads such as those found in tombs 8 and tomb 20. Lastly, the specific mixing of carnelian beads with the body of the deceased at Fifa would effectively join the two together, with the beads becoming or possibly representing a part of the body. Since such a practice is known from later periods in Egypt, where carnelian was used to make the heart amulet, it is not inconceivable that it could have taken on a similar role within the Levant.

Whatever their meaning however, it is important to note that based on the fact that not every member of the community had carnelian beads in their tombs, it is clear that whatever role they fulfilled, magical or otherwise, it formed an addendum rather than a necessity for ensuring the deceased's proper burial and afterlife. This differentiates carnelian beads from something like pottery, which is found in every tomb, was made locally, and seems to have been considered absolutely vital to the proper treatment of the deceased. Nonetheless, it seems that it may have been preferential to include carnelian beads in one's tomb, perhaps in order to secure their apotropaic or revitalizing powers for the benefit of the deceased community members.

6.4 Conclusion:

In this chapter I combined several lines of evidence to argue for variable life histories for the carnelian and glazed steatite beads excavated at Fifa. Beyond investigating manufacture, exchange, use, and deposition, I also explored the possible cultural and historical significances and meanings that these objects may have held both in broader context, but also for the people who used them at the Fifa cemetery.

Beginning with glazed steatite beads, I argued that these were created from solid blocks of talc that were reduced through several stages of grinding before their perforation using a copper implement. They were then glazed using cementation. These beads were likely created in Upper Egypt with the copper implements and colorants used for their creation imported from the Levant. Whereas differences were observed between beads from different tombs at Fifa, these are likely functions of chronological distinction, rather than evidence for several workshops operating at the same time. In addition, I explored how these beads may have been exchanged prior to their arrival at Fifa and argued that the groups who buried their Dead on the Dead Sea Plain were likely involved in the movement of a wide range of commodities. After acquisition, these groups altered their beads through the addition of several chemicals, though the exact purpose of this remains unclear. Exploring the significance of glazed steatite beads, I focused on the unique histories of these objects as well as the mutually engendered dependencies that were involved in their creation, with Levantine individuals providing copper ore and tools, and individuals living in Upper Egypt providing beads. Lastly, turning to the object's actual use, I argued that glazed steatite beads possessed a specific association with subadults and were used as part of a ritual to ensure the successful reincarnation of deceased subadults.

Carnelian beads meanwhile were created through a gradual process of knapping and grinding followed by perforation through pecking. This was variably carried out from one and two sides. The presence of beads pecked from one or both sides was used to argue that multiple contemporaneously operating production loci that were responsible for producing Fifa's beads. These production loci were likely both located at the site of Tayma in Northwest Arabia that produced a huge number of carnelian beads for export, many of which were exported to the southern Levant. Turning to the meaning of carnelian beads, I argued that the florescence of these in the early 4th millennium could signal the emergence of a new ornamental tradition that accompanied the beginning of the EBA. Lastly, I argued that carnelian beads may have served an amuletic function connected to the restoration of life, energy, and dynamism in the deceased.

Chapter 7 Conclusion:

7.1 Introduction

Having built life histories for the carnelian and glazed steatite beads found in the Fifa cemetery, in this chapter, I present an extended narrative version of those life histories. As the objects' symbolic and physical lives were inseparable in antiquity, both aspects are presented together. I then discuss the broader significance of the use of these ornaments at Fifa on a community, regional, and inter-regional scale. I lastly turn towards some unanswered questions.

7.2 The Life of Fifa's Glazed Steatite Beads

The glazed steatite beads found at Fifa were, in all instances, produced from blocks of solid steatite. These blocks were initially extracted in the Upper Egyptian desert before being moved to a Nile Valley settlement where their production likely took place. This production process was likely in some ways ritualized and it is possible that the creation of steatite beads was accompanied by incantations or specific rituals that were conducted during different moments in the production process. These would have complemented the other precise steps used in the creation of glazed steatite beads, which ensured that they became properly imbued with symbolic significance and magical potency.

While differences existed in the final appearance and quality of beads found in Fifa's different tombs, indicating that they were made by different producers, perhaps at different times, by in large, these were created using the same production process. After a piece of steatite was extracted from a larger block, it was rounded using a grinding stone before individual bead blanks were sliced off. The individual blanks were then further ground on their ends in order to reduce their thickness. Thereafter, the beads were perforated using a copper awl or needle, an object more than likely imported from the southern Levant. After being perforated, groups of beads were strung and rubbed reciprocally against a flat grinding slab until they reached the proper size.

After achieving the proper small size needed, the beads were buried in a glazing powder and glazed using the cementation method. During their glazing, the beads were heated to roughly 1000 °C at which time their hardness increased dramatically. The glazing powder that beads were buried in, in all cases, used copper ore as a colorant. This ore was possibly imported from the Levant, making the act of creating glazed steatite beads one that engendered mutual dependencies. While individuals in the Levant provided the copper ore and borers used to make beads, individuals living in the Nile Valley were responsible for the beads' production. Thus, the act of creating glazed steatite beads was one that reinforced both economic and social connections.

Additionally, the specific use of copper ores for coloration connected glazed steatite beads to a variety of symbolic traits and magical properties. These traits included transformation, rebirth, and both magical and pharmacological protection. The concentration of these traits into glazed steatite beads made them sought after, magically potent, items.

After their completion, the beads were eventually exchanged with individuals living in the Levant. The kinship groups who buried their dead at Fifa were perhaps active participants in some part of this exchange and may have participated in the broader movement of copper ore and objects, bitumen, salt, and a variety of animal products. While possible that Fifa's glazed steatite beads were exchanged in Sinai, the confluence of large numbers of glazed steatite beads on the gulf of Aqaba, combined with Hujayrat al-Ghuzlan's apparent role as an entrepot of exchange and its being a known source of the type of lambis shell bracelets found at Fifa, makes it likely that some of Fifa's glazed steatite beads were exchanged there. Whether or not beads travelled to the Gulf of Aqaba by land, via Sinai, or by sea however is currently uncertain. From there however, the beads travelled up the Wadi Arabah and eventually to Fifa.

Once acquired, glazed steatite beads were not worn in everyday life. Instead, they were used for a brief, albeit unknown, extent of time prior to their deposition in tombs. During that time, they may have been sewn onto either an article of clothing or some other object, though this possibility will require further experimental investigation. In addition, after being acquired, the ornaments were exposed to lead, phosphorus, and calcium. While some of the kinship groups who buried their family at Fifa applied these elements to fibers which then came in contact with their beads, others appear to have painted their glazed steatite beads directly. By using glazed steatite beads, even if just for a short time, kinship groups were able to signal their access to and knowledge of distant locales. In addition, the particular use of the beads by families prior to their deposition created a connective link between the community of the living and the community of the deceased.

Prior to their deposition during the mortuary ceremony, the glazed steatite beads were detached from whatever article or piece of jewelry they had been attached to. From there, they were placed in the tomb, either by being interspersed with the bones of the deceased, or in the case of tomb 12, by being placed as a discreet necklace on the neck of an infant burial. It is possible that for the community who buried their kin at Fifa, Glazed Steatite beads were specifically associated with subadults. Due to their magical potency as protective amulets and potential association with transformation and rebirth, for the families who had access to them, glazed steatite beads may have been understood to assist in the successful reincarnation of their deceased children while promising greater longevity in their next lives. As a result, these objects were likely incredibly valuable and would be worthwhile to include in a tomb, even if a kinship group possessed only a small number of them.

7.3 The Life of Fifa's Carnelian Beads

Fifa's carnelian beads were produced through a process of gradual knapping, grinding, polishing, and perforation. Whereas some beads were thoroughly polished, others received a much more limited treatment. All of Fifa's beads were perforated using the pecking method, with 2/3 of the assemblage pecked from both sides and the remaining beads pecked from one side. These different methods of perforation were likely performed in separate production contexts by individuals who utilized one of the two techniques. Since beads of both types were found in one tomb, these different producers seem to have been operating coevally. Evidence for the coeval operation of several workshops is known from Tayma, in Northwest Arabia where I argued Fifa's beads were made.

The establishment of Tayma as a major source of carnelian bead production coincided with the onset of the EB IA, suggesting that the scale of production at Tayma may have been a result of increased demand for carnelian beads from the Levant. This demand may have been related to the ideological changes between the Chalcolithic and EB IA, when various materials previously commonly used for beads went out of use in favor of carnelian. As a result, wearing carnelian may have been a deeply, ideologically, motivated act signaling that the kinship groups who buried their families at Fifa belonged to the broader southern Levantine social milieu. A desire to signal this may, at least partially, have motivated their acquisition.

After their production, the beads from Tayma were possibly transported by people living at the site on a seasonal basis to a center of exchange such as Hujayrat al-Ghuzlan. There, carnelian beads may have been acquired by the same kinship groups who also visited the site to acquire glazed steatite beads and lambis shell bracelets.

Fifa's carnelian beads were likely used for a limited time prior to their deposition in tombs. This time may have included the period of encampment at the site and could have also included the time during which kinship groups were peregrinating to Fifa. Like the limited use of glazed steatite beads, this would have linked the community of the living with the community of the dead, bringing the two closer together. Unlike glazed steatite beads however, it was not possible to connect carnelian beads with certain types of persons buried at Fifa. At Fifa, beyond their ideological significance, carnelian beads also possibly served as amulets, which were thought to be apotropaic and could have been connected to the restoration of life, energy, and dynamism in the deceased.

7.4 The Significance of Ornament Use at Fifa and Beyond

As discussed in section 2.8.1, the groups who buried their dead in the different cemeteries on the Dead Sea Plain seem to have followed different ornamental traditions. At Bâb adh-Dhrâʿ, these operated on two levels. At the community level, the kinship groups who buried in cemetery A and C used beads of different size and material. In addition, the groups who used Cemetery A and C placed their beads in tombs differently with those who buried their kin in Cemetery A placing their beads in jars, and those burying in Cemetery C placing them with the bones of the deceased. As a result, it is possible that beads played a different role in the mortuary ceremonies and beliefs of those groups. While the way that beads were placed was largely codified at the group level, at the level of the individual kinship group, the repetitive patterning of bead placement over time suggests that different kinship groups held long-lived, unique, and pervasive traditions of their own. These traditions, however, operated within the broader rules of the cemetery.

While the number of tombs excavated at Fifa is far fewer than at Bâb adh-Dhrâʿ, the function of ornaments there appears to have been similar. At the level of the community, the exclusive use of carnelian and glazed steatite ornaments at Fifa sets the cemeteries' ornamental tradition apart from those of the kinship groups who buried at Bâb adh-Dhrâʿ, Naq', and Jericho where different combinations of bead materials were used. In addition, while there is presently little comparative data, the specific association at Fifa of glazed steatite beads with infants and subadults could also represent a community wide tradition that differentiated those who buried their dead there.

At the level of the kinship group, it is perhaps notable that tomb 12's beads were placed as a necklace in contrast to the rest of Fifa's beads, which were interspersed with the bones of the deceased. This could indicate that beads were placed at Fifa according to particular family traditions. The best evidence for different families practicing separate ornamental traditions, however, comes from the lead, calcium, and phosphorus concentrations that were found on the ends and drill holes of beads from tomb 7 and 12, but only on the ends of beads from tomb 20. I argued that this could indicate that the kinship groups from tombs 7 and 12 attached their beads to some kind of fiber that contained these elements while those who buried their kin in tomb 20 directly applied the elements to their beads. The very inclusion or exclusion of beads from a kinship group's tomb may even have been a matter of family tradition. As a result, beads may be used as evidence for the pervasiveness of community traditions, but also for the degree of flexibility that existed within communities that allowed families a certain degree of autonomy in their ritual practice.

Despite these differences between cemeteries and between the kinship groups who buried their deceased at them, it is important to note the broad similarities of ornaments found between the different cemeteries of the Dead Sea Plain across the rest of the southern Levant. As revealed by the results of the database created for this thesis, in the EB IA, glazed steatite beads were used at a restricted number of sites with the vast majority being placed at the cemeteries of the Dead Sea Plain and Jericho. For those who used these beads in the EB IA, they were exclusively utilized as funerary ornaments. This stands in contrast to the Chalcolithic where glazed steatite beads had a wider geographic range and are found in both funerary and non-funerary contexts. The shared emphasis on these beads by the communities who buried on the Dead Sea Plain and at Jericho speaks to their having a great deal in common with one another, at least as far as their archaeologically visible mortuary and ornamental traditions went.

The inclusion of these beads, as well as, the presence of grave goods with Chalcolithic antecedents such as basalt bowls, lambis shell bracelets, and figurines could indicate that the communities who buried on the Dead Sea Plain and at Jericho maintained a greater level of continuity with Chalcolithic practices and beliefs than most of their peers living in the southern Levant during the EB IA. This conclusion does not go against the emerging consensus that the end of the Chalcolithic period was accompanied by the downfall of the dominant religio-political order (Joffe 2022; Yekutieli 2022), but rather suggests that different communities transitioned in different ways. Thus, while those who buried at the Dead Sea Plain rejected the Chalcolithic's dominant socio-political order, they may have maintained some of its religious scaffolding.

As a result, it is possible that grave goods such as glazed steatite beads and basalt bowls may have maintained some of their symbolic meanings between the periods or that the meanings they took on in the EB IA were derived from Chalcolithic antecedents. Despite this greater level of continuity in both material culture and possibly religious beliefs, the presence of carnelian beads at the cemeteries of the Dead Sea Plain demonstrates that the individuals who used those cemeteries were very much a part of the broader social milieu of the EB IA who assigned these objects a newfound and widespread significance with the onset of the period. This is also attested by the fact that those who buried their dead on the Dead Sea Plain elected to not use a variety of local materials for their ornaments, several of which are regularly found at Chalcolithic sites and sanctuaries, and which are common in the region in both earlier and later periods.

Amongst the largest unanswered questions for the EB IA cemeteries of the Dead Sea Plain concerns where people came from in order to bury their dead there. Earlier research posited the Kerak plateau as their most likely place of inhabitation (Chesson 2001). More recent research (Chesson 2019) however, has concluded that while it is not currently possible to determine where they lived, their funerary practices involved some degree of mobility as they travelled an unknown distance to their traditional cemetery. Fifa's ornaments speak to the mobility inherent in the lives of those who buried their kin there. As all of the ornaments found at Fifa can be defined as exotic, the possession of these materials would have provided an opportunity to display that those who had access to them and could place them in their family tombs had knowledge of and access to distant locales (Helms 1993).

Beyond this though, Fifa's beads may also provide some hints as to where at least some members of the community spent time and travelled through. As potentially indicated by the two EB IA tombs uncovered in the Arabah Valley, as well as by the distributions of glazed steatite and carnelian beads in the Gulf of Aqaba, Arabah Valley, and Cemeteries of the Dead Sea Plain, it is likely that at least some of the kinship groups who buried their dead at Fifa were involved in the exchange of a variety of raw materials and objects. These may have included bitumen, salt, copper ore, copper objects, and animal products. These were possibly exchanged at the Gulf of Aqaba for a variety of grave goods including carnelian beads, glazed steatite beads, and lambis shell bracelets. Thus, it seems likely that at least some of the kinship groups who buried their dead at Fifa actively moved through the Arabah Valley to the Gulf of Aqaba. It remains unclear where other kinship groups spent their time, but it may still be stated that death and burial were times of aggregation for a community that was perhaps otherwise dispersed.

In sum, beyond their individual life histories, Fifa's beads may be used to better understand community and family mortuary ritual at the site and on the Dead Sea Plain. In addition, more broadly, they may also be used to study the mobile lifeways of those who buried their dead on the Dead Sea Plain as well as the social and economic connections that existed between their community and the broader southern Levantine milieu.

7.5 Unanswered Questions and Future Research

Despite the great deal of new information this thesis has revealed, a variety of questions remain unresolved. Firstly, it remains unclear what mechanism determined whether a family group buried their deceased kin with beads. While I have suggested that a large part of a group's ability to bury their dead with beads was related to their own mobility and role in exchange, this answer is not fully adequate for several reasons. Firstly, it does not answer why some groups had greater or fewer numbers of beads. Secondly, here I have suggested that both carnelian and glazed steatite beads could be acquired by the same kinship groups at the Gulf of Aqaba. Despite this, the presence of over 100 glazed steatite beads in tomb 12 accompanied by no carnelian beads suggests that even if some groups travelled to a location where carnelian beads were exchanged, they, for whatever reason, either could not, or chose not to acquire them there.

A further complication comes from the fact that the sole tomb excavated at Fifa that had a shell bangle, tomb 11, contained no beads, while groups who had access to hundreds of beads, such as those who buried their dead in tomb 7, had no shell bangles in their tombs. This could potentially suggest that contrary to my earlier suggestions, kinship groups at large were not themselves involved in the exchange of objects, but rather that select members of the group who buried at Fifa acquired funerary objects for the benefit of the entire community. These individuals may have been responsible for acquiring large numbers of grave goods, bringing those goods to Fifa, 'setting up shop' at the site during the period of encampment, and disseminating their objects to kinship groups. Such an interpretation may be feasible as it seems that during the period of encampment, kinship groups acquired the tomb pottery that they placed in their tombs. If this was the case, it remains unclear who within the broader community who buried their dead on the Dead Sea Plain would have been responsible for this exchange and what they received in exchange for their important role in acquiring grave goods for the rest of the community. Unfortunately, this information may potentially be unrecoverable, permanently affecting our understanding of the life histories of the grave goods included in EB IA Dead Sea Plains tombs.

Another unanswered question relates to the concentrations of lead, calcium, and phosphorus that were found on beads from tombs 7, 12, and 20. While these elements were readily visible using SEM microscopy, they were not visible using optical microscopy and as a result, their nature and source remain unclear. While the fact that these elements were applied directly to beads from tomb 20 suggests that the purpose of these elements was aesthetic, no discernable differences were observed on beads from that tomb between areas with and without the elements. While I suggested that the presence of these elements on the inside of drill holes of beads from tombs 7 and 12 could indicate their coming in contact with a fiber treated with these elements, it remains unclear why a fiber would be treated with those elements or for that matter what type of article the beads may have been attached to prior to being placed in tombs. This matter is of particular interest as no prior assemblages of glazed steatite beads, regardless of geographic origin, have exhibited this trait. It is hoped that future research on textiles or other glazed steatite bead assemblages may shed light on this problem.

One area barely broached in this thesis relates to the significance of the particular combination of glazed steatite and carnelian beads. While these types of beads have been found in association with one another in the EB IA at the cemeteries of the Dead Sea Plain and Jericho, the specific association of these two types of beads may already be found in Chalcolithic contexts, and particularly at Nahal Ze'elim Cave 32 (the Cave of the Skulls). There, researchers found several wrapped linen bundles containing thousands of beads made of glazed steatite, carnelian, and a small number of beads made from other materials (Davidovich 2022) (fig. 7.1). While other Chalcolithic bead assemblages such as that from Peqi'in (Bar-Yosef Mayer and Porat 2013) also contained both materials, only at Nahal Ze'elim Cave 32 can both materials of bead be directly associated with one another to the almost complete broader exclusion of other materials. As a result, it must be asked whether the ornamental tradition used by those who deposited goods at Nahal Ze'elim cave 32 formed a direct antecedent to that used on the Dead Sea Plain in the EB IA with the groups who used the cave having some relation to those who later buried on the Dead Sea's opposite shore. In addition, while I have mainly focused on the unique meanings of carnelian and glazed steatite beads, it is possible that the two in combination took on some added or different significance or role.

Lastly, after observing the range of differences between beads from tombs 7, 12, and 20, I concluded that these were made by different producers. Using the fact that little overlap existed between the types of beads found in each tomb (in contrast to tomb 7's carnelian beads), I argued that these different types of beads were produced at different times. Nonetheless, I maintain my suggestion that the totality of Fifa's glazed steatite bead assemblage were made in Upper Egypt. It would however complicate my hypothesis if different kinship groups exclusively acquired their glazed steatite beads from different producers who made their beads according to specific crafting traditions and who occupied different sites. On the basis of the large number of glazed steatite beads found at well-dated predynastic cemeteries, it would be possible to directly investigate this question. If one undertook a systematic examination of glazed steatite beads from different predynastic cemeteries with a focus on variability over time, it would indeed be possible to confirm whether or not the observed differences are a matter of time or of different origin.

Figure 7.1 An unwrapped bead bundle from Nahal Ze'elim Cave 32 containing carnelian and steatite beads, as well as a small number of beads made from unidentified materials. (Photograph by Author).

7.6 Returning to Small Things Forgotten

In concluding, it is my hope that this research has demonstrated that beads are indeed very much like Deetz' (1977) 'small things forgotten' and are quite capable of saying a great deal about the past. Using beads as a proxy in combination with the life-history approach, I have been able to discuss issues of technology, aesthetics, mobility, religion, ideology, identity, and death and burial in both its physical and emotional aspects. Though all things are 'made' through many socio-cultural lenses, the intersections that exist between beads and these topics make them a particularly compelling object type to use as a lens for vivifying the past, the ultimate goal of this thesis. A growing awareness amongst scholars of beads' usefulness as a lens is borne out by the florescence of reports on beads in recent site reports and an ever-increasing number of studies devoted primarily to their manufacture and use. This research is allowing beads to finally gain a greater deal of recognition alongside more commonly studied artifact classes. Thus, it is hoped, that in the future, while beads will undoubtedly remain small things, perhaps they will no longer be forgotten.

Bibliography:

Abdel-Motelib, Ali, Michael Bode, Rita Hartmann, Ulrich Hartung, Andreas Hauptmann, and Kristina Pfeiffer
2012 Archeometallurgical expeditions to the Sinai Peninsula and the Eastern Desert of Egypt (2006, 2008). *Metalla* 19(1–2):3–59.

Abu-Azizeh, Wael
2013 The South-Eastern Jordan’s Chalcolithic-Early Bronze Age Pastoral Nomadic Complex: Patterns of Mobility and Interaction. *Paléorient* 39(1):2013.

Adams, Jenny, Selina Delgado-Raack, Laure Dubreuil, and Caroline Hamon
2009 Functional Analysis of Macro-Lithic Artefacts: A focus on Working Surfaces. In *Non-Flint Raw Material Use in Prehistory Old Prejudices and New Directions*, pp. 27. BAR International Series 1939.

Adams, Russell, and Hermann Genz
1995 Excavations at Wadi Fidan 4: A Chalcolithic Village Complex in the Copper Ore District of Feinan, Southern Jordan. *Palestine Exploration Quarterly* 127(1):8–20.

Adovasio, J. M., R. L. Andrews, J. S. Illingworth, C. A Pappas, and E. A. Oliver
2003 Basketry Impressions and Weaving Accoutrements from the Bab edh-Dhra' Town Site. In *Bâb edh-Dhrâ’: Excavations at the Town Site (1975–1981)*, pp. 599–621. Eisenbrauns, Winona Lake, Indiana.

Aharoni, Yohanan
1961 Expedition B. *Israel Exploration Journal* 11:11–24.

Akkermans, Peter M. M. G., and Glenn M. Schwartz
2003 *The Archaeology of Syria: From Complex Hunter-Gatherers to Early Urban Societies (c. 16,000-300 BC)*. Cambridge world archaeology. Cambridge University Press, Cambridge.

Alarashi, Hala
2016 Butterfly Beads in the Neolithic Near East: Evolution, Technology and Socio-cultural Implications. *Cambridge Archaeological Journal* 26(3):493–512.

Albaz, Shira
2018 Simple Choices or Hidden Meaning: Understanding Patterns in the Raw Materials of Bead Production throughout the Bronze Age. In *Tell it in Gath: studies in the history and archaeology of Israel: essays in honor of Aren M. Maeir on the occasion of his sixtieth birthday*, edited by Itzhaq Shai, Jeffrey R. Chadwick, Louise Hitchcock, Amit Dagan, Chris McKinny, and Joe Uziel, pp. 901–910. Ägypten und Altes Testament Band 90. Zaphon, Münster.

Albaz, Shira, and Kristina S. Reed
2021 Let's Trade: Carnelian Beads in the Early and Intermediate Bronze Age Southern Levant. In *To Explore the Land of Canaan*, edited by Aren M. Maeir and George A. Pierce, pp. 53–66. De Gruyter.

Alon, David, and Thomas E. Levy
1989 The Archaeology of Cult and the Chalcolithic Sanctuary at Gilat. *Journal of Mediterranean Archaeology* 2(2):163–221.

Alon, David, and Yuval Yekutieli
1995 The Tel Halif Terrace "Silo Site" and its Implications for the Early Bronze Age I. *'Atiqot* 27:149–189.

Amiran, Ruth
1978 *Early Arad I: The Chalcolithic Settlement and Early Bronze Age City, First-Fifth Seasons of Excavations, 1962-1966*. Israel Exploration Society, Jerusalem.

Amiran, Ruth, Michael Saban, Patricia Smith, Liora Horwitz, and Dov Levitte
1986 The excavation of two tomb-caves: one at ancient Arad and one in the Beth Shean Valley. *The Israel Museum Journal* 5:13–18.

Amzallag, Nissim
2019 The Religious Dimension of Copper Metallurgy in the Southern Levant. In *Isaac went out to the field': Studies in Archaeology and Ancient Cultures in Honor of Isaac Gilead*, edited by Haim Goldfus, Mayer I. Gruber, Shamir Yona, and Peter Fabian. Archaeopress, Oxford.

2021 Cultural Metallurgy—A Key Factor in the Transition from the Chalcolithic to Bronze Age in the Southern Levant. *Cambridge Archaeological Journal*

Andersson, Ann
2015 Thoughts on material expressions of cultic practice. Standing stone monuments of the Early Bronze Age in the southern Levant. In *Defining the Sacred: Approaches to the Archaeology of Religion in the Near East*, edited by Nicola Laneri, pp. 48–59. Oxbow Books, Oxford.

Andrews, Carol
1990 *Ancient Egyptian Jewelry*. British Museum Publications, London.

1994 *Amulets of Ancient Egypt*. British Museum Press, London.

Anfinset, Nils
2010 *Metal, Nomads and Culture Contact*. Routledge, London.

Appadurai, Arjun

1986 Introduction: commodities and the politics of value. In *The Social Life of Things: Commodities in Cultural Perspective*, edited by Arjun Appadurai, pp. 3–63. Cambridge University Press, Cambridge.

Artin, Gassia

2009 *La "Nécropole Enéolithique" de Byblos: Nouvelles Interprétations*. BAR International Series 1993. Archaeopress, Oxford.

2014 The northern Levant during the Chalcolithic period: the Lebanese-Syrian coast. In *The Oxford Handbook of the Archaeology of the Levant: c. 8000-332 BCE*, edited by M. L. Steiner and Ann E. Killebrew, pp. 212–222. Oxford University Press, Oxford.

Aston, Barbara G., James A. Harrell, and Ian Shaw

2000 Stone. In *Ancient Egyptian Materials and Technology*, edited by Paul T. Nicholson and Ian Shaw, pp. 5–77. Cambridge University Press, Cambridge; New York.

Avner, Uzi

1986 Ma'ale Shaharut. *Excavations and Surveys in Israel* 5:62–63.

1990 Eilat, Tumuli. *Excavations and Surveys in Israel* 9:76–78.

1991 Biq'at Nimra. *Excavations and Surveys in Israel* 10:53.

2002 Studies in the Material and Spiritual Culture of the Negev and Sinai Populations, during the 6th - 3rd Millennia B.C. Unpublished PhD Thesis, Hebrew University, Jerusalem.

2018 Protohistoric Developments of Religion and Cult in the Negev Desert. *Tel Aviv* 45(1):23–62.

Avner, Uzi, Israel Carmi, and Dror Segal

1994 Neolithic to Bronze Age Settlement of the Negev and Sinai in Light of Radiocarbon Dating: a View from the Southern Negev. In *Late Quaternary Chronology and Palaeoclimates of the Eastern Mediterranean*, edited by Ofer Bar-Yosef and Renee S. Kra, pp. 265–300.

Avner, Uzi, and Liora Kolska Horwitz

2017 Animal Sacrifices and Offerings from Cult and Mortuary Sites in the Negev and Sinai 6th - 3rd Millennia BC. *ARAM* 29:35–70.

Avrutis, Vladimir Wolff

2012 Late Early Bronze Age I Beads, Pendant and Earrings. In *Late Chalcolithic and Early Bronze Age I Remains at Nesher-Ramla Quarry*, edited by Edwin C. M Van den Brink. Zinman Institute of Archaeology, Haifa.

Bains, Roseleen, Milena Vasic, Daniella E. Bar-Yosef Mayer, Nerissa Russell, Katherine I. Wright, and Chris Doherty

2013 A Technological Approach to the Study of Personal Ornamentation and Social Expression at Çatalhöyük: In *Substantive technologies at Çatalhöyük: reports from the 2000-2008 seasons.*, edited by Ian Hodder, 9: pp. 331–363. Monumenta Archaeologica 31. British Institute of Archaeology at Ankara, London.

Bar, Shay, Guy Bar-Oz, Haggai Cohen-Klonymus, and Sonia Pinsky

2014 Fazael 1, a Chalcolithic Site in the Jordan Valley: Report of the 2013-2014 Excavation Season. *Journal of the Israel Prehistoric Society* 44:180–201.

Bar-Adon, Pessah

1980 *The Cave of the Treasure: the Finds from the Caves in Nahal Mishmar*. Israel Exploration Society, Jerusalem.

Bard, Katherine A.

1994 *From Farmers to Pharaohs: Mortuary Evidence for the Rise of Complex Society in Egypt*. Monographs in Mediterranean Archaeology 2. Sheffield Academic Press, Sheffield.

Bar-Yosef Mayer, Daniella E.

1995 The Molluscs from Grar. In *Grar: a Chalcolithic Site in the Northern Negev*, pp. 453–462. Ben Gurion University of the Negev Press, Beer-Sheva.

1999 The Role of Shells in Reconstruction of Socio-Economic Aspects of Neolithic through Early Bronze Age Societies in Sinai. Unpublished PhD Thesis, Hebrew University, Jerusalem.

2000 Mollusc Shells. In *Megiddo III: The 1992 - 1996 Seasons*, edited by Israel Finkelstein, David Ussishkin, and Baruch Halpern, pp. 478–486. Monograph series / Tel Aviv University, Sonia and Marco Nadler Institute of Archaeology 18. Emery and Claire Yass Publications in Archaeology, Tel Aviv.

2002a Egyptian-Canaanite Interaction during the Fourth and Third Millennia BCE: The Shell Connection. In *Egypt and the Levant: Interrelations from the 4th through the Early 3rd Millennium B.C.E.*, edited by Edwin C.M van den Brink and Thomas E. Levy, pp. 129–135. Leicester University Press, New York.

2002b The Shell Pendants. In *Kissufim Road: a Chalcolithic Mortuary Site*, edited by Yuval Goren and Peter Fabian, pp. 49–52. IAA reports 16. Israel Antiquity Authority, Jerusalem.

2003 Shell Beads, Freshwater Clams, and Landsnails from Tel Qashish. In *Tel Qashish a Village in the Jezreel Valley: Final Report of the Archaeological Excavations (1978-1987)*, pp. 415–423. Qedem Reports 5. Institute of Archaeology, Jerusalem.

2005 Pelecypod Beds Revisited: Glycymeris in Bronze Age Sites. *Journal of the Israel Prehistoric Society* 35:25–52.

2006 Marine and Riverine Shells at Gilat. In *Archaeology, Anthropology and Cult: the Sanctuary at Gilat, Israel*, edited by Thomas Evan Levy. Equinox, Sheffield.

2011 Nawamis, Shells, and Early Bronze Age Pastoralism. In *Daily Life, Materiality, and Complexity in Early Urban Communities of the Southern Levant: Papers in Honor of Walter E. Rast and R. Thomas Schaub*, edited by Meredith S. Chesson, Walter Aufrecht, and Ian Kuijt, pp. 185–195. Eisenbrauns, Winona Lake, Indiana.

2013 Shell Beads. In *Peqi'in: a late Chalcolithic burial site Upper Galilee, Israel*, pp. 365–370. Ostracon, Kinneret.

2015 Beads from the Intermediate Bronze Age Tomb 21 at Yehud: a Preliminary Report. *NGSBA Archaeology* 3:121–124.

2019 The Colour of Ornaments in the Neolithic and Chalcolithic of the Levant: Their Symbolic Meaning and Economic Value. In *The Value of Colour: Material and Economic Aspects in the Ancient World*, edited by Shiyanthi Thavapalan and David A. Warburton, pp. 69–97. Berlin Studies of the Ancient World 70. Edition Topoi / Exzellenzcluster Topoi der Freien, Berlin.

2021 The Beads. In *'En Esur ('Ein Asawir) III: Excavations in the Bronze Age Cemetery*, pp. 249–266. IAA Reports 68. Israel Antiquities Authority, Jerusalem.

Bar-Yosef Mayer, Daniella E., and Inbar Baruch
2006 Mollusc Shells. In *Megiddo IV: the 1998-2002 Seasons*, edited by Israel Finkelstein, David Ussishkin, and Baruch Halpern, pp. 497–504. Emery and Claire Yass Publications in Archaeology, Tel Aviv.

Bar-Yosef Mayer, Daniella E., Iris Groman-Yaroslavski, Ofer Bar-Yosef, Israel Hershkovitz, Astrid Kampen-Hasday, Bernard Vandermeersch, Yossi Zaidner, and Mina Weinstein-Evron
2020 On Holes and Strings: Earliest Displays of Human Adornment in the Middle Palaeolithic. *PLoS ONE* 15(7):1–13.

Bar-Yosef Mayer, Daniella E., and Naomi Porat
2008 Green stone beads at the dawn of agriculture. *PNAS* 105(25):8548–8551.

2009 Glazed Steatite Paste Beads in the Chalcolithic of the Levant: Long Distance Trade and Manufacturing Processes. In *Techniques and People: Anthropological Perspectives on Technology in the Archaeology of the Proto-historic and Early Historic Periods in the Southern Levant*, edited by Steven A. Rosen and Valentine Roux, pp. 111–122. De Boccard, Paris.

2013 Beads. In *Peqi'in: a late Chalcolithic burial site Upper Galilee, Israel*, pp. 337–365. Land of Galilee 2. Ostracon, Jerusalem.

Bar-Yosef Mayer, Daniella E., Naomi Porat, and Uri Davidovich
2014 Personal Ornaments at the Nahal Mishmar Cave of the Treasure. *Near Eastern Archaeology* 77(4):267–273.

Bar-Yosef Mayer, Daniella E., Naomi Porat, Z. Gal, Dina Shalem, and Howard Smithline
2004 Steatite beads at Peqi'in: long distance trade and pyro-technology during the Chalcolithic of the Levant. *Journal of Archaeological Science* 31:493–502.

Bar-Yosef, Ofer, Anna Belfer, Avner Goren, and Patricia Smith
1977 The Nawamis Near 'Ein Huderah (Eastern Sinai). *Israel Exploration Journal* 27(2–3):65–88.

Bar-Yosef, Ofer, Anna Belfer-Cohen, Avner Goren, Israel Hershkovitz, Ornit Ilan, Henk K. Mienis, and Benjamin Sass
1986 Nawamis and Habitation Sites near Gebel Gunna, Southern Sinai. *Israel Exploration Journal* 36(3–4):121–167.

Bar-Yosef, Ofer, Israel Hershkovitz, Gideon Arbel, and Avner Goren
1983 The Orientation of Nawamis Entrances in Southern Sinai: Expressions of Religious Belief and Seasonality? Tel Aviv 10(1):52–60.

Barzilai, Omry, Nimrod Getzov, Natalia Gubenko, Nimrod Marom, Ianir Milevski, Ariel Vered, and Junfu Zheng
2013 Proto-Historic Ein Zippori: The 2007 Excavation Season. *Journal of the Israel Prehistoric Society* 43:22–72.

Baumgaretel, Elise J.
1960 *The Cultures off Prehistoric Egypt II*. Oxford University Press, London.

Baysal, Emma L.
2019 *Personal Ornaments in Prehistory: an Exploration of Body Augmentation from the Palaeolithic to the Early Bronze Age*. Oxbow Books, Havertown.

de Beauclair, Roland

2010 Ornamental objects as a source of information on Neolithic burial practices at al-Buhais 18, UAE and neighboring sites. In *Death and Burial in Arabia and Beyond: Multidisciplinary Perspectives*, edited by Lloyd Weeks, pp. 11–15. Archaeopress, Oxford.

Beck, Horace C.

1928 Classification and Nomenclature of Beads and Pendants. *Archaeologia* 77:1–76.

1934a Notes on Glazed Stones Part I - Glazed Steatite. In *Ancient Egypt and the East*, pp. 69–83. British School of Archaeology in Egypt, London.

1934b The Use of the Microscope in the Study of Ancient Beads. *Journal of Microscopy* 54(3):186–194.

Beebe, H. Keith

1989 Maceheads. In *Bâb edh-Dhrâʿ Excavations in the Cemetery Directed by Paul W. Lapp (1965-67)*, pp. 289–294. Reports of the Expedition to the Dead Sea Plain, Jordan 1. Eisenbrauns, Winona Lake.

Beit-Arieh, Itzhaq

2003 *Archaeology of Sinai: the Ophir expedition*. Emery and Claire Yass Publications in Archaeology, Tel Aviv.

Ben-Marzouk, Nadia

2020 Forged by Society: An Interregional Investigation into the Social Implications of Metallurgical Knowledge Transfer in the Southern Levant and Egypt (ca. 5000-3000 BCE). Unpublished PhD Thesis, University of California, Los Angeles, Los Angeles.

Bentley, Gillian R.

1987 Kinship and Social Structure at Early Bronze Age IA Bab edh-Dhra', Jordan: A Bioarchaeological Analysis of Mortuary and Dental Data. Unpublished PhD Thesis, University of Chicago.

1991 A Bioarchaeological Reconstruction of the Social and Kinship Systems at Early Bronze Age Bab edh-Dhra', Jordan. In *Between Bands and States*, edited by Susan A. Gregg, pp. 5–34. Southern Illinois University at Carbondale Occasional Paper 9. Southern Illinois University, Carbondale.

Ben-Tor, Amnon

1975 Two Burial Caves of the Proto-Urban Period at Azor, 1971. *Qedem* 1:1–54.

Benz, Marion, Julia Gresky, and Hala Alarashi
2020 Similar but Different: Displaying social roles of subadults in burials from the late Pre-Pottery Neolithic site of Ba'ja, Southern Jordan. In *L'art du paraître apparences de l'humain, de la Préhistoire à nos jours*, edited by Hala Alarashi and Rosa Maria Dessi, pp. 93–107. Éditions APDCA, Nice.

Betts, A. V. G., and S. W. Helms (editors)
1991 *Excavations at Jawa 1972-1986: Stratigraphy, Pottery, and Other Finds*. Excavations and explorations in the Hashemite Kingdom of Jordon. Edinburgh University Press, Edinburgh.

Beynon, Diane E., Jack Donahue, R. Thomas Schaub, and Robert A. Johnston
1986 Tempering Types and Sources for Early Bronze Age Ceramics from Bab edh-Dhra' and Numeira, Jordan. *Journal of Field Archaeology* 13(3):297–305.

Binford, Lewis R.
1971 Mortuary Practices: Their Study and Their Potential. *Memoirs of the Society for American Archaeology* 25:6–29.

Blair, Elliot H.
2016 Glass Beads and Constellations of Practice. In *Knowledge in Motion: Constellations of Learning Across Time and Place*, edited by Andrew P. Roddick and Ann B. Stahl, pp. 97–125. University of Arizona Press, Tucson.

Blockman, Noga, and Benjamin Sass
2013 The Small Finds. In *Megiddo V: the 2004-2008 seasons,* edited by Matthew J. Adams, Israel Finkelstein, David Ussishkin, and Eric H. Cline, pp. 866–929. Eisenbrauns, Winona Lake, Indiana.

Bouquillon, Anne, Blanche Barthélemy de Saizieu, and A. Duval
1995 Glazed Steatite Beads from Merhgarh and Nausharo (Pakistani Balochistan). *MRS Proceedings* 352:527–538.

Bourke, Stephen J.
2002 Teleilat Ghassul: Foreign Relations in the Late Chalcolithic Period. In *Egypt and the Levant: Interrelations from the 4th through the Early 3rd Millennium B.C.E*, edited by Edwin C. M Van den Brink and Thomas E. Levy, pp. 154–164. Leicester University Press, London.

Bourke, Stephen J., Jaimie L. Lovell, Rachael Thyrza Sparks, Peta L. Seaton, Lachlan D. Mairs, and John Meadows
2000 A Second and Third Season of Renewed Excavation by the University of Sydney at Tulaylat al-Ghassul (1995-1997). *Annual of the Department of Antiquities of Jordan* 44:37–89.

Bourke, Stephen J., Peta L. Seaton, Rachael Thyrza Sparks, Jaimie L. Lovell, and Lachlan D. Mairs

1995 A First Season of Renewed Excavation by the University of Sydney at Tulaylat al-Ghassul. *Annual of the Department of Antiquities of Jordan* 39:31–63.

Bradbury, Jennie, Frank Braemer, and Maura Sala

2014 Fitting upland, steppe, and desert into a 'big picture' perspective: a case study from northern Jordan. *Levant* 46(2):206–229.

Braidwood, Robert J., and Linda S. Braidwood

1960 *Excavations in the Plain of Antioch vol. I the Earlier Assemblages Phases A-J*. University of Chicago Press, Chicago.

Braun, Eliot

1989 The Transition from the Chalcolithic to the Early Bronze Age in Northern Israel and Transjordan: Is there a Missing Link? In *L'Urbanisation de la Palestine à l'âge du Bronze ancien. Bilan et perspectives des recherches actuelles. Actes du Colloque d'Emmaüs, 20-24 octobre 1986*, pp. 7–27. BAR International Series 527. British Archaeological Reports, Oxford.

1991 Review of Bâb edh-Dhrâʿ: Excavations in the Cemetery Directed by Paul W. Lapp (1965-67). *American Journal of Archaeology* 95(4):744–745.

1997 *Yiftah'el: Salvage and Rescue Excavations at a Prehistoric Village in Lower Galilee, Israel.* IAA Reports 2. Israel Antiquities Authority, Jerusalem.

2006 Parochialism in Early Bronze Age I Ceramic Traditions: The Case of a "Safi Cup" from the EB I Site at Palmahim Quarry, Israel. In *"I Will Speak the Riddles of Ancient Times" Archaeological and Historical Studies in Honor of Amihai Mazar on the Occasion of His Sixtieth Birthday*, edited by Aren M. Maeir and Pierre de Miroschedji, pp. 3–6. Eisenbrauns, Winona Lake, Indiana.

2011a Early Interaction between Peoples of the Nile Valley and the Southern Levant. In *Before the Pyramids: the Origins of Egyptian Civilization*, edited by Emily Teeter, pp. 105–122. Oriental Institute Publications 33. University of Chicago, Chicago.

2011b The Transition from Chalcolithic to Early Bronze I in the Southern Levant: A "Lost Horizon" Slowly Revealed. In *Culture, Chronology and the Chalcolithic: Theory and Transition*, edited by Jaimie L. Lovell and Yorke M. Rowan, pp. 160-177. Oxbow Books, Oxford.

2019 Forging a Link: Evidence for a ‘Lost Horizon’ – The Late Chalcolithic to EB 1 Transition in the Southern Levant. In *Isaac went out to the field': Studies in Archaeology and Ancient Cultures in Honor of Isaac Gilead*, edited by Haim Goldfus, Mayer I. Gruber, Shamir Yona, and Peter Fabian, pp. 66–95. Archaeopress, Oxford.

2021 Observations on the Early Bronze Age cemetery at An-Naq’. In *Ancient landscapes of Zoara I: surveys and excavations at the Ghor as-Safi in Jordan, 1997-2018*, pp. 127–140. PEF Annual 17. Routledge, New York.

Braun, Eliot, Edwin C. M. van den Brink, Johanna Regev, Elisabetta Boaretto, and Shay Bar
2013 Aspects of Radiocarbon Determinations and the Dating of the Transition from The Chalcolithic Period to Early Bronze Age I in the Southern Levant. *Paléorient* 39(1):23–46.

Braun, Eliot, and Edwin C. M Van den Brink
2005 Tel Aviv, Ha-Qirya. *Hadashot Arkheologiyot* 117.

van den Brink, Edwin C. M
2011 A Chalcolithic and Early Bronze Age I Burial Ground near Sha‘ar Efrayim in the Sharon Plain. *’Atiqot* 66:1–53.

van den Brink, Edwin C. M, Liora Kolska Horwitz, Hamoudi Khalaily, Nili Liphschitz, Henk K. Mienis, and Yossi Nagar
2004 A Chalcolithic Dwelling and Burial Cave at Horvat Castra. *Israel Exploration Journal* 54(2):129–153.

van den Brink, Edwin C.M, Ram Gophna, and Asher Ovadia
2008 Burial Cave 2 in the Azor-Holon Cemetery: An Early Bronze Age I Tomb with Egyptian Finds. *Ägypten und Levante* 17:59–71.

van den Brink, Edwin C.M, Liora Kolska Horwitz, Robert Kool, Nili Liphschitz, Henk K. Mienis, and Vladimir Zbenovich
2015 Excavations at Tel Lod: Remains from the Pottery Neolithic A, Chalcolithic, Early Bronze Age I, Middle Bronze Age I and Byzantine Periods. *’Atiqot* 82:141–218.

Broeder, Nancy H., and Catherine W. Skinner
2003 Jewelry and Ornaments. In *Bâb edh-Dhrâ‘ Excavations at the Town Site (1975-1981)*, pp. 566–598. Reports of the Expedition to the Dead Sea Plain, Jordan 2. Eisenbrauns, Winona Lake, Indiana.

2020 Ornaments Excavated at Numayra, Jordan. In *Numayra: Excavations at the Early Bronze Age Townsite in Jordan, 1977-1983*, pp. 514–526. Reports of the Expedition to the Dead Sea Plain, Jordan 4. Eisenbrauns, University Park.

Brunton, G., and G. Caton-Thompson
1928 *The Badarian Civilization and Prehistoric Remains Near Badari*. Bernard Quaritch, London.

Burian, F., and E. Friedman
1985 Flint Borers: Methods of Production and Use. *Journal of the Israel Prehistoric Society* 18:63–65.

Busheri, Menashe
1969 קברים באזו. *Hadashot Arkheologiyot* 30:16.

Cecil, Rosanne (editor)
1996 *The Anthropology of Pregnancy Loss: Comparative Studies in Miscarriage, Stillbirth and Neonatal Death*. Routledge, London.

Chasan, Rivka, Edwin C. M. Van den Brink, and Danny Rosenberg
2019 "Crossing the Lines"—Elaborately Decorated Chalcolithic Basalt Bowls in the Southern Levant. *Bulletin of the American Schools of Oriental Research* 381:145–162.

Chesson, Meredith S.
2001 Embodied Memories of Place and People: Death and Society in an Early Urban Community. In *Social Memory, Identity, and Death: Anthropological Perspectives on Mortuary Rituals*, pp. 100–113. Archaeological Papers of the American Anthropological Association 10. American Anthropological Association, Arlington, VA.

2003 Households, Houses, Neighborhoods and Corporate Villages: Modeling the Early Bronze Age as a House Society. *Journal of Mediterranean Archaeology* 16(1):79–102.

2007 Remembering and Forgetting in Early Bronze Age Mortuary Practices on the Southeastern Dead Sea Plain, Jordan. In *Performing Death: Social Analyses of Funerary Traditions in the Ancient Near East and Mediterranean*, edited by Nicola Laneri, pp. 109–139. The Oriental Institute, Chicago.

2016 Risky Business: A Life Full of Obligations to the Dead and the Living on the Early Bronze Age Southeastern Dead Sea Plain, Jordan. In *The Archaeology of Anxiety, the Materiality of Anxiousness, Worry, and Fear*, edited by Jeffrey Fleisher and Neil Norman, pp. 41–66. Springer, New York.

2019 The Southern Levant During the Early Bronze Age I-III. In *The Social Archaeology of the Levant from Prehistory to the Present*, edited by Assaf Yasur-Landau, Eric H. Cline, and Yorke M. Rowan, pp. 163–182. Cambridge University Press, Cambridge.

Chesson, Meredith S., and R. Thomas Schaub
2007 Death and Dying on the Dead Sea Plain: Fifa, Khirbat al-Khanazir, and Bab adh-Dhra' Cemeteries. In *Crossing Jordan: North American Contributions to the Archaeology of Jordan*, edited by Thomas E. Levy, P.M Michele Daviau, Randall W. Younker, and May Shaer, pp. 253–260. Equinox, London.

Chevalier, J., M.L Inizan, and J. Tixier
1982 Une Technique de Perforation par Percussion de Perles en Cornaline (Larsa, Iraq). *Paléorient* 8(2):55–65.

Chłodnicki, Marek
2008 Trade and Exchange in the Predynastic and Early Dynastic Period in the Eastern Delta. In *Egypt at its Origins 2*, edited by Beatrice Midant-Reynes and Tristant Yann, pp. 489–500. Peeters, Leuven.

2017 Early Dynastic Bead Workshops at the Central Kom of Tell el-Farkha. *Études et Travaux* 30:211–219.

Ciałowicz, Krzysztof Marek, Yuval Yekutieli, and Marcin Czarnowicz (editors)
2016 *Tel Erani I: Preliminary Report of the 2013-2015 Excavations*. Wydawnictwo Alter, Kraków.

Clark, Vincent A.
1979 Investigations in a Prehistoric Necropolis Near Bab edh-Dhra'. *Annual of the Department of Antiquities of Jordan* 23:57–77.

Connan, Jacques, Arie Nissenbaum, and Daniel Dessort
1992 Molecular archaeology: Export of Dead Sea asphalt to Canaan and Egypt in the Chalcolithic-Early Bronze Age (4th-3rd millennium BC). *Geochimica et Cosmochimica* 56:2743–2759.

de Contenson, Henri
1992 *Préhistoire de Ras Shamra: les sondages stratigraphiques de 1955 à 1976*. Éditions Recherche sur les Civilisations, Paris.

Cooper, Lisa
2014 The northern Levant (Syria) during the Early Bronze Age. In *The Oxford Handbook of the Archaeology of the Levant: c. 8000-332 BCE*, edited by M. L. Steiner and Ann E. Killebrew, pp. 278–291. First edition. Oxford University Press, Oxford.

Costin, Cathy Lynne
1998 Introduction: Craft and Social Identity. *Archeological Papers of the American Anthropological Association* 8(1):3–16.

Cristiani, Emanuela, and Dusan Boric

2012 8500-year-old Late Mesolithic garment embroidery from Vlasac (Serbia): Technological, use-wear and residue analyses. *Journal of Archaeological Science* 39:3450–3469.

2017 Personal Adornment and Personhood among the Last Mesolithic Foragers of the Danube Gorges in the Central Balkans and Beyond. In *Not Just for Show: The Archaeology of Beads, Beadwork, & Personal Ornaments*, edited by Daniella E. Bar-Yosef Mayer, Clive Bonsall, and Alice M. Choyke, pp. 39–68. Oxbow Books, Oxford.

Currelly, C.T.

1906 Gebel Musa and the Nawamis. In *Researches in Sinai*, pp. 229–244. John Murray, London.

Damick, Alison, and Marshall Woodworth

2015 Steatite Beads from Tell Fadous-Kfarabida: A case study in early Bronze Age technology in Northern Coastal Lebanon. *Journal of Archaeological Science: Reports* 3:603–614.

Davenport, William H.

1986 Two kinds of value in the Eastern Solomon Islands. In *The Social Life of Things: Commodities in Cultural Perspective*, edited by Arjun Appadurai, pp. 95–109. Cambridge University Press, Cambridge.

Davidovich, Uri

2012 The Early Bronze IB in the Judean Desert Caves. *Tel Aviv* 39(1): 3–19.

2022 Bead Bundles. In *Adornment: Jewelry and Body Decoration in Prehistoric Times*, edited by Ahiad Ovadia, pp. 66–67. The Israel Museum, Jerusalem.

Davidovich, Uri, Micka Ullman, Boaz Langford, Amos Frumkin, Dafna Langgut, Naama Yahalom-Mack, Julia Abramov, and Nimrod Marom

2018 Distancing the Dead: Late Chalcolithic Burials in Large Maze Caves in the Negev Desert, Israel. *Bulletin of the American Schools of Oriental Research* 379:113–152.

Debano, Fernand, and Bodil Mortensen

1988 *The Predynastic Cemetery at Heliopolis*. Philipp von Zabern, Mainz am Rhein.

Dee, Michael, David Wengrow, Andrew Shortland, Alice Stevenson, Fiona Brock, Linus Girdland Flink, and Christopher Bronk Ramsey

2013 An absolute chronology for early Egypt using radiocarbon dating and Bayesian statistical modelling. *Proceedings of the Royal Society* 469(2159):20130395.

Deetz, James
1977 *In Small Things Forgotten: An Archaeology of Early American Life*. Anchor Books, New York.

Dever, William G. (editor)
1974 *Gezer II: Report of the 1967-70 Seasons in Fields I and II*. Hebrew Union College/Nelson Glueck School of Biblical Archaeology, Jerusalem.

Dinies, Michèle, Reinder Neef, Birgit Plessen, and Harald Kürschner
2016 Holocene Vegetation, Climate, Land Use and Plant Cultivation in the Tayma Region, Northwestern Arabia. In *The Archaeology of North Arabia. Oases and Landscapes: Proceedings of the International Congress held at the University of Vienna, 5-8 December 2013*, edited by Marta Luciani, pp. 57–78. Austrian Academy of Sciences Press, Vienna.

Dobres, Marcia-Anne
2000 *Technology and Social Agency: Outlining a Practice Framework for Archaeology*. Wiley-Blackwell, Oxford.

Dollfus, Genevieve, and Zeidan Kafafi
1993 Recent Researches at Abu Hamid. *Annual of the Department of Antiquities of Jordan* 37:241–262.

Drabsch, Bernadette
2015 *The Mysterious Wall Paintings of Teleilat Ghassul, Jordan: in Context*. Monographs of the Sydney University Teleilat Ghassul Project 3. Archaeopress Publishing Ltd, Oxford.

Dubreuil, Laure, Daniel Savage, Selina Delgado-Raack, Hugues Plison, Birgitta Stephenson, and Ignacio de la Torre
2015 Current Analytical Frameworks for Studies of Use-Wear on Ground Stone Tools. In *Use-Wear and Residue Analysis in Archaeology*. Manuals in Archaeological Method, Theory and Technique. Springer International Publishing, Switzerland.

Dunand, Maurice
1973 *Fouilles de Byblos V: l'architecture, les tombes, le matériel domestique des origines néolithiques à l'avènement urbain*. A. Maisonneuve, Paris.

Duncan, J. Garrow
1930 *Corpus of Dated Palestinian Pottery*. British School of Archaeology in Egypt, London.

Dunham, Sally
Beads for babies. *Zeitschrift für Assyriologie und vorderasiatische Archäologie* 83(1):237–257.

Edwards, Phillip C., Steven E. Falconer, Patricia L. Fall, Alexandra Ariotti, and Thomas K. Swoveland

2004 Archaeology and Environment of the Dead Sea Plain: Preliminary Results of the Third Season of Investigations by the Joint La Trobe University/Arizona State University Project. *Annual of the Department of Antiquities of Jordan* 48:181–201.

Eichmann, Ricardo, Lutfi Khalil, and Klaus Schmidt

2009 Excavations at Tall Hujayrat al-Ghuzlan ('Aqaba/Jordan) Excavations 1998-2005 and Stratigraphy. In *Prehistoric Aqaba I*, edited by Lutfi Khalil and Klaus Schmidt, pp. 17–77. Orient-Archäologie 23. Leidorf, Rahden/Westfalen.

Einarsdóttir, Jónína

2021 Maternal grief in cross-cultural context: Selective neglect, replaceable infants and lifesaving names. *Death Studies* 45(1):61–70.

Eisenberg, Emanuel, Avi Gopher, and Raphael Greenberg

2001 *Tel Te'o: a Neolithic, Chalcolithic, and Early Bronze Age Site in the Hula Valley*. IAA reports 13. Israel Antiquities Authority, Jerusalem.

Ekmen, H., C. Diker, F.G. Ekmen, and C. Tonoğlu

2021 New Evidence of Chalcolithic Age Steatite Beads from İnönü Cave: Typology and Technology Aspects with Archaeometric Techniques. *Mediterranean Archaeology and Archaeometry* 20(2):113–129.

Eldar, Iris, and Ya'aqov Baumgarten

1985 Neve Noy: A Chalcolithic Site of the Beer-sheba Culture. *The Biblical Archaeologist* 48(3):134–139.

d'Errico, Francesco, Christopher Henshilwood, Marian Vanhaeren, and Karen van Niekerk

2005 Nassarius kraussianus shell beads from Blombos Cave: evidence for symbolic behavior in the Middle Stone Age. *Journal of Human Evolution* 48:3–24.

d'Errico, Francesco, Marian Vanhaeren, Nick Barton, Abdeljalil Bouzouggar, Henk Mienis, Daniel Richter, Jean-Jacques Hublin, Shannon P. McPherron, and Pierre Lozouet

2009 Additional evidence on the use of personal ornaments in the Middle Paleolithic of North Africa. *Proceedings of the National Academy of Sciences* 106(38):16051–16056.

Eshed, Vered, and Uzi Avner

2018 A Late Neolithic - Early Chalcolithic Burial Site in Eilat, by the Red Sea, Israel. *Israel Exploration Journal* 68:5–29.

Fabian, Peter, Na'ama Scheftelowitz, and Isaac Gilead
2015 Horvat Qarqar South: Preliminary Report of a Chalcolithic Cemetery near Qiryat Gat, Israel. *Israel Exploration Journal* 65(1):1–30.

Falci, Catarina Guzzo, Jacques Cuisin, Andre Delpuech, Annelou Van Gijn, and Caroinne L. Hofman
2019 New Insights into Use-wear Development in Bodily Ornaments Through the Study of Ethnographic Collections. *Journal of Archaeological Method and Theory* 26:755–805.

Finkenstaedt, Elizabeth
1983 Beads at Badari. *Zeitschrift für Ägyptische Sprache und Altertumskunde* 110:27–29.

Fischer, Peter M., and Vera M.F Hammer
2008 Appendix 1: An Early Bronze Age Necklace from Tell Abu Al-Kharaz, Jordan Valley. In *Tell Abu Al-Kharaz in the Jordan Valley Volume I: The Early Bronze Age*. Contributions to the Chronology of the Eastern Mediterranean XVI. Verlag der Österreichischen Akademie der Wissenschaften, Wien.

Fraser, James A.
2018 *Dolmens in the Levant*. PEF Annual XIV. Routledge, London.

Froh, J.
2004 Archaeological Ceramics Studied by Scanning Electron Microscopy. *Hyperfine Interactions* 154:159–176.

Frolich, Bruno, and Donald J. Ortner
1982 Excavations of the Early Bronze Age Cemetery at Bab edh-Dhra' Jordan, 1981: A Preliminary Report. *Annual of the Department of Antiquities of Jordan* 26:249–265.

Frolich, Bruno, Donald J. Ortner, and Alain Froment
2008 The Osteology of the EB IA People. In *The Early Bronze Age I Tombs and Burials of Bab edh-Dhra', Jordan*, pp. 229–249. Reports of the Expedition to the Dead Sea Plain, Jordan 3. AltaMira Press, Plymouth.

Gamble, Lynn H.
2020 The origin and use of shell bead money in California. *Journal of Anthropological Archaeology* 60:101237.

Garstang, John
1932 Jericho: City and Necropolis. *Liverpool Annals of Archaeology and Anthropology* 19:3–22, 35–54.

Genz, Hermann

2014 The northern Levant (Lebanon) during the Early Bronze Age. In *The Oxford Handbook of the Archaeology of the Levant: c. 8000-332 BCE*, edited by M. L. Steiner and Ann E. Killebrew, pp. 292–306. First edition. Oxford University Press, Oxford.

Gilead, Isaac

1995 *Grar: a Chalcolithic Site in the Northern Negev*. Ben Gurion University of the Negev Press, Beer-Sheva.

Gilmour, Garth Hugh

2014 *Gezer VI: the objects from Phases I and II (1964-1974)*. Eisenbrauns, Winona Lake, Indiana.

Golani, Amir

2003 Stone Beads. In *Salvage excavations at the Early Bronze Age site of Qiryat Ata*, pp. 223. IAA Reports 18. Israel Antiquities Authority, Jerusalem.

2010 The Beads from Tomb 80 in the ’En Esur Cemetery. *’Atiqot* 64:115–119.

2014 Ashqelon during the EB I period – a centre for copper processing and trade. In *The Nile Delta as a Centre of Cultural Interactions Between Upper Egypt and the Southern Levant in the 4th millennium BC*, edited by Agnieszka Mączyńska, pp. 119–137. Poznań Archaeological Museum, Poznań.

Golani, Amir, Benyamin Storchan, and Anna Eirikh-Rose

2018 The Chalcolithic and Early Bronze Age IB Site of Beqo’a. *’Atiqot* 90:9–54.

Golden, Jonathan Michael

2010 *Dawn of the Metal Age: Technology and Society during the Levantine Chalcolithic*. Routledge, London.

Gopher, Avi, and Tsvika Tsuk

1996 The Chalcolithic Assemblages. In *The Nahal Qanah Cave: Earliest Gold in the Southern Levant*, edited by Avi Gopher, pp. 91–138. Tel Aviv University, Tel Aviv.

Gophna, Ram, and Shemuel Lifshitz

1980 A Chalcolithic Burial Cave at Palmahim. *’Atiqot (English Series)* 14:1–8.

Gorelick, Leonard, and A. John Gwinnett

1990 Innovative Lapidary Craft Techniques Neolithic Jarmo. *Archaeomaterials* 4:25–32.

Goren, Avner

2002 Nawamis of Sinai. *Archaeology Odyssey* 5(1):1–13.

Goren, Yuval, and Peter Fabian
2002 *Kissufim Road A Chalcolithic Mortuary Site*. IAA Reports 16. Israel Antiquities Authority, Jerusalem.

Goren, Yuval, and Sharon Zuckerman
2000 An Overview of the Typology, Provenance and Technology of the Early Bronze Age I "Grey Burnished Ware." In *Ceramics and Change in the Early Bronze Age of the Southern Levant*, edited by Graham Philip and Douglas Baird. Sheffield Academic Press, Sheffield.

Gorzalczany, Amir
2018 The Chalcolithic Cemetery at Palmaḥim (North): New Evidence of Burial Patterns from the Central Coastal Plain. *'Atiqot* 91:1–94.

Gošić, Milena, and Isaac Gilead
2015a Casting the Sacred: Chalcolithic Metallurgy and Ritual in the Southern Levant. In *Defining the Sacred: Approaches to the Archaeology of Religion in the Near East*, edited by Nicola Laneri, pp. 161–175. Oxbow Books, Oxford.

2015b Unveiling Hidden Rituals: Ghassulian Metallurgy of the Southern Levant in Light of the Ethnographic Record. In *Copper and Trade in the South- Eastern Mediterranean: Trade Routes of the Near East in Antiquity*, edited by Karolina Rosińska-Balik, Agnieszka Ochal-Czarnowicz, Marcin Czarnowicz, and Joanna Dębowska-Ludwin, pp. 25–37. Archaeopress, Oxford.

Greenberg, Raphael
2001 An Early Bronze Age I and II Tomb at Gadot, in the Hula Valley. *'Atiqot* 42:79–94.

2019 *The Archaeology of the Bronze Age Levant: From Urban Origins to the Demise of City-States, 3700–1000 BCE*. Cambridge University Press, Cambridge.

Greenberg, Raphael, Emanuel Eisenberg, Sarit Paz, and Yitzhak Paz
2006 *Bet Yerah: The Early Bronze Age Mound I: Excavation Reports, 1933-1986*. Israel Antiquities Authority, Jerusalem.

Grigson, Caroline
2012 Size Matters – Donkeys and Horses in the Prehistory of the Southernmost Levant. *Paléorient* 38(1):185–201.

Groman-Yaroslavski, Iris, and Daniella E. Bar-Yosef Mayer
2015 Lapidary technology revealed by functional analysis of carnelian beads from the early Neolithic site of Nahal Hemar Cave, southern Levant. *Journal of Archaeological Science* 58:77–88.

Gurova, Maria, and Clive Bonsall
2017 Experimental Replication of Stone, Bone, and Shell Beads from Early Neolithic Sites in Southeast Europe. In *Not Just for Show: The Archaeology of Beads, Beadwork, & Personal Ornaments*, edited by Daniella E. Bar-Yosef Mayer, Clive Bonsall, and Alice M. Choyke, pp. 159–167. Oxbow Books, Oxford.

Guy, P.L.O
1938 *Megiddo Tombs*. University of Chicago Press, Chicago.

Gwinnett, A. John, and Leonard Gorelick
1979 Ancient Lapidary: A Study using Scanning Electron Microscopy and Functional Analysis 22(1):17–32.

1981 Beadmaking in Iran in the Early Bronze Age. *Expedition* 24:10–23.

1988 The Change from Stone Drills to Copper Drills in Mesopotamia: An Experimental Perspective. *Expedition* 29(3):15–24.

1990 Innovative Lapidary Craft Techniques in Neolithic Jarmo. *Archaeomaterials* 4(1):25–32.

1993 Beads, Scarabs, and Amulets: Methods of Manufacture in Ancient Egypt. *Journal of the American Research Center in Egypt* 30:125–132.

Haibt, Max
2018 The Eastern Sabkha of Tayma Analysis of a 4th Millennium BC Carnelian Bead Production Center in Northwest Arabia. Unpublished Masters Thesis, Freie Universität Berlin, Berlin.

Harlan, Jack R.
1981 Natural Resources of the Southern Ghor. In *The Southeastern Dead Sea Plain Expedition: An Interim Report of the 1977 Season*, pp. 155–164. The Annual of the American Schools of Oriental Research 46. American Schools of Oriental Research, Cambridge, MA.

Harrell, James A.
2017 A Preliminary Overview of Ancient Egyptian Stone Beads. *Palarch's Journal of Archaeology of Egypt* 14(2):1–16.

Harrison, Timothy P.
1993 Economics with an Entrepreneurial Spirit: Early Bronze Trade with Late Predynastic Egypt. *The Biblical Archaeologist* 56(2):81–93.

2001 Early Bronze Social Organization as Reflected in Burial Patterns from the Southern Levant. In *Studies in the Archaeology of Israel and Neighboring Lands in Memory of Douglas L. Esse*, edited by Samuel R. Wolff, pp. 215–236. Studies in Ancient Oriental Civilization 59. The Oriental Institute, Chicago.

Hartung, Ulrich

2013 Some remarks on the Chronological Position of the Predynastic Settlement at Maadi (Egypt) and its Relations to the Southern Levant. *Paléorient* 39(1):177–191.

2014 Interconnections between the Nile Valley and the Southern Levant in the 4th Millennium BC. In *Egypt and the Southern Levant in the Early Bronze Age*, edited by Felix Höflmayer and Ricardo Eichmann, pp. 107–134. Leidorf, Rahden/Westfalen.

Hassan, Fekri A., Joris van Wetering, and Geoffrey Tassie

2017 Urban Development at Nubt, Naqada Region, Upper Egypt, during the Predynastic - Protodynastic Period. In *Egypt at its Origins 5*, edited by Beatrice Midant-Reynes and Tristant, pp. 81–127. Peeters, Leuven.

Hauptmann, Andreas, Lutfi Khalil, and Sigrid Schmitt-Strecker

2009 Evidence of Late Chalcolithic/Early Bronze Age I Copper Production from Timna Ores at Tall al-Mgass, ’Aqaba. In *Prehistoric Aqaba I*, edited by Lutfi Khalil and Klaus Schmidt, pp. 295–304. Orient-Archäologie 23. Leidorf, Rahden/Westfalen.

Hausleiter, Arnulf, and Ricardo Eichmann

2019 The Archaeological Exploration of the Oasis of Tayma’. In *Tayma’ I: Archaeological Exploration, Paleoenvironment, Cultural Contacts*, edited by Arnulf Hausleiter, Ricardo Eichmann, and Muhammad al-Najem, pp. 3–58. Archaeopress, Oxford.

Hegde, Karunakara

1983 The Art of the Harappan Microbead. *Archaeology* 36(3):68, 70, 72.

Heimann, Robert

2016 X-Ray Powder Diffraction (XRPD). In *The Oxford Handbook of Archaeological Ceramic Analysis*, edited by Alice Hunt, pp. 326–341. Oxford University Press.

Helms, Mary W.

1993 *Craft and the Kingly Ideal: Art, Trade, and Power*. University of Texas Press, Austin.

Hendrickx, Stan

1999 La chronologie de la préhistoire tardive et des débuts de l'histoire de l'Egypte. *Archéo-Nil* 9:13–81.

Hennessy, J. B.

1969 Preliminary Report on a First Season of Excavations at Teleilat Ghassul. *Levant* 1(1):1–24.

Henry, Donald O.

1995 The Timnian and Pastoral Nomadism in the Chalcolithic. In *Prehistoric Cultural Ecology and Evolution*, pp. 353–374. Interdisciplinary Contributions to Archaeology. Springer, Boston.

Herr, Larry G.

2002 5,000-year-old burials discovered in Jordan. *Near Eastern Archaeology* 65(4):282–283.

Hestrin, Ruth, and Miriam Tadmor

1963 A Hoard of Tools and Weapons from Kfar Monash. *Israel Exploration Journal* 13(4):265–288.

Hikade, Thomas

2004 Urban Development at Hierakonpolis and the Stone Industry of Square 105N5W. In *Egypt at its Origins: Studies in Memory of Barbera Adams*, edited by Stan Hendrickx, R.F Friedman, Krzysztof M Ciałowicz, and Marek Chłodnicki, pp. 181–197. Peeters, Leuven.

Hobsbawm, Eric

1983 Introduction: Inventing Traditions. In *The Invention of Tradition*, edited by Eric Hobsbawm and Terence Ranger, pp. 1–14. Cambridge University Press, Cambridge.

Hodder, Ian

1987 The contextual analysis of symbolic meanings. In *The Archaeology of Contextual Meanings*, edited by Ian Hodder, pp. 1–10. Cambridge University Press, Cambridge.

Horn, Maarten

2014 A Badarian-Naqadian cognitive link? A possible insight on the basis of a Badarian hippopotamus-shaped pendant from Egyp. *Polish Archaeology in the Mediterranean* 23(2):41–70.

2015 Preliminary Investigations into the Production of Glazed Steatite Beads: Discussing the Use of Turqoise during the Badarian Period in Egypt. *Archéo-Nil* 25:91–121.

Ilan, David
2002 Mortuary Practices in Early Bronze Age Canaan. *Near Eastern Archaeology* 65(2):94–104.

Ilan, David, and Yorke M. Rowan
2012 Deconstructing and Recomposing the Narrative of Spiritual Life in the Chalcolithic of the Southern Levant. *Archaeological Papers of the American Anthropological Association* 21(1):89–113.

2015 The Judean Desert as a Chalcolithic Necropolis. *Journal of Mediterranean Archaeology* 28(2):171–194.
2019 Expediting Reincarnation in the 5th Millennium BCE: Interpreting the Chalcolithic Ossuaries of the Southern Levant. *Oxford Journal of Archaeology* 38(3):248–270.

Ilan, Ornit, and Michael Sebbane
1989 Copper Metallurgy, Trade, and the Urbanization of Southern Canaan in the Chalcolithic and Early Bronze Age. In *L'urbanisation de la Palestine à l'âge du Bronze ancien*, edited by Pierre de Miroschedji, pp. 139–162. BAR International Series 527. British Archaeological Reports, Oxford.

Janz, Lisa, Asa Cameron, Dashzeveg Bukhchuluun, Davaakhuu Odsuren, and Laure Dubreuil
2020 Expanding frontier and building the Sphere in arid East Asia. Quaternary International 559:150–164.

Ji, Chang-Ho C.
1997 The Chalcolithic and Early Bronze Cemeteries Near 'Iraq al-Amir and the Preliminary Report on Salvage Excavations. *Annual of the Department of Antiquities of Jordan* 41:49–68.

Joffe, Alexander H.
1993 *Settlement and Society in the Early Bronze Age I and II, southern Levant: Complentarity and Contradiction in a Small-scale Complex Society*. Monographs in Mediterranean Archaeology 4. Sheffield Acad. Press, Sheffield.

2022 New Models for the End of the Chalcolithic in the southern Levant. In *Transitions During the Early Bronze Age in the Levant: Methodological Problems and Interpretative Perspectives*, edited by Matthew J. Adams and Valentine Roux, pp. 81–115. Zaphon, Münster.

In Preparation. Textiles in the Prehistoric Southern Levant. *Journal of the Israel Prehistoric Society*.

Kandel, Andrew W., and Nicholas J. Conard

2005 Production sequences of ostrich eggshell beads and settlement dynamics in the Geelbek Dunes of the Western Cape, South Africa. *Journal of Archaeological Science* 32:1711–1721.

Kaplan, Jacob

1993 Giv'atayim. In *The New Encyclopedia of Archaeological Excavations in the Holy Land*, edited by Ephraim Stern, pp. 520–521. Simon & Schuster, New York.

Kenoyer, Jonathan Mark

2017a Stone Beads of the Indus Tradition: New Perspectives on Harappan Bead Typology, Technology and Documentation. In *Stone Beads of South and Southeast Asia: Archaeology, Ethnography, and Global Connections*, edited by Alok Kumar Kanungo, pp. 151–166. Aryan Books International, Delhi.

2017b Using SEM to Study Stone Bead Technology. In *Stone Beads of South and Southeast Asia: Archaeology, Ethnography, and Global Connections*, edited by Alok Kumar Kanungo, pp. 409–437. Aryan Books International, Delhi.

2021 Glazed Steatite and Faience Technology at Harappa, Pakistan (>3700–1900 BCE): Technological and Experimental Studies of Production and Variation. In *Ancient Glass of South Asia*, edited by Alok Kumar Kanungo and Laure Dussubieux, pp. 39–100. Springer Singapore, Singapore.

Kenoyer, Jonathan Mark, Asa Cameron, Dashzeveg Bukhchuluun, Chunag Amartuvshin, Batdalai Byambatseren, William Honeychurch, Laure Dussubieux, and Randall Law

2022 Carnelian beads in Mongolia: new perspectives on technology and trade. *Archaeological and Anthropological Sciences* 14(1):6.

Kenoyer, Jonathan Mark, and Massimo Vidale

1992 A New Look at Stone Drills of the Indus Valley Tradition. *Materials Research Society Symposium Proceedings* 267:495–518.

Kenoyer, Jonathan Mark, Massimo Vidale, and Kuldeep K. Bhan

1994 Carnelian Bead Production in Khambhat, India: An Ethnoarchaeological Study. In *Living Traditions Studies in the Ethnoarchaeology of South Asia*, edited by Bridget Allchin, pp. 281–306. Oxford & IBH Publishing Co. PVT. LTD., New Delhi.

Kenoyer, Jonathan Mark, Massimo Vidale, and Kuldeep Kumar Bhan

1991 Contemporary stone beadmaking in Khambhat, India: Patterns of craft specialization and organization of production as reflected in the archaeological record. *World Archaeology* 23(1):44–63.

Kenyon, Kathleen M.
1960 *Excavations at Jericho Volume I: The Tombs Excavated in 1952-4*. British School of Archaeology in Jerusalem, London.

1965 *Excavations at Jericho Volume 2: The tombs excavated in 1955-8*. British School of Archaeology in Jerusalem, London.

Kerner, Susanne
2009 The Pottery of Tall Hujayrat al-Ghuzlan 1998 to 2004. In *Prehistoric 'Aqaba I*, edited by Lutfi Khalil and Klaus Schmidt, pp. 127–232. Orient-Archäologie Bd. 23. Leidorf, Rahden/Westfalen.

2010 Craft Specialisation and its Relation with Social Organisation in the Late 6th to Early 4th Millennium BCE of the Southern Levant. *Paléorient* 36(1):179–198.

Kersel, Morag M., and Meredith S. Chesson
2013 Tomato Season in the Ghor es-Safi: A Lesson in Community Archaeology. *Near Eastern Archaeology* 76(3):159–165.

Kersel, Morag M., and Austin (Chad) Hill
2019 The (W)Hole Picture: Responses to a Looted Landscape. *International Journal of Cultural Property* 26(3):305–329.

Killick, David
2009 Cairo to Cape: The Spread of Metallurgy Through Eastern and Southern Africa. *Journal of World Prehistory* 22(4):399–414.

Klimscha, Florian
2009 Radiocarbon Dates from Prehistoric Aqaba and Other Related Sites from the Chalcolithic Period. In *Prehistoric Aqaba I*, edited by Lutfi Khalil and Klaus Schmidt, pp. 363–401. Orient-Archäologie 23. Leidorf, Rahden/Westfalen.

2011 Long-range Contacts in the Late Chalcolithic of the Southern Levant. Excavations at Tall Hujayrat al-Ghuzlan and Tall al-Magass near Aqaba, Jordan. In *Egypt and the Near East - the crossroads: proceedings of an international conference on the relations of Egypt and the Near East in the Bronze Age, Prague, September 1-3, 2010*, edited by Jana Mynářová, pp. 177–209. Czech University, Czech Institute of Egyptology, Prague.

Kolska Horwitz, Liora, and Ianir Milevski
2019 Domestication of the Donkey (Equus asinus) in the Southern Levant: Archaeozoology, Iconography and Economy. In *Animals and Human Society in Asia Historical, Cultural, and Ethical Perspectives,* edited by Rotem Kowner, Guy Bar-Oz, Michal Biran, Meir Shahar, and Gideon Shelach-Lavi, pp. 93–148. Palgrave Macmillon, London.

Kopytoff, Igor
1986 The Cultural Biography of Things: Commoditization as Process. In *The Social Life of Things: Commodities in Cultural Perspective*, edited by Arjun Appadurai, pp. 64–92. Cambridge University Press, Cambridge.

Kora, Aruna Jyothi
2020 Traditional Soapstone Storage, Serving, and Cookware used in the Southern states of India and its Culinary Importance. *Bulletin of the National Research Centre* 44(1):83.

Ktalav, Inbar
2013 Mollusc Shells. In *Megiddo V: the 2004-2008 seasons*, edited by Matthew J. Adams, Israel Finkelstein, David Ussishkin, and Eric H. Cline, pp. 1215–1219. Eisenbrauns, Winona Lake, Indiana.

2018a Chalcolithic and Early Bronze Age IB Mollusks from Beqo'a. *'Atiqot* 90:75–77.

2018b The Shells from the Chalcolithic Cemetery at Palmaḥim (North). *'Atiqot* 91:103–104.

Kuhn, Steven L., and Mary C. Stiner
2007 Paleolithic Ornaments: Implications for Cognition, Demography and Identity. *Diogenes* 54(2):40–48.

Lass, Egon H.E
2003 An Early Bronze Age IB Burial Cave and a Byzantine Farm at Ḥorbat Ḥani (Khirbet Burj el-Ḥaniya) (West). *'Atiqot* (44):1–51.

Lave, Jean, and Etienne Wenger
1991 *Situated Learning: Legitimate Peripheral Participation*. Cambridge University Press, Cambridge.

Law, R.W.
2018 The Art of the Harappan microbead - Revisited. In *Walking with the Unicorn: Social organization and material culture in Ancient South Asia. Jonathan Mark Kenoyer Felicitation Volume*, edited by D. Frenez, G. Jamison, R.W. Law, Massimo Vidale, and R.H. Meadow, pp. 327–342. Archaeopress, Oxford.

Lee, John R.
2003 Worked Stones. In *Bâb edh-Dhrâʿ Excavations at the Town Site (1975-1981)*, pp. 622–637. Reports of the Expedition to the Dead Sea Plain, Jordan 2. Eisenbrauns, Winona Lake, Indiana.

Levy, Thomas E. (editor)

2006 *Archaeology, Anthropology and Cult: the Sanctuary at Gilat, Israel*. Routledge, London.

Levy, Thomas E., and David Alon

1982 The Chalcolithic Mortuary Site near Mezad Aluf, Northern Negev Desert: A Preliminary Study. *Bulletin of the American Schools of Oriental Research* 248:37–59.

1987a Excavations in Shiqmim Cemetery 3: Final Report on the 1982 Season. In *Shiqmim I: Studies Concerning Chalcolithic Societies in the Nothern Negev Desert, Israel (1982-1984)*, edited by Thomas E. Levy, pp. 333–355. BAR International Series 356. Archaeopress, Oxford.

1987b Excavations in the Shiqmim Village. In *Shiqmim I: Studies Concerning Chalcolithic Societies in the Nothern Negev Desert, Israel (1982-1984)*, edited by Thomas E. Levy, pp. 153–218. BAR International Series 356. Archaeopress, Oxford.

Levy, Thomas E., David Alon, D. Anderson, Yorke M. Rowan, and Morag M. Kersel

2006 The Sanctuary Sequence: Excavations at Gilat: 1975-77, 1989, 1990-92. In *Archaeology, Anthropology and Cult: the Sanctuary at Gilat, Israel*, edited by Thomas Evan Levy, pp. 95–212. Equinox, Sheffield.

Levy, Thomas E., David Alon, Yorke Rowan, Edwin C. M. van den Brink, Caroline Grigson, Augustin Holl, Patricia Smith, Paul Goldberg, Alan J. Witten, Eric Kansa, John Moreno, Yuval Yekutieli, Naomi Porat, Jonathan Golden, Leslie Dawson, and Morag Kersel

1997 Egyptian-Canaanite Interaction at Nahal Tillah, Israel (ca. 4500-3000 B. C. E.): An Interim Report on the 1994-1995 Excavations. *Bulletin of the American Schools of Oriental Research* 307:1–51.

Littleton, Judith

1990 Bone Inventory *(Feifah Tombs)*.

Loud, Gordon

1948 *Megiddo II: seasons of 1935-39*. Oriental Institute Publications 62. University of Chicago Press, Chicago.

Lovell, Jaimie L.

2010 Community is Cult, Cult is Community: Weaving the Web of Meanings for the Chalcolithic. *Paléorient* 36(1):103–122.

Lucas, A., and J.R Harris

1962 *Ancient Egyptian Materials and Industries*. London, Arnold.

Ludvik, Geoffrey E.
2018 Hard Stone Beads and Socio-Political Interaction in the Intermediate Bronze Age Southern Levant, ca. 2500-2000 BCE. Unpublished PhD Thesis, University of Wisconsin, Madison.

Ludwig, Theodore
1989 Clay Figurines. In *Bâb edh-Dhrâʿ Excavations in the Cemetery Directed by Paul W. Lapp (1965-67)*, pp. 274–289. Reports of the Expedition to the Dead Sea Plain, Jordan 1. Eisenbrauns, Winona Lake.

Macalister, Robert Alexander Stewart
1912 *The Excavation of Gezer: 1902-1905 and 1907-1909*. John Murray, London.

MacDonald, Burton (editor)
1992 *The Southern Ghors and northeast ʼArabah Archaeological survey*. J.R Collis Publications, Sheffield.

Macdonald, Eann, James Lesley Starkey, and Gerald Lankester Harding
1932 *Beth Pelet II*. British School of Archaeology in Egypt, London.

Mackay, Ernest
1937 Beadmaking in Ancient Sind. *Journal of the American Oriental Society* 57(1):1–15.

Magee, Peter
2014 *The Archaeology of Prehistoric Arabia: Adaptation and Social Formation from the Neolithic to the Iron Age*. Cambridge University Press, Cambridge.

Magrill, Pamela
2006 *A Researcher's Guide to the Lachish Collection in the British Museum*. British Museum Research Publications 161. British Museum, London.

Mallon, Alexis, Robert Koeppel, and René Neuville
1934 *Teleilat Ghassul I, 1929-1932*. Pontifical Biblical Institute, Rome.

Mallowan, Max E. L.
1947 Excavations at Brak and Chagar Bazar. *Iraq* 9:1–259.

Manclossi, Francesca, and Steven A. Rosen
2022 *Flint Trade in the Protohistoric Levant: the Complexities and Implications of Tabular Scraper Exchange in the Levantine Protohistoric Periods*. Routledge, London.

Margarit, Monica
2016 Testing the endurance of prehistoric adornments: Raw materials from the aquatic environment. *Journal of Archaeological Science* 70:66–81.

Matin, Mehran, and Moujan Matin

2012 Egyptian faience glazing by the cementation method part 1: an investigation of the glazing powder composition and glazing mechanism. *Journal of Archaeological Science* 39(3):763–776.

Mazar, Amihai, and Yael Rotem

2012 The Small Finds from the Early Bronze and Intermediate Bronze Ages. In *Excavations at Tel Beth-Shean 1989 - 1996. Vol. 4: The 4th and 3rd millennia BCE*, pp. 350–390. The Beth-Shean Valley Archaeological Project Publication 4. Israel Exploration Society, Jerusalem.

Mazzoni, S.

1998 Area E - Late Chalcolithic, Early, Middle and Late Bronze I Ages: Materials and Chronology. In *Tell Afis (Siria) Scavi sull'acropoli 1988-1992, The 1989-1992 Excavations on the Acropolis*, edited by S.M Cecchini and S. Mazzoni, pp. 9–100. Edizioni ETS, Pisa.

McCreery, David

1978 Preliminary report of the A.P.C. Township Archaeological Survey. *Annual of the Department of Antiquities of Jordan* 22:150–161.

Meadow, R.H., and Jonathan Mark Kenoyer

2005 Excavations at Harappa 2000–2001: New Insights on Chronology and City Organization. In *South East Asian Archaeology, 2001*, edited by C. Jarrige and V. Lefevre. CNRS.

Meyerhof, Ezra L.

1989 *The Bronze Age Necropolis at Kibbutz Hazorea, Israel*. University of Michigan Press, Ann Arbor.

Mienis, Henk K.

2005 The Mollusc Remains. In *Shoham (North) Late Chalcolithic Burial Caves in the Lod Valley, Israel*, pp. 155–157. Israel Antiquities Authority, Jerusalem.

2011 The Mollusc Remains from the Burial Caves at Sha'ar Efrayim. *'Atiqot* 66:73–74.

2012 Shells from Areas B And D. In *The Azor Cemetery. Moshe Dothan's Excavations, 1958 and 1960*, pp. 199–202. The Israel Antiquities Authority, Jerusalem.

Milevski, Ianir

2011 *Early Bronze Age Goods Exchange in the Southern Levant: A Marxist Perspective*. Equinox, Sheffield.

Miller, Joana
2009 Things as persons: Body ornaments and alterity among the Mamaindê (Nambikwara). In *The occult life of things: Native Amazonian theories of materiality and personhood*, edited by Fernando Santos-Granero, pp. 60–80. University of Arizona Press, Tuscon.

Minotti, Mathilde
2012 Ornaments and Use-Wear Analysis: Methods of Study Applied to the Adaima Necropolises. In *International Conferenec on Use-Wear Analysis*, edited by Joao Marreiros, Nuno Bicho, and Juan F. Gibaja, pp. 80–89. Cambridge Scholars Publishing, Cambridge.

de Miroschedji, Pierre
1993 Far'ah, Tell-El (North): Neolithic Period to Middle Bronze Age. In *The New Encyclopedia of Archaeological Excavations in the Holy Land*, edited by Ephraim Stern, pp. 433–438. Simon & Schuster, New York.

2000 Les sépultures hypogées au Levant des Ive-IIIe millénaires. In *L'ipogeismmo nel Mediterraneo: origini, sviluppo, quadri culturali.*, pp. 29–82. Universita degli Studi di sassari, Facolta di lettere e filosofia, Sassari.

2014 The Southern Levant (Cisjordan) During the Early Bronze Age. In *The Oxford Handbook of the Archaeology of the Southern Levant*, edited by Margreet L. Steiner and Ann E. Killebrew, pp. 95–109. Oxford University Press, Oxford.

de Miroschedji, Pierre, and Mo'ain Sadeq
2005 The frontier of Egypt in the Early Bronze Age: preliminary soundings at Tell es-Sakan (Gaza Strip). In *Archaeological Perspectives on the Transmission and Transformation of Culture in the Eastern Mediterranean*, edited by Joanne T. Clarke, pp. 155–169. Levant Supplementary Series 2. Oxbow Books, Oxford.

Moorey, Peter Roger Stuart
1999 *Ancient Mesopotamian Materials and Industries: the Archaeological Evidence*. Eisenbrauns, Winona Lake, Indiana.

Müller-Neuhof, Bernd
2014 A "marginal" region with many options: the diversity of Chalcolithic/Early Bronze Age socio-economic activities in the hinterland of Jawa. *Levant* 46(2):230–248.

2020 The EBA Colonization of the Northern Bādiyah: Fixing the Chronological Framework. *Studies in the History and Archaeology of Jordan* 13:129–142.

Nagaya, Kazuyoshi
2016 More Piercing Insights. *Nekhen News* 28:11–12.

Nai'mat, Zakariya N.A.
2003 Early Bronze Age I Mortuary Practices in the Southern Ghors of Jordan (Bâb adh-Dhrâʿ, An-Naqe' and Feifa). Unpublished MA Thesis, Yarmouk University, Irbid.

Najjar, Mohammed
2001 As-Safi and Fifa. *Munjazat* 2:38.

Nakai, Izumi, and Yoshinari Abe
2012 Portable X-ray powder diffractometer for the analysis of art and archaeological materials. *Applied Physics A* 106(2):279–293.

Needler, Winifred
1984 *Predynastic Egypt and Archaic Egypt in the Brooklyn Museum*. Wilbour Monographs 9. The Brooklyn Museum, Brooklyn.

Nicholson, Paul T., and Edgar Peltenburg
2000 Egyptian Faience. In *Ancient Egyptian Materials and Technology*, edited by Paul T. Nicholson and Ian Shaw. Cambridge University Press, Cambridge; New York.

Nicolle, Christophe
2012 The mid-4th millennium gathering site of Mutawwaq in Northern Jordan. In *Ad Orientem. Del final del Paleotico en el norte de Espana a las primeras civilizaciones del Oriente Proximo. Estudios en Homenaje al Professor Juan Antonio Fernandez-Tresguerres Velasco*, pp. 431–446. Ménsula Ediciones, Oviedo.

Nicolle, Christophe, and Frank Braemer
2012 Settlement Networks in the Southern Levant in the Mid 4th Millennium BC: Sites with Double- Apsed Houses in the Leja Area of Southern Syria During the EBA IA. *Levant* 44(1):1–16.

Nicolle, Christophe, and Michel al-Maqdissi
2006 Sharaya: un village du Bronze ancien Ia en Syrie du Sud. *Paléorient* 32(1):125–136.

Nigro, Lorenzo
2005 *Tell es-Sultan/Gerico alle soglie della prima urbanizzazione: il villaggio e la necropoli del Bronzo Antico I (3300-3000 A.C.)*. La Sapienza, Rome.

Nigro, Lorenzo, Lucio Calcagnile, Jehad Yasin, Elisabetta Gallo, and Gianluca Quarta
2019 Jericho and the Chronology of Palestine in the Early Bronze Age: A Radiometric Re-Assessment. *Radiocarbon* 61(1):1–31.

North, Robert
1961 *Ghassul 1960*. Analecta Biblica 14. Pontifical Biblical Institute, Rome.

Notroff, Jens, Klaus Schmidt, Ulrike Siegel, and and Lutfi Khalil
2014 Reconstructing networks, linking spaces—the view from the Aqaba region (Jordan). *Levant* 46(2):249–267.

Odler, Martin
2016 *Old Kingdom Copper Tools and Model Tools*. Archaeopress Egyptology 14. Archaeopress Publishing Ltd, Oxford.

Ogden, Jack
2000 Metals. In *Ancient Egyptian Materials and Technology*, edited by Paul T. Nicholson and Ian Shaw, pp. 148–176. Cambridge University Press, Cambridge.

Oldenburg, Evelyn
1991 *Sukas IX: The Chalcolithic and Early Bronze Age Periods*. Royal Danish Academy of Sciences and Letters, Copenhagen.

Olsen, Sandra L.
1988 Applications of Scanning Electron Microscopy in Archaeology. *Advances in Electronics and Electron Physics* 71:357–380.

Oren, Eliezer D.
1973 The Overland Route Between Egypt and Canaan in the Early Bronze Age (Preliminary Report). *Israel Exploration Journal* 23(4):198–205.

Ortner, Donald J., and Bruno Frolich
2008 *The Early Bronze Age I Tombs and Burials of Bab edh-Dhra', Jordan*. Reports of the Expedition to the Dead Sea Plain, Jordan 3. AltaMira Press, Plymouth.

Outram, Alan K.
2008 Introduction to Experimental archaeology. *World Archaeology* 40(1):1–6.

Panei, Liliana, Gilberto Rinaldi, and Maurizio Tosi
2005 Investigations on ancient beads from the Sultanate of Oman (Ra’s al-Hadd - Southern Oman). *ArchéoSciences* (29):151–155.

Papadopoulos, Thanasis, Litsa Kontorli-Papadopoulou, and Konstantinos D. Politis
2001 Rescue Excavations at an-Naq’ and Tulaylat Qasr Musa Al-Hamid 2000. *Annual of the Department of Antiquities of Jordan* 45:189–194.

Payne, Joan Crowfoot
1993 *Catalogue of the Predynastic Egyptian Collection in the Ashmolean Museum*. Clarendon Press, Oxford.

Peet, Thomas Eric
1914 *The Cemeteries of Abydos, Part II. 1911- 1912*. Egypt Exploration Fund, London.

Perrot, Jean
1955 The Excavations at Tell Abu Matar, Near Beersheba. *Israel Exploration Journal* 5(3):167–189.

Perrot, Jean, and Daniel Ladiray
1980 *Tombes à Ossuaires de la Région Cotière Palestinienne au IVe Millénaire avant l'ère Chrétienne*. Association Paléorient, Paris.

Petrie, W.M.F
1901 *Diospolis Parva: The Cemeteries of Abadiyeh and Hu 1898-9*. Egypt Exploration Fund, London.

1917 *Tools and Weapons*. British School of Archaeology in Egypt, London.

Petrie, W.M.F, and J.E. Quibell
1896 *Naqada and Ballas*. Bernard Quaritch, London.

Petrie, W.M.F, G.A. Wainwright, and A.H Gardiner
1913 *Tarkhan I and Memphis V*. British School of Archaeology in Egypt, London.

Pfeiffer, Kristina
2009 The Technical Ceramic for Metallurgical Activities in Tall Hujayrat al-Ghuzlan and Comparable Sites in the Southern Levant. In *Prehistoric Aqaba I*, edited by Lutfi Khalil and Klaus Schmidt, pp. 305–338. Orient-Archäologie 23. Leidorf, Rahden/Westfalen.

Philip, Graham
2003 The Early Bronze Age of the Southern Levant: A Landscape Approach. *Journal of Mediterranean Archaeology* 16(1):103–132.

2008 The Early Bronze Age I-III. In *Jordan An Archaeological Reader*, edited by Russell B Adams, pp. 161–226. Equinox, Sheffield.

Philip, Graham, and Douglas Baird
1993 Preliminary Report on the Second (1992) Season of Excavations at Tell esh-Shuna North. *Levant* 25(1):13–36.

2000 Early Bronze Age Ceramics in the Southern Levant: an Overview. In *Ceramics and Change in the Early Bronze Age of the Southern Levant*, edited by Graham Philip and Douglas Baird, pp. 3–30. Sheffield Academic Press, Sheffield.

Philip, Graham, and Owen Williams-Thorpe
2001 The Production and Consumption of Basalt Artefacts in the Southern Levant during the 5th - 4th Millennia BC: A Geochemical and Petrographic Investigation. In *Proceedings of Archaeological Sciences 1997*, edited by A.R Millard, pp. 129-150. Archaeopress, Oxford.

Pickard, C., and U.-D. Schoop
2013 Characterization of Late Chalcolithic Micro-Beads From Camlibel Tarlasi, North-Central Anatolia. *Archaeometry* 55(1):14–32.

Politis, Konstantinos D.
1998 Survey and Rescue Collections in Ghawr as-Safi. *Annual of the Department of Antiquities of Jordan* 42:627–634.

2012 The Beads and Miscellaneous Objects. In *Sanctuary of Lot at Deir ʻAin ʻAbata in Jordan: excavations, 1988-2003*, pp. 43–44. Jordan Distribution Agency, Amman.

2021 The Early and Middle Bronze Ages. In *Ancient landscapes of Zoara I: surveys and excavations at the Ghor as-Safi in Jordan, 1997-2018*, pp. 107–126. PEF Annual 17. Routledge, New York.

Ponting, Matthew
2004 The Scanning Electron Microscope and the Archaeologist. *Physics Education* 39(2):166–170.

Popper-Giveon, Ariela, Atef Abu-Rabia, and Jonathan Ventura
2014 From white stone to blue bead: materialized beliefs and sacred beads among the Bedouin in Israel. *Material Religion* 10(2):132–153.

Porat, Naomi
In Preparation Beads and Pendants. In *Two Bronze Age Cemeteries in the Qirya Quarter of Tel Aviv*. Ägypten und Altes Testament 113. Zaphon, Münster.

Purschwitz, Christoph
2017 The Prehistory of Tayma: The Chipped Stone Evidence. The Surface Finds and a Techno-Typological Analysis of Chert Artefacts from the Carnelian Bead Workshop SE2. *Zeitschrift für Orient-Archäologie* 10:288–311.

Quibell, J.E., and F.W. Green
1902 *Hierakonpolis II*. Egyptian Research Account, London.

Raad, Danielle R., and Cheryl A. Makarewicz
2019 Application of XRD and digital optical microscopy to investigate lapidary technologies in Pre-Pottery Neolithic societies. *Journal of Archaeological Science: Reports* 23:731–745.

Rapp, George, and Christopher L. Hill
2006 *Geoarchaeology: the Earth Science Approach to Archaeological Interpretation*. 2nd ed. Yale University Press, New Haven.

Rast, Walter E., and R. Thomas Schaub
1974 Survey of the Southeastern Plain of the Dead Sea, 1973. *Annual of the Department of Antiquities of Jordan* 19:5–53.
1978 A Preliminary Report of Excavations at Bab edh-Dhra' 1975. *Annual of the American Schools of Oriental Research* 43:1–31.

1980 Preliminary Report of the 1979 Expedition to the Dead Sea Plain, Jordan. *Bulletin of the American Schools of Oriental Research* 240:21–61.

1981 *The Southeastern Dead Sea Plain Expedition: An Interim Report of the 1977 Season*. The Annual of the American Schools of Oriental Research 46. American Schools of Oriental Research, Cambridge.

2003 *Bâb edh-Dhrâʿ Excavations at the Town Site (1975-1981)*. Reports of the Expedition to the Dead Sea Plain, Jordan 2. Eisenbrauns, Winona Lake, Indiana.

Reese, David S.
1995 Shells from the Wadi Hisma Sites. In *Prehistoric Cultural Ecology and Evolution*, pp. 385–390. Interdisciplinary Contributions to Archaeology. Springer US, Boston, MA.

Regev, Johanna, Pierre de Miroschedji, Raphael Greenberg, Eliot Braun, Zvi Greenhut, and Elisabetta Boaretto
2012 Chronology of the Early Bronze Age in the Southern Levant: New Analysis for a High Chronology. *Radiocarbon* 54(3–4):525–566.

Ritter Kaplan, Haya
1979 Tel Aviv, a Burial Cave in the Qirya. *Israel Exploration Journal* 29(3):241.

Rizkana, Ibrahim, and Jürgen Seeher
1988 *Maadi II: The Lithic Industries of the Predynastic Settlement*. Philipp von Zabern, Mainz am Rhein.

1989 *Maadi: III The Non-Litthic Small Finds and the Structural Remains of the Predynastic Settlement*. Philipp von Zabern, Mainz am Rhein.

1990 *Maadi IV: The Predynastic Cemeteries of Maadi and Wadi Digla*. Philipp von Zabern, Mainz am Rhein.

Rosen, Steven A.
1995 Microlithic Drills from the Camel Site, Mitzpeh Ramon. *Journal of the Israel Prehistoric Society* 26:148–158.

1997 *Lithics After the Stone Age: a Handbook of Stone Tools from the Levant*. AltaMira Press, Walnut Creek.

2017 *Revolutions in the Desert: the Rise of Mobile Pastoralism in the Negev and the Arid Zones of the Southern Levant*. Routledge, New York.

Rosenberg, Danny, and Raphael Greenberg
2014 The Stone Assemblage. In *Bet Yerah: The Early Bronze Age Mound II: Urban Structure and Material Culture 1933-1986 Excavations.*, pp. 189–234. Israel Antiquities Authority, Jerusalem.

Roux, V., B. Bril, and G. Dietrich
1995 Skills and Learning Difficulties Involved in Stone Knapping: The Case of Stone-Bead Knapping in Khambhat, India. *World Archaeology* 27(1):63–87.

Rowan, Yorke M.
2004 The Ground Stone Assemblage from Ashqelon, Afridar - Area E. *'Atiqot* 45:83–96.

2014 The Southern Levant (Cisjordan) During the Chalcolithic Period. In *The Oxford Handbook of the Archaeology of the Southern Levant*, edited by Margreet L. Steiner and Ann E. Killebrew, pp. 223–236. Oxford University Press, Oxford.

Rowan, Yorke M., and Jonathan Golden
2009 The Chalcolithic Period of the Southern Levant: A Synthetic Review. *Journal of World Prehistory* 22:1–92.

Rowan, Yorke M., and David Ilan
2007 The Meaning of Ritual Diversity in the Chalcolithic of the Southern Levant. In *Cult in Context: Reconsidering Ritual in Archaeology*, edited by David A. Barrowclough and Caroline Malone. Oxbow, Oxford.

2012 The Subterranean Landscape of the Southern Levant during the Chalcolithic Period. In *Sacred Darkness: A Global Perspective on the Ritual Use of Caves*, edited by Holley Moyes, pp. 87–108. University of Colorado Press, Boulder.

Rowan, Yorke M., and Thomas E. Levy
2011 Transitions in Macehead Manufacture in the Ancient Levant: A Case Study from Nahal Tillah (Tel Halif Terrace), Israel. In *Daily Life, Materiality, and Complexity in Early Urban Communities of the Southern Levant: Papers in Honor of Walter E. Rast and R. Thomas Schaub*, edited by Meredith S. Chesson, Walter Aufrecht, and Ian Kuijt, pp. 199–218. Eisenbrauns, Winona Lake, Indiana.

Rowan, Yorke M., Thomas E. Levy, David Alon, and Yuval Goren
2006 Gilat's Ground Stone Assemblage: Stone Fenestrated Stands, Bowls, Palettes, and Related Artifacts. In *Archaeology, Anthropology and Cult: the Sanctuary at Gilat, Israel*, edited by Thomas Evan Levy, pp. 575–684. Equinox, Sheffield.

de Saizieu, Barthélemy, and Anne Bouquillon
1994 Steatite Working at Mehrgarh During the Neolithic and Chalcolithic Periods: Quantitative Distribution, Characterization of Material and Manufacturing Processes. In *Proceedings of the twelfth International Conference of the European Association of South Asian Archaeologists held in Helsinki University, 5-9 July 1993*, edited by A. Parpola and P. Koskikallio, pp. 47–59. Suomalainen Tiedeakatemia, Helsinki.

2001 Émergence et évolution des matériaux vitrifiés dans la région de l'Indus du 5 e au 3 e millénaire (Merhgarh-Nausharo). *Paléorient* 26(2):93–111.

Salmon, Yossi
2008 Qiryat Haroshet - An Early Bronze Age Cemetery in the Vicinity of Tel Qashish. *Contract Archaeology Reports* 3:5–31.

Sass, Benjamin
2000 The Small Finds. In *Megiddo III: The 1992 - 1996 Seasons*, edited by Israel Finkelstein, David Ussishkin, and Baruch Halpern, pp. 349–423. Monograph series / Tel Aviv University, Sonia and Marco Nadler Institute of Archaeology 18. Emery and Claire Yass Publications in Archaeology, Tel Aviv.

Sass, Benjamin, and Gilad Cinamon
2006 The Small Finds. In *Megiddo IV: the 1998-2002 Seasons*, edited by Israel Finkelstein, David Ussishkin, and Baruch Halpern, pp. 353–428. Emery and Claire Yass Publications in Archaeology, Tel Aviv.

Savage, Stephen H.
2011 From Maadi to the Plain of Antioch: What Can Basalt Spindle Whorls Tell us About Overland Trade in the Early Bronze I Levant. In *Daily Life, Materiality, and Complexity in Early Urban Communities of the Southern Levant: Papers in Honor of Walter E. Rast and R. Thomas Schaub*, edited by Meredith S. Chesson, Walter Aufrecht, and Ian Kuijt, pp. 119–138. Eisenbrauns, Winona Lake, Indiana.

Schaub, R. Thomas
1981 Ceramic Sequences in the Tomb Groups at Bâb edh-Dhrâʿ. Edited by Walter E. Rast and R. Thomas Schaub. *Annual of the American Schools of Oriental Research* 46:69–118.

1991 Feifa and Wadi Khanazir. Archaeology in Jordan. *American Journal of Archaeology* 95:261–262.

2008a Basalt Bowls in EB IA Shaft Tombs at Bâb edh-Dhrâʿ: Production, Placement, and Symbolism. In *New Approaches to Old Stones Recent Studies of Ground Stone Artifacts*, edited by Yorke M. Rowan and Jennie R. Ebeling, pp. 277–284. Routledge, London.

2008b Cultural Artifacts of the EB I Tombs. In *The Early Bronze Age I Tombs and Burials of Bab edh-Dhra', Jordan*. Reports of the Expedition to the Dead Sea Plain, Jordan 3. AltaMira Press, Plymouth.

2009 Travelers to a Permanent Abode: Burial Practices of the Early Bronze Age I in the Southern Ghawrs of Jordan. *Studies in the History and Archaeology of Jordan* 10:745–756.

Schaub, R. Thomas, and Walter E. Rast
1989 *Bâb edh-Dhrâʿ Excavations in the Cemetery Directed by Paul W. Lapp (1965-67)*. Reports of the Expedition to the Dead Sea Plain, Jordan 1. Eisenbrauns, Winona Lake.

Scheftelowitz, Na'ama
2002 Beads. In *Tel Kabri: the 1986-1993 excavation seasons*, pp. 356–362. Monograph series / Tel Aviv University, Sonia and Marco Nadler Institute of Archaeology no. 20. Tel Aviv University, Tel Aviv.

Scheftelowitz, Na'ama, and Ronit Oren
2004 *Giv'at Ha-Oranim: A Chalcolithic Site*. Tel Aviv University, Tel Aviv.

Scheper-Hughes, Nancy
1985 Culture, Scarcity, and Maternal Thinking: Maternal Detachment and Infant Survival in a Brazilian Shantytown. *Ethos* 13(4):291–317.

Seaton, Peta
2008 *Chalcolithic cult and risk management at Teleilat Ghassul: the Area E Sanctuary*. BAR international series 1864. Archaeopress, Oxford.

Sebbane, Michael, and Uzi Avner
1993 Biq'at Nimra: A Tomb from the Beginning of the Early Bronze Age I. *'Atiqot* 22:33–40.

Seeher, Jürgen
1992 Burial Customs in Predynastic Egypt: A View from the Delta. In *The Nile Delta in Transition: 4th - 3rd Millennium B.C.*, edited by Edwin C. M Van den Brink, pp. 225–234. Israel Exploration Society, Jerusalem.

Segal, Dror, and Israel Carmi
1996 Rehovot Radiocarbon Date List V. *'Atiqot* 29:79–106.

Segal, Irina, Ludwig Halicz, and Andrei Kamenski
2004 The Metallurgical Remains from Ashqelon, Afridar— Areas E, G and H. *'Atiqot* 45:311–330.

Seger, Joe D., Brent Baum, Oded Borowski, Dan P. Cole, Harold Forshey, Eugene Futato, Paul F. Jacobs, Mark Laustrup, Patti O'Connor Seger, and Melinda Zeder
1990 The Bronze Age Settlements at Tell Halif: Phase II Excavations, 1983-1987. *Bulletin of the American Schools of Oriental Research. Supplementary Studies* 26:1–32.

Shalem, Dina, Zvi Gal, and Howard Smithline
2013 *Peqi'in: a late Chalcolithic burial site Upper Galilee, Israel*. Land of Galilee 2. Ostracon, Jerusalem.

Sharvit, Jacob, Ehud Galili, Baruch Rosen, and Edwin C. M van den Brink
2002 Predynastic Maritime Traffic along the Carmel Coast of Israel: a Submerged Find from North Atlit Bay. In *In Quest of Ancient Settlements and Landscapes Archaeological Studies in Honor of Ram Gophna*, edited by Edwin C. M van den Brink and Eli Yannai. Ramot Publishing - Tel Aviv University, Tel Aviv.

Shaw, Alison
2014 Rituals of Infant Death: Defining Life and Islamic Personhood. *Bioethics* (2):84–95.

Shizhu, Wen, and Huang Ping
2012 *Principles of Tribology*. John Wiley & Sons Inc, Hoboken, N.J.

Smithline, Howard
2001 Chalcolithic and Early Bronze Age Caves at Asherat Western Galilee. *'Atiqot* 42:35–78.

Spielmann, Katherine A.
1998 Ritual Craft Specialists in Middle Range Societies. *Archeological Papers of the American Anthropological Association* 8(1):153–159.

Stager, Lawrence E.
1985 The First Fruits of Civilization. In *Palestine in the Bronze and Iron Ages: Papers in Honor of Olga Tufnell*, edited by Jonathan N. Tubb, pp. 172–188. Institute of Archaeology, London.

1992 The Periodization of Palestine from Neolithic through Early Bronze Times. In *Chronologies in Old World Archaeology*, edited by R. Ehrich, pp. 22–41. 3rd ed. University of Chicago Press, Chicago.

2001 Port Power in the Early and Middle Bronze Age: the Organization of Maritime Trade and Hinterland Production. In *Studies in the Archaeology of Israel and its Neighbors in Memory of Douglas L. Esse*, edited by Samuel R. Wolff, pp. 625–638. Studies in Ancient Oriental Civilization 59. The Oriental Institute of the University of Chicago, Chicago.

Steimer-Herbet, Tara
2000 Etude des monuments mégalithiques de Mengez (Liban) d'après les carnets de fouilles du R.P.Tallon (1959-1969). *Syria* 77(1):11–21.

Steimer-Herbet, Tara, and Marie Besse
2017 Qarassa, vestiges d'une société à mégalithes dans le Leja en Syrie du Sud, entre 3600 et 3000 avant J.-C. *Paléorient* 43(2):91–113.

Stern, Ephraim (editor)
1993 *The New Encyclopedia of Archaeological Excavations in the Holy Land*. Simon & Schuster, New York.

2008 *The New Encyclopedia of Archaeological Excavations in the Holy Land: Supplementary Volume*. Israel Exploration Society, Jerusalem.

Stevenson, Alice
2007 The Aesthetics of Predynastic Egyptian Burial: Funerary Performances in the Fourth Millennium BC. *Archaeological Review from Cambridge* 22(1):76–92.

2009 Social Relationships in Predynastic Burials. *The Journal of Egyptian Archaeology* 95:175–192.

2016 The Egyptian Predynastic and State Formation. *Journal of Archaeological Research* 24:421–468.

Stocks, Denys A.
1989 Ancient factory mass-production techniques: indications of large-scale stone bead manufacture during the Egyptian New Kingdom Period. *Antiquity* 63(240):526–531.

2003 *Experiments in Egyptian archaeology: stoneworking technology in ancient Egypt*. Routledge, London.

Sussman, Varda, and Sara Ben-Arieh
1966 Ancient Burials in Givʿatayim. *ʾAtiqot* 3:27–39.

Talbot, Geraldine C.
1983 Beads and Pendants from the Tell and Tombs. In *Excavations at Jericho Volume 5: The Pottery phases of the Tell and other Finds*. British School of Archaeology in Jerusalem, London.

Tarlow, Sarah
1999 *Bereavement and Commemoration: An Archaeology of Mortality*. Wiley-Blackwell, Oxford.

Tata, Frederico, Joao Cascalheira, Joao Marreiros, Telmo Pereira, and Nuno Bicho
2014 Shell bead production in the Upper Paleolithic of Vale Boi (SW Portugal): an experimental perspective. *Journal of Archaeological Science* 42:29–41.

Thuesen, I
1988 *Hama: The Pre- and Protohistoric Periods*. Nationalmuseet, Copenhagen.

Tite, M. S., and M. Bimson
1989 Glazed steatite: An investigation of the methods of glazing used in ancient Egypt. *World Archaeology* 21(1):87–100.

Tite, M. S., Andrew J. Shortland, and Anne Bouquillon
2008 Glazed Steatite. In *Production Technology of Faience and Related Early Vitreous Materials*, pp. 23–36. Monograph 72. Oxford University School of Archaeology, Oxford.

Tite, M. S., Andrew J. Shortland, A. Kaczmarczyk, and P.B Vandiver
2008 Faience Production in Egypt. In *Production Technology of Faience and Related Early Vitreous Materials*, pp. 57–90. Monograph 72. Oxford University School of Archaeology, Oxford.

Tite, M. S., Andrew J. Shortland, and P.B Vandiver
2008 Raw Materials and Fabrication Methods Used in the Production of Faience. In *Production Technology of Faience and Related Early Vitreous Materials*, pp. 37–56. Monograph 72. Oxford University School of Archaeology, Oxford.

Tufnell, Olga
1958 *Lachish IV (Tell ed-Duweir) the Bronze Age*. Oxford University Press, London.

Ussishkin, David
1980 The Ghassulian Shrine at En-gedi. *Tel Aviv* 7(1–2):1–44.

2015 The Sacred Area of Early Bronze Age Megiddo: History and Interpretation. *Bulletin of the American Schools of Oriental Research* 373:69–104.

Van Gijn, Annelou
2017 Bead Biographies from Neolithic Burial Contexts Contributions from the Microscope. In *Not Just for Show: The Archaeology of Beads, Beadwork, & Personal Ornaments*, edited by Daniella E. Bar-Yosef Mayer, Clive Bonsall, and Alice M. Choyke, pp. 103–114. Oxbow Books, Oxford.

Vandiver, P.B
1983 Egyptian Faience Technology Appendix A. In *Ancient Egyptian Faience*, pp. A1–A144. Aris and Phillips, Warminster.

de Vaux, Roland
1951 La trosième campagne de fouilles à Tell el- Far‘ah, près Naplouse. Rapport préliminaire. *Revue Biblique* 58:393–430, 566–590.

1952 La quatrième campagne de fouilles à Tell el-Far‘ah près Naplouse. *Revue Biblique* 59:551–583.

de Vaux, Roland, and A.M Steve
1949 La deuxieme campagne de fouilles Tell el-Far‘ah, pres Naplouse. *Revue Biblique* 56:102–138.

Vidale, Massimo
1989 A Steatite-Cutting Atelier on the Surface of Moenjodaro. *Annali* 49:29–51.

1995 Early Beadmakers of the Indus Tradition the Manufacturing Sequence of Talc Beads at Mehrgarh in the 5th Millennium B.C. *East and West* 45(1):45–80.

Waheeb, Mohammad
1995 The First Season of the An-Naq’ Project, Ghawr as-Safi. *Annual of the Department of Antiquities of Jordan* 39:553–555.

Wei, Yi, Francesco d’Errico, Marian Vanhaeren, Fei Peng, Fuyou Chen, and Xing Gao
2017 A technological and morphological study of Late Paleolithic ostrich eggshell beads from Shuidonggou, North China. *Journal of Archaeological Science* 85:83–104.

Weinstein, James M.
1984 Radiocarbon Dating in the Southern Levant. *Radiocarbon* 2(3):297–366.

Wenger, Etienne
1998 *Communities of Practice: Learning, Meaning, and Identity*. Cambridge University Press, Cambridge.

Wengrow, D.
2006 *The Archaeology of Early Egypt: Social Transformations in North-East Africa, 10,000 to 2,650 BC*. Cambridge University Press, Cambridge.

van Wetering, Joris, and Geoffrey J. Tassie
2020 Nubt during the Fourth Millennium. In *The Many Histories of Naqada: Archaeology and Heritage in an Upper Egyptian Region*, edited by Alice Stevenson and Joris van Wetering, pp. 69–94. Golden House Publications, London.

Wiessner, Polly
1984 Reconsidering the behavioral basis for style: A case study among the Kalahari San. *Journal of Anthropological Archaeology* 3(3):190–234.

Wilkinson, Alix
1989 Jewelry Beads. In *Bâb edh-Dhrâʿ Excavations in the Cemetery Directed by Paul W. Lapp (1965-67)*. Reports of the Expedition to the Dead Sea Plain, Jordan 1. Eisenbrauns, Winona Lake.

Winnicka, Kinga
2016 More than Meets the Eye: Microscopic and Technological Studies on Early Bronze Age Bone and Antler Beads from Kichary Nowe, South-Eastern Poland. In *Close to the Bone: Current Studies in Bone Technologies*, edited by Selena Vitezovic, pp. 376–394. Belgrade Institute of Archaeology, Belgrade.

Wright, Katherine, Pat Critchley, and Andrew Garrard
2008 Stone Bead Technologies and Early Craft Specialization: Insights from Two Neolithic Sites in Eastern Jordan. *Levant* 40(2):131–165.

Wright, Katherine, Mohammed Najjar, Jonathan Last, Norah Moloney, Matthias Flender, Jonathan Gower, Nicholas Jackson, Amanda Kennedy, and Rula Shafiq
1998 The Wadi Faynan Fourth and Third Millennia Project, 1997: Report on the First Season of Test Excavations at Wadi Faynan 100. *Levant* 30(1):33–60.

Wulff, H.E., H.S. Wulff, and L. Koch
1968 Egyptian faience - a possible survival in Iran. *Archaeology* 21:98–107.

Xia, Nai
2014 *Ancient Egyptian Beads*. Springer, Heidelberg.

Yahalom-Mack, Naama, Dafna Langgut, Omri Dvir, Ofir Tirosh, Adi Eliyahu-Behar, Yigal Erel, Boaz Langford, Amos Frumkin, Mika Ullman, and Uri Davidovich
2015 The Earliest Lead Object in the Levant. Edited by John P. Hart. *PLOS ONE* 10(12): e0142948.

Yannai, Eli
2007 el-Fureidis. *Hadashot Arkheologiyot* 119.

2016 *’En Esur ('Ein Asawir) II Excavations at the Cemeteries*. Ostracon Publishing Services, Jerusalem.

Yannai, Eli, and Daniella E. Bar-Yosef Mayer
2016 Bead Production in Tombs T3 and T20. In *’En Esur ('Ein Asawir) II Excavations at the Cemeteries*, pp. 116–120. Ostracon Publishing Services, Jerusalem.

Yekutieli, Yuval

2001 The Early Bronze Age IA of Southwestern Canaan. In *Studies in the Archaeology of Israel and its Neighbors in Memory of Douglas L. Esse*, edited by Samuel R. Wolff, pp. 659–688. Studies in Ancient Oriental Civilization 59. The Oriental Institute of the University of Chicago, Chicago.

2014 The Early Bronze Age Southern Levant: The Ideology of an Aniconic Reformation. In *The Cambridge Prehistory of the Bronze and Iron Age Mediterranean*, edited by A. Bernard Knapp and Peter van Dommelen, pp. 609–618. Cambridge Univ. Press, Cambridge.

2022 "Let's Make a Clean Slate of the Past!" Alternative Reading of the Chalcolithic-Early Bronze Age Transition. In *Transitions Dring the Early Bronze Age in the Levant: Methodological Problems and Interpretative Perspectives*, edited by Matthew J. Adams and Valentine Roux, pp. 117–120. Zaphon, Münster.

Zuckerman, Sharon

2003 Tel Qashish in the Early Bronze Age I. In *Tel Qashish a Village in the Jezreel Valley: Final Report of the Archaeological Excavations (1978-1987)*, pp. 57–60. Qedem Reports 5. Institute of Archaeology, Jerusalem.

Appendix A: EDS Readings from Fifa and Comparative Examples

Sample	Tomb	Object	Type	SiO_2	Na_2O	PO_4	K_2O	CaO	MgO	Al_2O_3	MnO	V_2O_5	FeO	CuO	PbO
1	7	5076 Fragment	Steatite Body	62.49	1.58			2	27.7					3.4	
2	7	5070.004 Fragment	Drill Hole	57.57	1.2	5.26	.46	7.72	9.71	.92				2.49	7.9
2	7	5070.004 Fragment	Lead Concentration on Glaze	41.09	7.03	4.77	0.36	4.47	21.53	1.02			0.78	1.30	8.54
3	7	5070.004 Fragment	Glaze	58.01				0.99	29.49					10.54	
6	12	5108.001 Fragment	Steatite Body	64.62	0.54			0.98	31.89				0.77		
6	12	5108.001	Drill Hole	19.19		15.30	1.26	16.64	6.57	0.74			1.85	4.20	29.85
15	20	5101.002	Glaze	58.93		1.95		11.84	4.08	17.5	1.72		3.99		
15	20	5101.002	Drill Hole	73.66				14.76	1.41		3.11		7.06		
16	20	5101.001	Vanadium and Lead Coating	32.31				2.05	20.6	1.02		20.33			22.66

Table AD.1 EDS Readings from Fifa Glazed Steatite Beads

Period	Origin	Component	SiO_2	Na_2O	PO_4	K_2O	CaO	MgO	Al_2O_3	Cl	FeO	CuO	PbO
Badarian (5th -4th millennium)	Egypt	Glaze	51.9	7.6			3.3	19.6	1.2		1.7	14.7	
Naqada I (4th millennium)	Egypt	Glaze	60.08	5.4		.09	.72	25.94	.56		.2	5.21	
Late Chalcolithic (4th millennium)	Anatolia	Glaze	50.24		3.72	.09	2.65	26.53	2.06		1.53	3.35	9.79
Late Chalcolithic	Anatolia	Bulk	63.52	1.15		.09	.42	38.02	1.26	.45	1.10		
Chalcolithic (5th – 4th millennium)	Indus Valley	Glaze	50.6	10.3		.6	6.5	1.6	11.6		3.5	11.5	
Chalcolithic (5th – 4th millennium)	Indus Valley	Glaze	59.4	9.6		1.6	5	.7	11.9		3.6	6.5	

Table AD.2 Readings taken from Pickard and Schoop 2013; de Saizieu and Bouqillon 2001; Tite and Bimson 1989; Vandiver 1983;

Appendix B: Database of Late Chalcolithic and Early Bronze Age I Beads and Pendants

Late Chalcolithic (c. 4500-3700)

Abu Hamid (Transjordan)				
Dollfus and Kaffifi 1993				
Context:	Unspecified Context			
	Bone	Shell	Unidentified Stone	Total
Long Barrel	1		1	2
Long Cylinder				
Trapezoidal Pendant		2		2
Oval Pendant		3		3
	1	5	1	7

Abu Matar (Cisjordan)								
Perrot 1955								
Context:	Unspecified Context							
Shell Species:	Aspatharia, Cowrie, Nerite							
	Bone	Copper	Marble	Mother of Pearl	Schist	Shell	Turquoise	Total
Unspecified						3		3
Cylinder Disc		8		2				10
Long Cylinder		1						1
Square Long Cone	1							1
Trapezoidal Pendant	1			1			1	3
Oval Pendant	1		1	4				6
Rectangular Pendant	1				1			2
Tabular Pendant	1							1
	5	9	1	7	1	3	1	27

Tell Afis (Lebanon)		
Mazzoni 1998		
Context:	Domestic	
	Greenstone	Total
Unspecified	1	1
	1	1

Arad (Cisjordan)			
Amiran 1978			
Context:	Unspecified Context		
	Limestone	Mother of Pearl	Total
Trapezoidal Pendant	1	1	2
	1	1	2

Ben Shemen (Cisjordan)			
Perrot and Ladiray 1980			
Context:	Funerary		
	Greenstone	Limestone	Total
Short Cylinder		1	1
Teardrop Pendant	1		1
	1	1	2

Beqo'a (Cisjordan)			
Golani et al. 2018; Ktalav 2018			
Context:	Funerary		
Shell Species	Glycymeris Nummaria		
	Mother of Pearl	Shell	Total
Unspecified	1	1	2
Cylinder Disc		1	1
	1	2	3

Byblos (Lebanon)											
Dunand 1973											
Context:	Jar Burials										
	Bone	Carnelian	Flint	Greenstone	Hematite	Limestone	Mother of Pearl	Ostrich Eggshell	Rock Crystal	Steatite	Total
Unspecified	?	?	?	?	53	?	?	?	?	?	53+?
Candy Wrapper Pendant	5										5
	5+?	?	?	?	53	?	?	?	?	?	58+?

Ein Gedi (Cisjordan)			
Ussishkin 1980; Bar-Yosef Mayer et al. 2014			
Context:	Shrine Alter		
	Bone	Glazed Steatite	Total
Unspecified		?	?
Crescent Shaped Pendant	1		1
Extended Cylindrical Pendant	1		1
	2	?	2+?

'el-Fureidis (Cisjordan)		
Yannai 2007		
Context:	Funerary	
	Limestone	Total
Trapezoidal Pendant	1	1
	1	1

Fazael 1 (Cisjordan)		
Bar et al. 2014		
Context:	Domestic	
	Unidentified Stone	Total
Long Barrel	1	1
	1	1

Gezer (Cisjordan)					
Dever 1974; Gilmour 2014					
Context:	Fill				
	Carnelian	Ostrich Eggshell	Mother of Pearl	Shell	Total
Unspecified	?	?		?	?
Cylinder Disc			1		1
Short Cylidner			1		1
	?	?	2	?	2

Gilat (Cisjordan)											
Bar-Yosef Mayer 2006; Levy et al. 2006; Rowan et al. 2006											
Context:	Industrial area, pits, dog burials, domestic.										
	Agate	Amazonite	Bone	Calcite	Carnelian	Ceramic	Chalk	Flint	Gypsum	Ivory	Total
Unspecified		2	2		1	2	3	1			11
Barrel Disc		5		1	1			1			8
Oblate Disc		1					1				2
Short Cylinder with Two Convex Ends	1	1					1	2			5
Long Cylinder			3	2					1		6
Long Truncated Bicone		1		1			1				3
Unspecified Pendant			1	3		15	6			1	26
Cylindrical Pendant		1		1							2
Decorated Trapezoidal Pendant							2				2
Dome Shaped Pendant									1	1	2
Rounded Trapezoidal Pendant							1				1
Trapezoidal Pendant						1					1
Thick Triangular Pendant							1				1
	1	15	6	8	2	18	16	4	2	2	75

Gilat (cont.)	
Bar-Yosef Mayer 2006; Levy et al. 2006; Rowan et al. 2006	
Shell Species:	Nerita Sanguinolenta, Nerita Polita, Strombus Mutabilis, Columbella Rustica, Ancilla sp., Glycymeris Violacescens, Aspatharia Rubens, Tridacna sp.
Context:	Industrial area, pits, burials, domestic.

	Jasper	Limestone	Mother of Pearl	Ostrich Eggshell	Quartz	Sandstone	Schist	Shell	Turquoise	Unidentified Stone	Total
Unspecified		1			1		2	17	2	2	25
Barrel Disc	4	6		1			4	1	1		17
Oblate Disc				1					1		2
Short Cylinder with Two Convex Ends		5							2		7
Long Cylinder		10									10
Truncated Bicone		3					3			1	7
Unspecified Pendant		6		1	1		3	5		1	17
Cylindrical Pendant		2					1				3
Decorated Trapezoidal Pendant			1					1			2
Dome Shaped Pendant			2								2
Oval Pendant		1									1
Rectangular Pendant			1								1
Rounded Trapezoidal Pendant		2						2			4
Trapezoidal Pendant		4	2								6

Thick Triangular Pendant						1				1	2
	4	40	6	3	2	1	13	26	6	5	106

Giv'at Ha-Oranim (Cisjordan)		
Scheftelowitz and Oren 2004		
Context:	Funerary, Pits	
	Mother of Pearl	Total
Rectangular Pendant	3	3
	3	3

Grar (Cisjordan)					
Bar-Yosef Mayer 1995; Gilead 1995					
Shell Species	Dentalium Sp, Glycymeris Violascens, Cerastoderma Glaucum, Donax Trunculus.				
Context:	Funerary, Pits				
	Ceramic	Greenstone	Limestone	Shell	Total
Unspecified				12	12
Pear Shaped Pendant			1		1
Rectangular Pendant	1		4		5
Rhomboid Pendant		1			1
Trapezoidal Pendant	1				1
	2	1	5	12	20

Horvat Castra (Cisjordan)				
Van den Brink et al. 2004				
Context:	Funerary			
	Carnelian	Faience[13]	Greenstone	Total:
Short Cylinder		4		4
Long Cylinder		4		4
Elliptical Long Cylinder	1			1
Convex Long Truncated Convex Cone			1	1
	1	8	1	10

Horvat Qarqar South (Cisjordan)		
Fabien et al. 2015		
Context:	Funerary	
	Mother of Pearl	Total
Trapezoidal Pendant	4	4
	4	4

[13] It is possible that some of these faience beads are glazed steatite on account of their small size and plain perforations.

Kissufim Road (Cisjordan)		
Bar-Yosef Mayer 2002b		
Context:	Funerary. Pendants found intermixed with the bones of the deceased.	
Shell Species	Aspatharia Rubens, Pinctada Margaritifera	
	Mother of Pearl	Total
Oval Pendant	2	2
Rectangular Pendant	6	6
Trapezoidal Pendant	7	7
	15	15

Lod (Cisjordan)		
Van den Brink et al. 2015		
Context:	Unspecified	
Shell Species	Glycymeris Nummaria	
	Shell	Total
Unspecified	3	3
	3	3

Nahal Mishmar (Cisjordan)								
Bar-Yosef Mayer et al. 2014								
Context:	Funerary, Hoard							
	Calcite	Carnelian	Lapis Lazuli	Limestone	Mother of Pearl	Shell	Glazed Steatite	Total
Short Cylinder	1	2	1			3	2	9
Truncated Convex Bicone		3						3
Short Truncated Bicone		1						1
Standard Cylinder							1	1
Pentagonal Short Cylinder		1						1
Rectangular Pendant					3			3
Trapezoidal Pendant				1				1
	1	7	1	1	3	3	3	19

Nahal Qanah (Cisjordan)						
Gopher and Tsuk 1996						
Context:	Funerary					
Shell Species	Dentalium, Glycymeris Sp.					
	Carnelian	Greenstone	Shell	Turquoise	Unidentified Stone	Total
Short Cylinder	2		9		2	13
T-shaped pendant		1				1
	2	1	9		2	14

Nahal Ze'elim Cave 32 (The Cave of the Skulls) (Cisjordan)			
Aharoni 1961; Davidovich 2022; Joffe n.d.			
Context:	Cave. Beads formed into a purse and sewn onto cloth bags.		
	Carnelian	Glazed Steatite	Total
Unspecified	?	~12,000	~12,000+?
	?	~12,000	~12,000+?

Nahal Ze'elim Cave 49 (Cisjordan)			
Aharoni 1961			
Context:	Cave.		
	Bone	Shell	Total
Trapezoidal Pendant	3	3	6
	3	3	6

Neve Noy (Cisjordan)		
Eldar and Baumgarten 1985; Bar-Yosef and Porat 2009.		
Context:	Cave.	
	Glazed Steatite[14]	Total
Unspecified	?	?
	?	?

[14] Beads originally published as faience. Reassigned by Bar-Yosef Mayer and Porat 2009.

Palmahim Quarry (Cisjordan)				
Gophna and Lifshitz 1980; Gorzalczany 2018; Ktalav 2018				
Context:	Funerary			
Shell Species	Glycymeris nummaria			
	Limestone	Shell	Unidentified Stone	Total
Unspecified		1		1
Short Barrel			1	1
Trapezoidal Pendant	4			4
	4	1	1	6

Peqi'in (Cisjordan)													
Bar-Yosef Mayer 2013; Bar-Yosef Mayer and Porat 2013													
Shell Species:	Nerita sanguinolenta, Theodoxus jordani, Columbella rustica, Nassarius gibbosulus, Ancilla cf lineolata, Ancillla sp, Conus mediterraneus, Conus sp., Glycymeris insubrica, unio terminalis, unionidae, pinctada margaritifera.												
Context:	Funerary												
	Actinolite	Agate	Amazonite	Amethyst	Apatite	Basalt	Bone	Calcarenite	Calcite	Carnelian	Chalk	Copper	Total
Barrel Disc		2			1					1			4
Cylinder Disc					3								3
Oblate	2		1										3
Short Barrel	2				12	5		3	3	3	2	2	32
Short Truncated Convex Cone					1								1
Short Convex Bicone		1											1
Short Truncated Convex Bicone				1						2	2		5
Short Cylinder					3	1			1	2		2	9
Short Truncated Bicone						1				1			2
Standard Truncated Bicone					1								1
Standard Cylinder												2	2
Ellipsoid					1								1
Long Barrel	1		1		1			1	1				5
Long Convex Bicone							1						1

Long Truncated Bicone					1								1
Elliptical Short Cylinder					1								1
Elliptical Long Convex Bicone	1												1
Lenticular Long Convex Bicone			2										2
Circle and Flat Cylinder Disc					1								1
Zoomorphic Pendant					1								1
	6	3	4	1	27	7	1	4	5	9	4	6	77

Peqi'in (cont.)											
Bar-Yosef Mayer 2013; Bar-Yosef Mayer and Porat 2013											
Shell Species:	Nerita sanguinolenta, Theodoxus jordani, Columbella rustica, Nassarius gibbosulus, Ancilla cf lineolata, Ancillla sp, Conus mediterraneus, Conus sp., Glycymeris insubrica, unio terminalis, unionidae, pinctada margaritifera.										
Context:	Funerary										
	Fluorite	Limestone	Marble	Obsidian	Rock Crystal	Serpentine	Shell	Glazed Steatite	Turquoise	Unidentified Stone	Total
Unspecified				1			1	1	1		4
Barrel Disc		1					4				5
Cylinder Disc		2									2
Short Barrel	1	70	15			1	21			8	116
Short Convex Bicone			1								1
Short Truncated Convex Bicone		14	3		1		53	1		1	73
Short Cylinder		7	1				2	184		1	195
Circular			1					1			2

Standard Barrel			1								1
Standard Cylinder								1			1
Long Barrel		3	1							1	5
Elliptical Standard Barrel			1								1
Elliptical Long Barrel			1								1
Circle and Flat Short Barrel			1								1
Circle and Flat Short Cylinder								1			1
Zoomorphic Pendant		1									1
	1	98	26	1	1	1	81	189	1	11	410

Qina Cave (Cisjordan)		
Davidovich et al. 2018		
Context:	Funerary. Objects found cached together in a fissure in the deepest part of the cave.	
Shell Species	Pinctada margaritifera	
	Mother of Pearl	Total
Rectangular Pendant	11	11
Trapezoidal Pendant	13	13
“Violin Figurine” Trapezoidal Pendant	2	2
	26	26

Ras Shamra (Syria)						
Contenson 1992						
Context:	Funerary					
Shell Species	Dentalium Sp.					
	Greenstone	Obsidian	Shell	Steatite (Unglazed)	Unidentified Stone	Total
Unspecified			8			8
Short Barrel	1					1
Short Cylinder				2		2
Ellipsoid	1				1	2
Long Barrel		1				1
Long Cylinder			1	1	1	3
Oval Globular Pendant					1	1
Ram’s Head Pendant				1		1
Rectangular Pendant				1		1
	2	1	9	5	3	21

Sha’ar Efrayim (Cisjordan)				
Van den Brink 2011				
Context:	Funerary.			
Shell Species	Conus flavidus, Glycymeris insubrica			
	Bone	Carnelian	Shell	Total
Unspecified			1	1
Short Cylinder		2		2
Long Barrel	3			3
Long Concave	1			1
Unspecified Pendant			2	2
	4	2	3	9

Shiqmim (Cisjordan)								
Levy and Alon 1982; Levy and Alon 1987a; Levy and Alon 1987b; Rowan and Golden 2009								
Contexts:	Domestic, Funerary							
Shell Species	Connus Sp. Dentalium Sp.							
	Bone	Carnelian	Copper	Mother of Pearl	Ostrich Eggshell	Shell	Glazed Steatite	Total
Unspecified	3	7	1		1	3	?	15+?
Barrel Disc		1						1
Oblate	1							1
Short Cylinder	4							4
Long Cylinder						1		1
Trapezoidal Pendant	1			4		5		10
Rectangular Pendant				2				2
Figurine Shaped Trapezoidal Pendant				1				1
Violin Shaped Pendant				1				1
	9	8	1	8	1	9	?	36+?

Shoham (North) (Cisjordan)		
Mienis 2005		
Context:	Funerary	
Shell Species	Glycymeris, Cerastoderma	
	Shell	Total
Unspecified Pendant	3	3
	3	3

Teleilat Ghassul (Transjordan)												
Bourke 2002; Bourke et al. 1995, 2000, Hennessy 1969; Mallon et al. 1934; North 1961; Seaton 2008												
Context:	Courtyard Debris, Domestic, Sanctuary, Unspecified,											
	Bone	Calcite	Carnelian	Chalk	Faience	Greenstone	Hematite	Jasper	Limestone	Malachite	Marble	Total
Unspecified	?		?		?	1						1+?
Barrel Disc											1	1
Cylinder Disc								2	2			4
Short Barrel									1	4		5
Short Cylinder										1		1
Standard Barrel	1											1
Long Barrel										4		4
Long Cylinder	1	1										2
Long Truncated Convex Bicone										1		1
Triangular Short Barrel										2		2
Pentagonal Long Barrel										1		1
Globular Oval Pendant							1					1
Isosceles Triangle Pendant	1											1
Oval Pendant				1					6			7
Oval Pendant with Top Ring									1			1
Rectangular Pendant with Top Ring	1											1
Semicircle Pendant	2											2

Teardrop Pendant									1			1
Triangular Pendant	3	1		1		2	1		5			13
Trapezoidal Pendant	1											1
	10	2	?	2	?	3	2	2	16	13	1	51+?

Teleilat Ghassul							
Bourke 2002; Bourke et al. 1995, 2000, Hennessy 1969; Mallon et al. 1934; North 1961; Seaton 2008							
Context:	Courtyard Debris, Domestic, Sanctuary, Unspecified,						
	Mother of Pearl	Nephrite	Sandstone	Serpentine	Shell	Steatite (Unglazed)	Unidentified Stone	Total
Unspecified							1+?	1+?
Barrel Disc							5	5
Short Cylinder	1				40	1	?	42+?
Long Barrel							1	1
Long Cylinder							?	?
Arrowhead Shaped Pendant	1							1
Crescent Pendant	3							3
Oval Pendant	1	1					1	3
Quadrant Pendant					1			1
Rectangular Pendant	4	2			4			10
Semicircle Pendant	2	1						3
Teardrop Pendant		1						1
Triangular Pendant	2			1			1	4
Trapezoidal Pendant			1				?	1+?
	14	5	1	1	45	1	9+?	76+?

Early Bronze Age IA (c. 3700-3400)

Ashqelon, Afridar (Cisjordan)		
Rowan 2004		
Context:	Domestic	
	Flint	Total
Unspecified	1	1
	1	1

Azor (Cisjordan)		
Mienis 2012		
Context:	Unidentified floor refuse.	
Shell Species		
	Shell	Total
Unspecified	3	3
	3	3

Bâb adh-Dhrâʿ (Transjordan)										
Schaub 2008b; Schaub and Rast 1989										
Context	Funerary									
	Bone	Calcite	Carnelian	Hematite	Lapis Lazuli	Malachite	Shell	Glazed Steatite[15]	Unidentified Stone	Total
Unspecified	?			1	1			429		431
Barrel/Cylinder Disc		1	223			?	86	11		321
Short Cylinder/Barrel			22					977	1	999
Standard Barrel/Short Truncated Convex Bicone							41	9	?	50+?
Long Bicone			1			1		7	1	10
	?	1	246	1	1	1+?	127	1,433	2+?	1421+?

[15] I argue for the reidentification of most of the faience and ostrich eggshell beads published by Wilkinson (1989) as glazed steatite.

Byblos (Lebanon)												
Gassia 2009												
Context	Jar Burials											
Shell Species	Dentalium											
	Basalt	Bone	Calcite	Carnelian	Ceramic	Gold	Greenstone	Hematite	Ivory	Jasper	Limestone	Total
Unspecified		47	1	234	77	21	1	1	1	1	213	597
Unspecified Pendant	1	8		2							14	25
	1	55	1	236	77	21	1	1	1	1	227	622

Byblos (cont.)								
Gassia 2009								
Context	Jar Burials							
Shell Species	Dentalium							
	Obsidian	Rock Crystal	Schist	Silver	Shell	Steatite (Unglazed)	Unidentified Stone	Total
Unspecified	1	1	3	97	74	5	125	306
Unspecified Pendant	1			1	5		10	16
	2	1	3	98	79	5	135	322

Tell el-Far'ah (North) (Cisjordan)				
De Vaux and Steve 1949				
Context:	Funerary			
	Carnelian	Faience	Shell	Total
Unspecified			1	1
Short Cylinder	1			1
Standard Cylinder		7		7
	1	7	1	9

Fifa (Transjordan)				
Context:	Funerary			
Shell Species	Glycymeris nummaria, Venerida.			
	Carnelian	Glazed Steatite	Shell	Total
Unspecified/Fragmentary		669[16]	3	672
Cylinder Disc	4	1		5
Short Cylinder	60	189	1	250
Standard Cylinder		11		11
Long Cylinder		1		1
	64	871	4	939

Wadi Fidan 4 (Transjordan)					
Adams and Genz 1995					
Context:	Copper Production Area				
	Bone	Carnelian	Copper	Shell	Total
Unspecified				2	2
Cylinder Disc	1				1
Short Cylinder		1	1		2
Long Cylinder			2		2
Long Barrel			2		2
	1	1	5	2	9

Wadi Fidan 100 (Transjordan)		
Wright et al. 1998		
Context:	Domestic	
	Carnelian	Total
Unspecified	?	?
	?	?

Gadot (Cisjordan)			
Greenberg 2001			
Context:	Funerary		
	Carnelian	Unidentified Stone	Total
Unspecified	1	17	18
	1	17	18

[16] Most of these beads were not measured, it's highly likely that the majority were of short cylinder shape, the shape of the vast majority of measured glazed steatite beads.

Hama (Syria)				
Thuesen 1988				
Context:	Domestic			
	Carnelian	Shell	Unidentified Stone	Total
Unspecified	1	2	4	7
	1	2	4	7

Hujayrat al-Ghuzlan (Transjordan)					
Klimscha 2011; Notroff et al. 2014					
Context:	Foundation Deposit: Found beneath floor of a shrine in a jar.				
	Carnelian	Schist	Shell	Glazed Steatite[17]	Total
Unspecified	1		190	?	191+?
Trapezoidal Pendant		1			1
	1	1	190	?	192+?

Jawa (Transjordan)			
Betts and Helms 1991			
Context:	Workshop, Domestic		
	Bone	Carnelian	Total
Cylinder Disc	3		3
Short Cylinder		3	3
	3	3	6

[17] The number of glazed steatite beads is not listed in the publication, but images of the assemblage suggest that several thousands glazed steatite beads are present.

Jericho (Cisjordan)										
Kenyon 1960, 1965; Talbot 1983										
Context:	Funerary, Open area.									
	Bone	Carnelian	Faience	Greenstone	Rock Crystal	Sandstone	Shell	Glazed Steatite	Unidentified Stone	Total
Unspecified	24	275	2	1		1	49	358	223	983
Short Barrel		123			5			104		227
Short Cylinder		227							48	275
Long Cylinder	1								3	4
"Bone Cult Object"	9									9
Trapezoidal Globular Pendant				2						2
	34	625	2	3	5	1	49	462	274	1500

El-Judaidah (Amuq Valley)											
Braidwood and Braidwood 1960											
Context:	Domestic, Funerary										
	Bone	Carnelian	Ceramic	Greenstone	Kaolin	Marble	Obsidian	Shell	Steatite (Unglazed)	Unidentified Stone	Total
Unspecified		1		1							2
Cylinder Disc							1				1
Short Cylinder		1			1	1				1	4
Oblate					20						20
Long Barrel			1							1	2
Horn Shaped Pendant									1		1
Lotus Pod Pendant				1							1
Long Barrel Pendant	16										16
Prolate Spheroid Pendant				1							1
Rectangular Pendant								1			1
Thumb Shaped Pendant				1							1
	16	2	1	4	21	1	1	1	1	2	50

Lachish (Cisjordan)					
Tufnell 1958					
Context:	Domestic Cave[18]				
	Carnelian	Faience	Gold	Shell	Total
Unspecified				5	5
Barrel Disc		80			80
Short Cylinder		2			2
Short Barrel	14				14
Short Convex Bicone		1			1
Standard Convex Bicone			1		1
Long Barrel	2	5			7
	14	88	1	5	110

Ma'ale Shaharut (Cisjordan)				
Avner 1986, 2002				
Context:	Tomb			
	Bone	Shell	Glazed Steatite	Total
Unspecified	1	?	?	1+?
	1	?	?	1+?

Nahal Besor: Site H (Cisjordan)			
Macdonald et al. 1932			
Context:	Unspecified, Workshop		
	Ostrich Eggshell	Shell	Total
Unspecified		5	5
Cylinder Disc	?		?
	?	5	5+?

Qiryat Horoshet Cemetery (Cisjordan)		
Salmon 2008		
Context:	Tomb	
	Carnelian	Total
Short Cylinder	2	2
	2	2

[18] Cave had finds dating from the EB IA all the way through the Middle Bronze Age (Tufnell 1958: 73-74; Magrill 2006: 34-35). An unknown number of beads in this assemblage therefore likely date later than the EB IA, something unsurprising in light of the presence of bead shapes that are atypical for the period.

Naq' (Transjordan)					
Braun 2021; Nai'mat 2003.					
Context:	Unspecified, Workshop				
	Bone	Carnelian	Glazed Steatite	Unidentified Stone	Total
Unspecified	?	?	?	?	?
Unspecified Pendant	4				4
	4+?	?	?	?	4+?

Sha'ar Efrayim (Cisjordan)		
Van den Brink 2011		
Context:	Funerary	
Shell Species:	Conus flavidus	
	Shell	Total
Unspecified	9	9
	9	9

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Sukas IX (Syria)		
Oldenburg 1991		
Context:	Funerary	
	Frit	Total
Unspecified	1	1
	1	1

Yiftah'el (Cisjordan)		
Braun 1997		
Context:	Funerary	
	Unidentified Stone	Total
Long Cylinder	1	1
	1	1

Early Bronze Age IB (c. 3400-3100)

Abu Kharaz (Transjordan)								
Fischer and Hammer 2008								
Context:	Domestic							
	Artificial Glass	Bone	Ceramic	Limestone	Sandstone	Shell	Unidentified Stone	Total
Unspecified	3		13	2	22	18		58
Unspecified Pendant		3				1	1	5
Decorated Cylinder Pendant				1				1
Globular Pendant				1				1
Pierced Bone Pendant		1						1
Teardrop Pendant		1						1
	3	5	13	4	22	19	1	67

Arad (Cisjordan)				
Amiran et al. 1986				
Context:	Funerary			
	Carnelian	Rock Crystal	Unidentified Stone	Total
Barrel/Cylinder Disc	?	?	?	?
	?	?	?	?

Asherat (Cisjordan)						
Smithline 2001						
Context:	Funerary					
Shell Species	Glycymeris insubricus, Cerastoderma glaucum					
	Amethyst	Carnelian	Ceramic	Frit	Shell	Total
Short Cylinder		2				2
Standard Barrel	1					1
Long Barrel			1	1		2
Long Cylinder		1				1
Pierced Oval Disc					2	2
	1	2	1	1	2	8

Azor (Cisjordan)								
Ben-Tor 1975; van den Brink et al. 2008; Busheri 1969								
Context:	Funerary							
Shell Species	Conus flavidus, Dentalium							
	Agate	Amethyst	Bone	Carnelian	Chalcedony	Gold	Jasper	Total
Unspecified	?	?		420	?		?	420+?
Short Cylinder				1				1
Long Cylinder			3			2		5
Bull's Head Pendant					1			1
	?	?	3	421	1+?	2	?	426+?

Azor cont.							
Ben-Tor 1975; van den Brink et al. 2008; Busheri 1969							
Context:	Funerary						
Shell Species	Conus flavidus, Dentalium						
	Limestone	Malachite	Quartz	Rock Crystal	Shell	Unidentified Stone	Total
Unspecified		?	?		22		22+?
Circular	540			180			720
Long Cylinder					2		2
	540	?	?	180	24		744+?

Bâb adh-Dhrâʿ (Transjordan)								
Broeder and Skinner 2003; Schaub and Rast 1989								
Context:	Domestic, Funerary							
	Eilat Stone	Faience	Mother of Pearl	Quartz	Rock Crystal	Shell	Unidentified Stone	Total
Barrel/Cylinder Disc	1				?	10		10+?
Short Cylinder				1				1
Long Cylinder		6						6
Oval Globular Pendant							1	1
Rectangular Pendant			1					1
	1	6	1	1	?	10	1	19+?

Beqo'a (Cisjordan)			
Golani et al. 2018; Ktalav 2018a.			
Context:	Domestic		
Shell Species	Glycymeris nummaria.		
	Ceramic	Shell	Total
Unspecified		7	7
Standard Cylinder	1		1
	1	7	8

Beth Shean (Cisjordan)			
Mazar and Rotem 2012			
Context:	Public Building		
	Limestone	Unidentified Stone	Total
Short Cylinder	1		1
Long Pear-Shaped Pendant		1	1
	1	1	1

Beth Yerah (Cisjordan)		
Greenberg et al. 2006		
Context:	Funerary	
	Ivory	Total
“Mushroom Shaped” Bead	?	?
	?	?

Deir ‘Ain Abata (Transjordan)					
Politis 2012					
Context:	Funerary				
	Carnelian	Faience	Shell	Unidentified Stone	Total
Unspecified		20	164	8	192
Short Barrel	16				16
Long Barrel			1		1
Rectangular Truncated Bicone Disc			1		1
	16	20	166	8	210

En Esur (Cisjordan)										
Bar-Yosef Mayer 2021; Golani 2010; Yannai 2016										
Context:	Funerary									
Shell Species:	Asphataria vubens, Conus mediterraneus, Erosaria Spurca, Nassarius Sp., Nerita Sp. Scapohpod (Dentalium)									
	Agate	Amazonite	Amethyst	Apatite	Bentorite	Carnelian	Ceramic	Chlorite	Copper	Total
Barrel Disc			46			262				308
Cylinder Disc	1					162				163
Oblate						1	1			2
Short Barrel						18	6			24
Short Cylinder					2	39	105		9	155
Short Truncated Bicone			1							1
Short Cylinder with Two Convex Ends						2				2
Circular									1	1
Standard Barrel							1			1
Standard Cylinder							7		5	13
Standard Truncated Convex Bicone						1	6			7
Standard Convex Bicone							1			1
Standard Pear Shaped						1				1
Long Barrel		1								1
Long Convex Bicone			1				5			6
Long Truncated Convex Bicone							12			12
Long Cylinder							4		11	15
Elliptical Long Cylinder				1						1

Lenticular Long Truncated Convex Bicone				1						1
Unspecified Pendant								1		1
Bull's Head Pendant						1				1
Isosceles Triangle Pendant	1									1
	2	1	48	2	2	487	148	1	26	717

En Esur (cont.)

Bar-Yosef Mayer 2021; Golani 2010; Yannai 2016

Context:	Funerary
Shell Species:	Asphataria vubens, Conus mediterraneus, Erosaria Spurca, Nassarius Sp., Nerita Sp. Scapohpod Beads (Dentalium)

	Faience	Flint	Hematite	Limestone	Mud Paste	Obsidian	Peridot	Quartz	Rock Crystal	Sandstone	Total
Unspecified								1		3	4
Barrel Disc		2		3			2	9		2	18
Cylinder Disc		1		20			7	117			145
Oblate	1		1		265	1		1			269
Short Barrel				14	3			1			18
Short Cylinder		2		14	188			11			215
Short Convex Bicone								2			2
Short Truncated Bicone				1				2			3
Short Convex Cone					1						1
Short Cylinder with Two Convex Ends				1							1

Circular					3						3
Standard Barrel				1	34						35
Standard Cylinder				1	558			1			560
Standard Truncated Convex Bicone				1	1						2
Long Barrel					63				1		64
Long Convex Bicone				1	1						2
Long Truncated Convex Bicone					3						3
Long Cylinder				1	379						380
Elliptical Standard Barrel					3						3
Elliptical Standard Cylinder					4						4
Elliptical Long Cylinder					11						11
Polygonal Circular		1									1
Square Long Cylinder					1						1
Cylindrical Pendant								1			1
Scarab Shaped Pendant			1								1
	1	6	2	58	1518	1	9	146	1	5	1747

En Esur (cont.)					
Bar-Yosef Mayer 2021; Golani 2010; Yannai 2016					
Context:	Funerary				
Shell Species:	Asphataria vubens, Conus mediterraneus, Erosaria Spurca, Nassarius Sp., Nerita Sp. Scapohpod Beads (Dentalium)				
	Shell	Glazed Steatite	Turquoise	Unidentified Stone	Total
Unspecified	45				45
Barrel Disc				24	24
Cylinder Disc		194	2		196
Oblate		8			8
Short Barrel	13			8	21
Short Cylinder	85	311	1		397
Short Truncated Convex Bicone	1			6	7
Standard Barrel	2	48	45		95
Standard Cylinder	18	619	1		638
Standard Pear Shaped			11		11
Long Barrel		21			21
Long Truncated Convex Bicone		1			1
Long Cylinder	1	14	16		31
Ovoid Standard Barrel		1	1		2
	165	1,217	77	38	1,497

Ein Hanaziv (Cisjordan)				
Amiran et al. 1986				
Context:	Funerary			
	Carnelian	Rock Crystal	Unidentified Stone	Total
Barrel/Cylinder Disc	?	?	?	?
	?	?	?	?

Ein Zippori (Cisjordan)			
Barzilai et al. 2013			
Context:	Unspecified		
	Obsidian	Sandstone	Total
Short Cylinder	4	1	5
	4	1	5

Tel Erani (Cisjordan)				
Ciałowicz et al. 2016				
Context:	Unspecified			
	Carnelian	Faience	Unidentified Stone	Total
Unspecified	?			?
Cylinder Disc with Two Convex Ends			2	2
Short Cylinder		1	5	6
Short Barrel			2	2
	?	1	9	10+?

Tell el-Far’ah (North) (Cisjordan)						
De Vaux 1951, 1952; De Vaux and Steve 1949						
Context:	Funerary					
	Carnelian	Faience	Rock Crystal	Shell	Unidentified Stone	Total
Unspecified			?	36		36+?
Short Barrel	?					?
Short Cylinder	?	?				?
Teardrop Pendant					1	1
	?	?	?	36	1	37+?

Tel Gezer (Cisjordan)		
Gilmour 2014; Macalister 1919		
Context:	Funerary	
	Carnelian	Total
Unspecified	?	?
	?	?

Giv’atayim (Cisjordan)				
Kaplan 1993; Sussman and Beit-Arieh				
Context:	Funerary			
	Carnelian	Rock Crystal	Shell	Total
Unspecified	?	?	4	4+?
	?	?	4	4+?

Halif Terrace (Cisjordan)						
Alon and Yekutieli 1995; Levy et al. 1997; Seger et al. 1990						
Context:	Pit, Domestic Refuse					
Shell Species:	Strombus sp.					
	Alabaster	Carnelian	Faience	Mother of Pearl	Steatite (Unglazed)	Total
Unspecified	1	?	?	1		2+?
Beetle Pendant					1	1
	1	?	?	1	1	3+?

Hama (Syria)					
Thuesen 1988					
Context:	Domestic, Funerary				
	Quartz	Shell	Steatite (Unglazed)	Unidentified Stone	Total
Unspecified		106		5	111
Short Cylinder	6		5	3	14
	6	106	5	8	125

Horbat Hani (Cisjordan)			
Lass 2003			
Context:	Funerary		
Shell Species	Dentalium		
	Carnelian	Shell	Total
Short Cylinder	10	1	11
	10	1	11

Hazorea (Cisjordan)						
Meyerhof 1989						
Context:	Funerary					
	Carnelian	Copper	Eilat-Stone	Shell	Unidentified Stone	Total
Unspecified				?		?
Barrel Disc			1		1	2
Short Barrel	5				1	6
Short Cylinder	2					2
Long Cylinder		1				1
Oval Pendant	1					1
	7	1	1	?	2	11+?

Jebel el Jill (Transjordan)			
Henry 1995; Reese 1995			
Context:	Animal corral.		
Shell Species:	Conus, Dentalium, Mitra, Nerita		
	Shell	Unidentified Stone	Total
Unspecified	44		44
Rectangular Pendant		1	1
	44	1	45

Jericho (Cisjordan)			
Kenyon 1960; Talbot 1983			
Context:	Domestic, Funerary		
	Bone	Unidentified Stone	Total
Unspecified	1	?	1+?
"Bone Cult Object" Pendant	1		1
	2	?	2+?

Tell Kabri (Cisjordan)			
Scheftelowitz 2002			
Context:	Funerary		
	Carnelian	Glazed Steatite	Total
Short Barrel	1		1
Short Cylinder		15	15
	1	15	16

Kfar Monash (Cisjordan)		
Hestrin and Tadmor 1963		
Context:	Hoard	
	Carnelian	Total
Short Cylinder	?	?
	?	?

Lod (Cisjordan)		
Van den Brink et al. 2015		
Context:	Hoard	
Shell Species:	Glycymeris nummaria, Glycymeris pilosa	
	Shell	Total
Unspecified	24	24
	24	24

Megiddo (Cisjordan)											
Bar-Yosef Mayer 2000; Bar-Yosef Mayer and Baruch 2006; Blockman and Sass 2013; Guy 1938; Ktalav 2013; Loud 1948; Sass 2000; Sass and Cinamon 2006; Ussishkin 2015											
Context:	Funerary, Foundation Deposit, Temple floor debris, Unspecified										
Shell Species:	Cerastoderma glaucum, Conus mediterraneus, Dentalium Sp., Melanopsis buccinoidea, Phalium undulatum										
	Agate	Alabaster	Carnelian	Ceramic	Copper	Faience	Malachite	Quartz	Shell	Unidentified Stone	Total
Unspecified						400			16		416
Short Barrel			3			~37					~40
Short Cylinder			4			~37		7		1	~49
Oblate				4	2						6
Standard Barrel			2	4	1	4					11
Long Barrel	1										1
Long Cylinder			2		1						3
Long Truncated Convex Bicone				2	1						3
“Dome Shaped” Bead								1			1
Bull Head Pendant		1									1
Frog Shaped Pendant							1				1
	1	1	11	10	5	478	1	8	16	1	532

Nesher-Ramla Quarry (Cisjordan)						
Avrutis 2012						
Context:	Funerary					
	Bone	Carnelian	Ceramic	Rock Crystal	Shell	Total
Unspecified					7	7
Oblate				1		1
Short Barrel			1			1
Short Cylinder		2				2
Long Barrel	5				2	7
Drop-shaped Pendant			1			1
	5	2	2	1	9	19

Tel Qashish (Cisjordan)		
Bar-Yosef Mayer 2003		
Context:	Domestic	
Shell Species	Conus mediterraneus	
	Shell	Total
Unspecified	1	1
	1	1

Qirya Cemetery (Cisjordan)									
Braun and van den Brink 2005; Ritter Kaplan 1979; Porat in Preparation									
Context:	Funerary								
Shell Species:	Dentalium								
	Bentorite	Bone	Calcite	Carnelian	Copper	Dolomite	Frit	Greenstone	Total
Unspecified	?	23	2+?			1	?	1	27+?
Cylinder Disc		8							8
Short Barrel		27							27
Short Cylinder		15		129	1				145
Long Barrel				1					1
Cylinder and Ring Pendant		3							3

	?	76	2+?	130	1	1	?	1	211+ ?

Qirya Cemetery (cont.)								
Braun and van den Brink 2005; Ritter Kaplan 1979; Porat in Preparation								
Context:	Funerary							
Shell Species:	Dentalium							
	Hematite	Limestone	Ostrich Eggshell	Peridot	Rock Crystal	Shell	Unidentified Stone	Total
Unspecified	1			?	6	4 (+?)	5 (+?)	16+?
Short Cylinder		2					3	5
Long Cylinder					1			1
Unspecified Pendant			1					1
Cylinder and Ring Pendant							6	6
	1	2	1	?	7	4+?	14+?	33+?

Qiryat Ata (Cisjordan)		
Golani 2003		
Context:	Domestic	
	Carnelian	Total
Short Barrel	1	1
	1	1

Tell es-Saken (Cisjordan)			
De Miroschedji and Sadeq 2005			
Context:	Midden		
	Faience	Mother of Pearl	Total
Large Barrel	1		1
Rectangular Pendant		1	1
	1	1	2

Sha'ar Efrayim (Cisjordan)		
Van den Brink 2011; Mienis 2011		
Context:	Funerary	
Shell Species	Conus flavidus	
	Shell	Total
Unspecified	1	1
	1	1

Tell esh-Shuna (Transjordan)		
Philip and Baird 1993		
Context:	Midden	
	Unidentified Stone	Total
Unspecified	1	1
	1	1

Al-Umayri Dolmen (Transjordan)		
Philip and Baird 1993		
Context:	Funerary	
	Carnelian	Total
Unspecified	?	?
	?	?

EB I (c. 3700-3100 BCE)

Abu Halil (Sinai)							
Bar-Yosef Mayer 1999; Bar-Yosef Mayer 2011; Bar-Yosef Mayer and Porat 2009							
Context:	Funerary						
Shell Species:	Nerita, Cyprraea, Lambis, Ancilla, Conus ring, C. parvatus, Pinctada disc, Circenita, Codakia, Dentalium						
	Bone	Carnelian	Ostrich Eggshell	Quartz	Shell	Glazed Steatite	Total
Unspecified	?	?	?	?	3498	?	3498+?
	?	?	?	?	3498	?	3498+?

Ein Huderah (Sinai)							
Bar-Yosef et al. 1977; Bar-Yosef Mayer 1999							
Context:	Funerary						
Shell Species:	Dentalium, Connus, Nerita-Natica-Pinctada						
	Bone	Carnelian	Mother of Pearl	Ostrich Egghsell	Shell	Glazed Steatite	Total
Unspecified	38	150	53	75	1763	480	2559
	38	150	53	75	1763	480	2559

Ein Um Ahmed (Sinai)							
Bar-Yosef Mayer 1999; Bar-Yosef Mayer 2011; Bar-Yosef Mayer and Porat 2009							
Context:	Funerary						
Shell Species:	Nerita, Lambis, Strombus, Conus Ring, C. Parvatus, Gastropod, Pinctada disc, Circenita, Glycymeris, Dentalium						
	Bone	Carnelian	Ostrich Eggshell	Quartz	Shell	Glazed Steatite	Total
Unspecified	?	?	?	?	1262	?	1262+?
	?	?	?	?	1262	?	1262+?

El Abar (Sinai)							
Bar-Yosef Mayer 1999; Bar-Yosef Mayer 2011; Bar-Yosef Mayer and Porat 2009							
Context:	Funerary						
Shell Species:	Nerita, Cypraea, Lambis, Pirenella, Conus ring, C. c. flavidus, C. parvatus, Pinctada disc, Glycymeris, Bivalve, Dentalium						
	Bone	Carnelian	Ostrich Eggshell	Quartz	Shell	Glazed Steatite	Total
Unspecified	?	?	?	?	4260	?	4260+?
	?	?	?	?	4260	?	4260+?

Gebel Gunna (Sinai)									
Bar-Yosef et al. 1986; Bar-Yosef Mayer and Porat 2009									
Context:	Funerary								
Shell Species:	Conus, Cypraea, Dentalium								
	Bone	Carnelian	Ivory	Limestone	Mother of Pearl	Quartz	Shell	Glazed Steatite	Total
Unspecified	7	95	3	7	23	4	1120	519	1778
	7	95	3	7	23	4	1120	519	1778

Gunna 50 (Sinai)					
Bar-Yosef et al. 1986					
Context:	Domestic				
Shell Species:	Conus, Cypraea, Dentalium				
	Carnelian	Faience	Ostrich Eggshell	Shell	Total
Unspecified	1	7	8	?	16+?
	1	7	8	?	16+?

Mengez Necropolis (Lebanon)				
Steimer-Herbet 2000				
Context:	Funerary			
	Carnelian	Limestone	?Glazed Steatite?	Total
Unspecified		?	?	?
Short Cylinder	?			?
	?	?	?	?

Nakb Hibran (Sinai)							
Bar-Yosef Mayer 1999; Bar-Yosef Mayer 2011; Bar-Yosef Mayer and Porat 2009							
Context:	Funerary						
Shell Species:	Nerita, Lambis, Cypraea, Conus ring, C. parvatus, Pinctada disc, Glycymeris, Dentalium						
	Bone	Carnelian	Ostrich Eggshell	Quartz	Shell	Glazed Steatite	Total
Unspecified	?	?	?	?	1181	?	1181+?
	?	?	?	?	1181	?	1181+?

Qarassa Dolmen Field (Syria)			
Steimer-Herbet and Besse 2017			
Context:	Funerary		
	Carnelian	Glazed Steatite	Total
Unspecified	?	?	?
	?	?	?

Al-Qasabat Dolmen Field (Transjordan)					
Ji 1997					
Context:	Funerary				
	Carnelian[19]	Ceramic	Hematite	Jasper	Total
Unspecified	?	?	?	?	1330
	?	?	?	?	1330

Sawawin (Sinai)							
Bar-Yosef Mayer 1999; Bar-Yosef Mayer 2011; Bar-Yosef Mayer and Porat 2009							
Context:	Funerary						
Shell Species:	Cellana, Nerita, Lambis, Cypraea, Polinies, Mitrella, Conus ring, Conus spp. Mytilidae, Pinctada disc, Circenita, Dentalium						
	Bone	Carnelian	Ostrich Eggshell	Quartz	Shell	Glazed Steatite	Total
Unspecified	?	?	?	?	2665	?	2665+?
	?	?	?	?	2665	?	2665+?

Wadi Hebar (Sinai)							
Bar-Yosef Mayer 1999; Bar-Yosef Mayer 2011; Bar-Yosef Mayer and Porat 2009							
Context:	Funerary						
Shell Species:	Nerita, Lambs, Cyrpaea, Polinices, Conus Ring, C. Parvatus, gastropod, Glycymeris, Pinctada disc, Dentalium						
	Bone	Carnelian	Ostrich Eggshell	Quartz	Shell	Glazed Steatite	Total
Unspecified	?	?	?	?	3579	?	3579+?
	?	?	?	?	3579	?	3579+?

[19] Carnelian apparently predominates within the assemblage of 1330 beads (Ji 1997: 55)

Wadi Nasb (Sinai)							
Bar-Yosef Mayer 1999; Bar-Yosef Mayer 2011; Bar-Yosef Mayer and Porat 2009							
Context:	Funerary						
Shell Species:	Clanculus, Neria, Lambis, Cypraea, Engina, Conus ring, C. parvatus, Pinctada disc, Pinctada other, Asaphis, Dentlium						
	Bone	Carnelian	Ostrich Eggshell	Quartz	Shell	Glazed Steatite	Total
Unspecified	?	?	?	?	1016	?	1016+?
	?	?	?	?	1016	?	1016+?