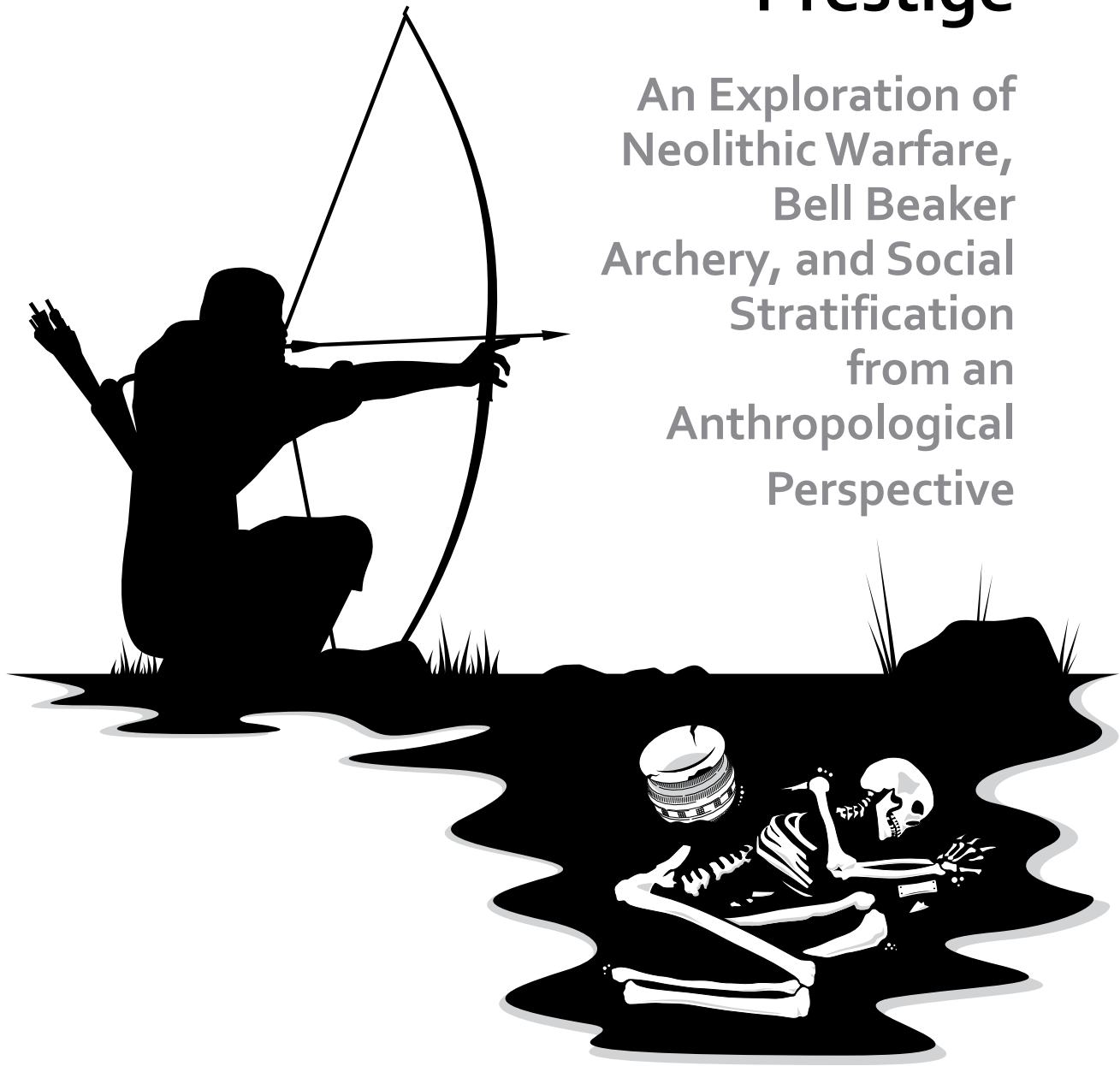


Practice and Prestige

An Exploration of
Neolithic Warfare,
Bell Beaker
Archery, and Social
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from an
Anthropological
Perspective



Jessica Ryan-Despraz



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ARCHAEOPRESS PUBLISHING LTD
Summertown Pavilion
18-24 Middle Way
Summertown
Oxford OX2 7LG
www.archaeopress.com

ISBN 978-1-80327-052-4
ISBN 978-1-80327-053-1 (e-Pdf)

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Introduction

The content of this book originates from a PhD dissertation defended in 2021 at the University of Geneva in Switzerland (Ryan-Despraz 2021). This project combined anthropological analyses with an archaeological perspective in order to interpret ‘archer’ burials from the Bell Beaker period in modern-day Central Europe. The primary aim of this project was to apply an anthropological methodology to Bell Beaker skeletons in an attempt to identify a specialized archer occupation. Anthropologically, this involved two primary analyses. The first was at a population level and involved comparing individuals with an archery-related burial context (i.e. Bell Beaker stone wristguards, arrowheads, and bow-shaped pendants) to individuals without archery-related grave goods in order to localize any developmental differences. The second took place at an individual level and included assessments of each ‘suspected archer’ skeleton to determine the likelihood of he or she having been a specialized archer based on bone morphologies linked to biomechanics. In order to contextualize these anthropological results, this project also developed an archaeological framework. The goal of this perspective was to outline, condense, and discuss the various evidence for warfare and archery throughout the Neolithic period in general and the Bell Beaker period in particular. This also included an examination of prehistoric concepts of specialization and social organization, specifically with regard to hierarchy. These perspectives were important because no matter the results of the anthropological analyses, the presence of potentially artisanal and specialized archery-related items in burials denotes the significance of archery during the Bell Beaker period. By focusing on the broader archaeological context of these objects, one may begin to address questions such as: Why archery? What could have been its functions? Who were these ‘archers’? How can modern researchers use this information to better understand Bell Beaker society?

Keeping these questions in mind, this book consists of three main parts. Part 1 presents evidence for warfare and archery throughout the European Neolithic period, with special regard paid to the Bell Beaker period. Part 2 delves into prehistoric conceptions of specialization and social hierarchy and how they could relate to a warrior ideal. Lastly, Part 3 outlines and discusses the project’s broader anthropological results and situates these findings within the archaeological context. Each of these sections allows researchers to look at similar questions from multiple angles, thereby contributing a cross-disciplinary approach to studies of prehistoric daily life.

Archaeological background

Neolithization

Understanding Neolithization puts into perspective the context for early instances of migration and interactions between peoples. This is then directly relevant to the evolution of warfare and conflict from the Early Neolithic to the Bell Beaker period.

The arrival of agriculture marks the beginning of the Neolithic period, which originated in the Fertile Crescent and began its spread through Europe starting in the southeast during the 7th millennium BC (Mathieson *et al.* 2018). From this point, the two primary theories for diffusion

are the demic diffusion model (DDM) and the culture diffusion model (CDM) (Chikhi *et al.* 2002; Demoule 2017; Guilaine 2017, 2015; Mazurié de Keroualin 2003). The former indicates a spread due to the movement of people and the latter to a movement of ideas. In recent years with the development of DNA analysis research, studies have found the DDM to be the principal cause for the spread of the Neolithic Revolution. Genetic studies tracing the DNA of these first farmers and that of local hunter-gatherer groups supports a Near Eastern origin for agriculture rather than an evolution of local nomadic groups (Bramanti *et al.* 2009; Chikhi *et al.* 2002; Haak *et al.* 2015, 2010; Hofmanová *et al.* 2016; Vanhanen *et al.* 2019). Results also show a population increase of non-local groups in Central Europe at the same time as the introduction of farming to the region, and analyses of mtDNA also demonstrate minimal admixture with local women (Bramanti *et al.* 2009). Haak *et al.* (2015) distinguished two major migrations into Europe: the first farmers arriving from the Near East (different genetic profile from the local hunter-gatherers), and the Yamnaya pastoralists arriving from the steppe during the Late Neolithic. The first migration spread via a Mediterranean and a Danubian route, and by 5600 BC the Neolithic farmers had arrived in the Iberian Peninsula (Guilaine 1994; Mathieson *et al.* 2018). However, it remains undecided to what extent the Neolithization of the Iberian peninsula came from a Mediterranean route or via the Rhone Valley, with two probable waves of expansion (Beau *et al.* 2017; Rivollat *et al.* 2015). Archaeological findings confirm a Mediterranean migration route from the Fertile Crescent, however recent DNA studies have also found Early Neolithic individuals from the Iberian Peninsula with mtDNA haplogroups matching Early Neolithic Central European individuals (Alt *et al.* 2020; Beau *et al.* 2017; Haak *et al.* 2015; Rivollat *et al.* 2015). From these periods, sedentary societies took over and the first food producing culture in Central Europe was the Linear Pottery Culture (also known as LBK from the original German term *Linearbandkeramik*), which performed both animal husbandry (cattle, sheep, pigs) and agriculture (cereals and legumes) (Demoule 2009; Schier 2015). From this period of the Neolithic onward, evidence for warfare becomes prevalent¹, with signs of conflict continuing to appear throughout the Neolithic up until its confirmed presence during the Early Bronze Age.

The Early and Middle Neolithic periods

The earliest evidence for farming in Europe appears in the Balkans, specifically Greece, during the 7th millennium BC (Demoule 2009; Dolukhanov *et al.* 2005; Hofmanová *et al.* 2016; Semino *et al.* 2004). The continued expansion of these first Neolithic farmers, such as the Starčevo–Körös–Criş and the Vinča Cultures, into Transdanubia influenced the Linear Pottery Culture (LBK), which was the first Neolithic culture in Central Europe in the second half of the 6th millennium BC (Gronenborn 1999; Oross and Bánffy 2009; Quitta 1960). LBK expansion happened quickly and over a large geographic range, with many sites revealing large percentages of non-local individuals in addition to female exogamy, indicating that the LBK peoples were highly mobile (Bentley *et al.* 2002; Bickle *et al.* 2011; Price 2000). The culture itself is largely recognizable from its homogenous pottery and domestic longhouses, many of which had outer bedding trenches and were close to a water source (Ash *et al.* 2016; Bradley 2001; Gronenborn 1999; Milisauskas and Kruk 1989; Oross and Bánffy 2009; Stäuble 2005). The primary agricultural economy revolved around crops of einkorn, wheat, barley, peas,

¹ This is not to say that warfare did not exist prior to the Neolithic. Indeed, some signs of violence do appear prior to this period, but often times their links to conflict remain questionable.

and lentils as well as animal husbandry (cattle, sheep, goats, and pigs), and these traditions continued into the Middle Neolithic (Ash *et al.* 2016; Çilingiroğlu 2005; Dürrwächter *et al.* 2006; Kreuz *et al.* 2005). Besides the characteristic pottery, this cultural evolution brought about the ‘Neolithic package’, which Çilingiroğlu (2005) classifies the material objects as clay (e.g. figurines and pottery), stone (e.g. amulets, bracelets, and beads), and bone (e.g. polishers and spatulae), many of which were also likely prestige and/or symbolic items. Lastly, funerary rites were largely homogenous, with the majority of burials having been individual inhumations grouped in necropoli, though some were also associated with domestic structures, as well as instances of jar burials in the southeast (Bacvarov 2006; Cauwe *et al.* 2007; Chapman 2000).

Some of the dominant cultures of the Middle Neolithic include the Stroke Ornamented Pottery, Rössen, Lengyel, Polgár, Michelsberg, and Funnel Beaker, many of which display characteristics from the preceding Early Neolithic, such as the use of longhouses (Milisauskas and Kruk 1989). However, the number of surrounding ditches increases and many settlements begin to appear at higher elevations, farther away from water sources, which could be a sign of increased conflict (Howell 1987; Milisauskas and Kruk 1989; Pažinová 2007). Both the farming of cereals and animal husbandry remained important parts of the economy, and horse domestication also likely appeared during this period in the Eurasian steppe (Anthony 2007, 1986; Gaunitz *et al.* 2018; Milisauskas and Kruk 1989; Outram *et al.* 2009). The Middle Neolithic also witnessed the increased use of flint and copper mining, including for use in trading (Willms 1982). One of the more significant cultural changes of the Middle Neolithic involved the funerary traditions. During this time, monumental tombs began to appear in the form of tumuli and dolmens, including long barrow cemeteries often having multiple chambers, with examples of both rich individual and collective burials (Cauwe *et al.* 2007; Chambon and Thomas 2010; Demoule 2009; Przybył 2014).

The Pre-Bell Beaker Final Neolithic period

The Final Neolithic period in Central Europe (the region in question) began with the Corded Ware Culture, which is largely identifiable from its characteristic pottery, burial traditions, polished stone axes, and the appearance of copper (mostly as jewelry found in the East) (Tillman 1990). Like its successor, the Corded Ware Culture covered a large part of Europe, stretching from the Caucasus to Switzerland and from Denmark to the Alps. This relatively large range coincides with the appearance of carriages and wheels in the archaeological record and possibly the local domestication of the horse, all of which would have driven social and economic development (Tillman 1990). The second Neolithic migration of the Yamnaya Culture from the steppe region is responsible for the majority of the DNA profile for the Corded Ware individuals (Haak *et al.* 2015; Sjögren *et al.* 2019). However, there remains a high level of admixture between them and the local Neolithic hunter-gatherers (Allentoft *et al.* 2015). This is interesting to note because the succeeding (in some regions) Bell Beaker and Únětice Cultures exhibit much lower levels of Yamnaya ancestry, indicating an ‘arrival’ of the Bell Beakers rather than a steady ‘evolution’ of a culture.

Some researchers think that changes from preceding periods in both number and distribution of Corded Ware and Bell Beaker settlement sites is an indication for a herding-based rather than an agricultural-based economy (Tillman 1990). Indeed, a large number of the artifacts associated with these cultures come from funerary contexts, including those most relevant

to this work (objects linked to archery and warfare). However, from a global perspective, one should also note the extensive work done on the domestic sphere (Besse 2014a; Gibson 2019). With regard to funerary contexts, the presence of consistent traditions throughout the culture indicates some type of social network. For the Corded Ware individuals, these traditions placed male burials on an East-West axis with the head to the West and facing South (thus buried on the right side) (Besse and Strahm 2001; Bourgeois and Kroon 2017; Kruřová 2003). Female burials were also on an East-West axis and facing South, but lying on their left sides with the head towards the East. A study looking at individual identity and culture networks found that male burials were much more uniform throughout the entire complex than female burials, which were also similar, but only at a more regional level (Besse and Strahm 2001; Kruřová 2003; Bourgeois and Kroon 2017). Normally this would imply a higher level of masculine mobility, however this contradicts isotope analyses that found high levels of female mobility for this period (Kristiansen *et al.* 2017; Sjøgren *et al.* 2016). This raises questions pertaining to the discrepancy between the biological profile and the cultural traditions. For this reason, when looking at the network of information, ideas, and culture during the Corded Ware period, it is worth noting links to male migration and exchange. One theory for this involves the movement of bands of male warriors (Bourgeois and Kroon 2017).

Throughout the Neolithic period, there is a steady change in terms of culture, organization, and economics. At the end of the Neolithic, especially in Western Europe, metallurgy plays an important role in these changes, with the copper daggers and stone wristguards of the Bell Beaker Culture replacing the previous polished axes of the Corded Ware Culture (Figure 1). Drinking goblets also become more common, which could be symbolic of the social organization and values of the day. Such items could have been a sign of an emerging social structure along with the dissemination of ideas and knowledge (Guilaine and Zammit 2008).



Figure 1: a. A Corded Ware polished battle ax from near Hijken (Netherlands), from Wentlink (2020: Figure 5.14) (object from the Drent Museum collection in Assen); b. Example Bell Beaker stone wristguards, including a roughout (left), from the Eastern complex, images by Clément Nicolas

The Bell Beaker period

The name for the Bell Beaker period derives from its characteristic pottery, the bell beaker, which was a ceramic pot in the form of an inverted bell. Geographically speaking, this culture is incredibly vast, spreading from Scotland to North Africa and from Portugal to Poland, with radiocarbon dating placing the beginnings between 2900 and 2700 BC and its conclusion around 2100 or 2000 BC. This makes the traditional cultural ‘bookends’ of this period the beginnings of widespread agriculture and the beginning of the Bronze Age. Therefore, the Bell Beaker period largely acts as a type of transition between the last of the Stone Ages and the first of the Metal Ages. However, this general cultural chronology is not the same as the regional chronologies (Figure 2) (Bailly and Salanova 1999; Lemerrier 2018; Müller and van Willigen 2001). For example, the earliest date appears in Portugal and the latest in Poland, and it does not appear to last more than a few centuries in each region (e.g. the Bell Beaker period in Switzerland took place from about 2450 - 2200 BC) (Besse 2014b). Such a geography-dependent chronology therefore raises questions concerning migration, and whether such a spread was due to the migration of people or rather of ideas. In terms of the bell beakers themselves, these ceramics share similar morphologies throughout both time and space;

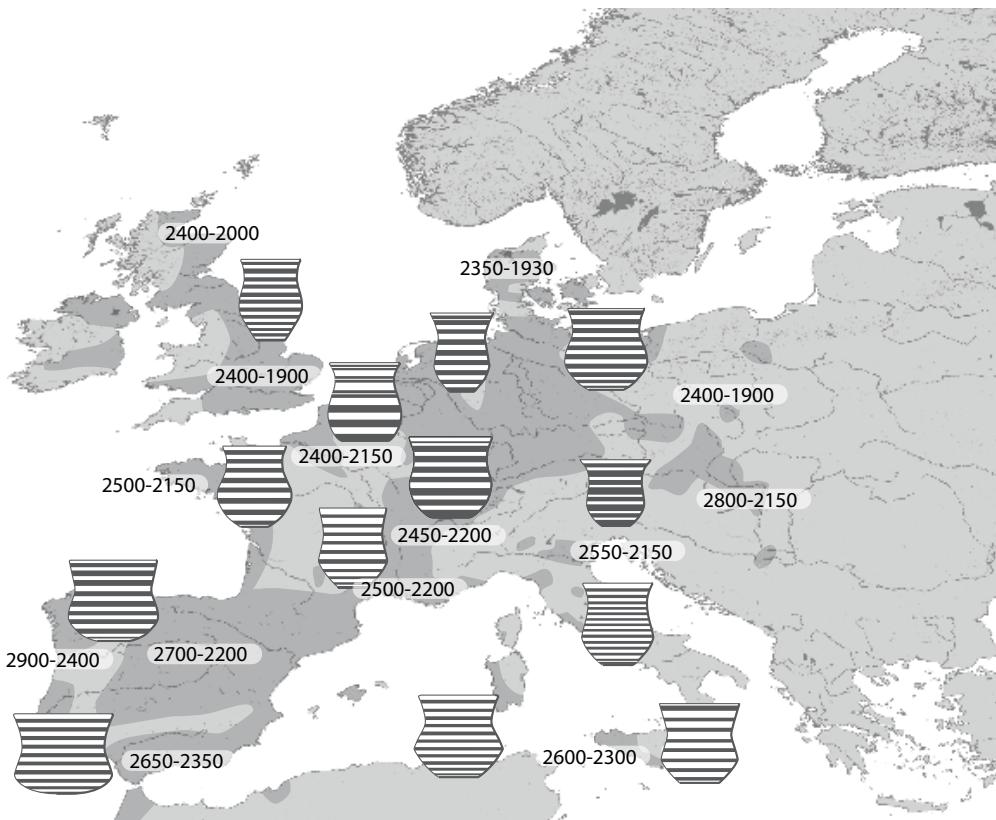


Figure 2: Distribution map of bell beakers throughout Europe, from Besse (2015: Figure 1)

however they also demonstrate regional differences and local productions (Besse 2015, 2014b; Derenne *et al.* 2020). Understanding material and population distributions is therefore critical to understanding not only the peoples of the Bell Beaker Culture, but also their overarching values and how they would have interacted.

While several theories exist, various studies have found a likely origin for the Bell Beaker peoples in the Iberian peninsula, specifically around the central Atlantic coast in Portugal. Kunst (2001) outlines five primary supports for this theory:

1. Similarities between Bell Beaker pottery and earlier pottery from the region
2. Earlier settlements are not drastically different from Bell Beaker settlements
3. Preceding corbelled tomb architecture resembles that of Bell Beaker fortification towers
4. Apparent continuation of pre-Bell Beaker tombs being used primarily during the Bell Beaker period
5. The oldest C14 dates of Bell Beaker assemblages appear in the Portuguese region (Müller and van Willigen 2001)

Exactly how the Bell Beaker Culture continued its northwest spread throughout Europe could have been through migration, ideology, or social interactions (e.g. trade) (Müller and van Willigen 2001). Previous research on the Bell Beaker groups has come up with three primary theories aimed at interpreting these people and their goods. The first looks at ethnicity, seeing the Beaker people as immigrants moving throughout Europe and spreading their material culture. Differences between Bell Beaker burial practices and those of the preceding local cultures supports this idea as do studies looking at cranial and dental morphology (Budziszewski *et al.* 2003; Desideri 2007; Desideri and Besse 2011; Fitzpatrick 2011; Piguet *et al.* 2007). Isotope analyses have also confirmed the mobility of at least a few Bell Beaker individuals (Desideri 2018; Desideri *et al.* 2010; Fitzpatrick 2011; Price *et al.* 2004). However, whereas the preceding Corded Ware peoples arrived in Central Europe due to migration from the East, there is minimal genomic continuity between Bell Beaker individuals from the Iberian Peninsula and those from the East (Olalde *et al.* 2018). This means that the Bell Beaker phenomenon was not completely the result of human migration.

The second theory looks at the fact that Bell Beaker ceramics mainly appear as funerary offerings and hypothesizes that their circulation was uniquely as prestige items for the rich (Shennan 1976; Vander Linden 2015). In this case, Bell Beaker material items serve as an indication for emerging hierarchies and a desire to portray social status (Shennan 1976). The focus of this theory is therefore on object mobility rather than human mobility. However, the more recent findings that most ceramics were made with local materials (Convertini 1996; Derenne *et al.* 2020) requires the modification of this idea to refer to the transfer of techniques and know-how rather than of the physical object.

The third theory concerns the more abstract idea of a Bell Beaker belief system in which the material items represent male drinking rites for certain groups of people (Sherratt 1987). This would mean a transfer or mobility of a belief system. Specifically, the hypothesis speculates that the weapons (e.g. arrows and daggers) were symbolic of hunting, either for the current life or the afterlife, and the beaker was a container for the ritualistic drinking of blood.

However, studies examining beaker residue have found that they contained a diversity of food and liquids (Guerra-Doce 2006), therefore this theory requires some reworking with space for additional nuance.

One overall implication from these theories is that the Bell Beaker Culture was perhaps among the first to contain social distinctions as well as male dominance (Fitzpatrick 2011). However, it is also worth noting that these theories are not mutually exclusive. For this reason, one should further consider the ‘pan-European’ explanation, which focuses on the fact that the Bell Beaker Culture distribution often appears as ‘islands’ throughout the continent (Brodie 2001; Fitzpatrick 2011). The vast majority of raw materials used for bell beakers was local, raising the question as to how products could be both local as well as similar throughout Europe (Convertini 1996; Rehman *et al.* 1992). While the designs are not overly complicated and therefore would not have necessarily required large levels of observation to replicate, technological analyses have come to two main conclusions: the potters were circulating throughout the complex (Vander Linden 2015) and there was a break in fabrication techniques between the Final Neolithic period and the Bell Beaker Culture (Derenne *et al.* 2020). However, many sites in Central Europe also show that the Corded Ware and Bell Beaker Cultures overlapped significantly (e.g. Wädenswil-Vorderau, Dietfurt, Straubing-Alburg, Straubing-Öberau, Weichering, Salzburg-Hellbrunn, Worms-Rädergewann, Komořany) (Heyd 2007). This demonstrates some level of interaction and cooperation between the two groups, though inter group conflict could also be an explanation (Strahm 1998).

One tradition that appears to be consistent throughout the Bell Beaker complex is the funerary ritual, for which there are three primary trends: Central and Northwest Europe (i.e. Britain and the Netherlands), French Atlantic and the Western Mediterranean Basin (‘Western complex’), and Central Europe (‘Eastern complex’). In the North and Northwest, there are mostly barrows with a central grave and then others along the periphery. In the West, there are mainly collective burials reused from previous cultures, and Central Europe sees mostly flat graves in cemeteries (Vander Linden 2015). The burials of the Eastern complex follow three guidelines: men are buried in a crouched position on their left sides and women on their right sides, the grave pits have a north-south orientation, and the deceased faces east (Heyd 2001; Vander Linden 2015). A study by Müller (2001) confirmed this to be the norm, with inconsistencies between biological sex and archaeological sex only 4.6-5.6% of the time. This pattern is interesting because of its contrast to the Corded Ware burials (often an East-West axis with women on their left sides and men on their right sides). Many prominent Bell Beaker sites are funerary and it is very likely that they serve as an indicator of social structure. This is especially true for items of value associated with a single individual. In general in Bohemia and Moravia, more complex burials also contain more valuable objects, for example those seen in Figure 3 (Dvořák 1993).

While the very fact of placing an item in a burial denotes its value, that value is not necessarily artisanal or economic. When looking at these burial contexts, it is essential to differentiate between biological sex and possible representations linked to gender. Common items seen in masculine burials (i.e. the objects most commonly linked to biologically sexed males) include beakers, weapons or weapon-related items (e.g. daggers, wristguards, arrowheads), and bow-shaped pendants (Vander Linden 2015). Feminine burials (i.e. the objects most commonly linked to biologically sexed females) tend to have a larger variety of ceramics

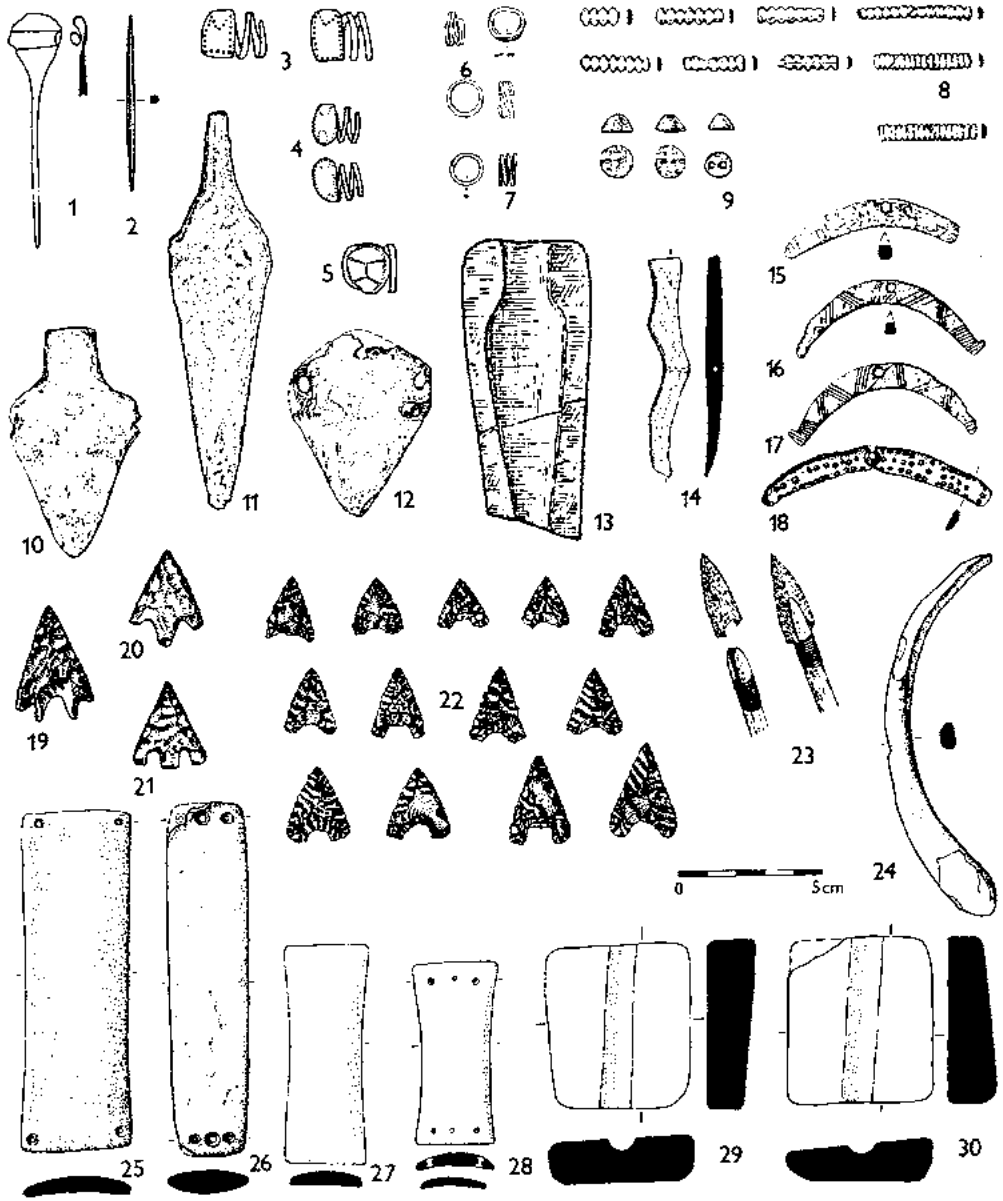


Figure 3: The common Bell Beaker grave goods ensemble in Moravia (Czechia), including metal objects (needles, awls, earrings, hair ornaments), v-shaped buttons, daggers, bow-shaped pendants, arrowheads, stone wristguards, and arrow shaft smoothers, from Dvořák (1993: Figure 144)

along with other ornamentation, v-shaped buttons, and copper awls (Müller 2001; Vander Linden 2015). However, these patterns are much less consistent than the links between grave orientation and sex, with Müller (2001) finding 18% of female burials had a dagger and 10% had a wristguard, but arrowheads and bow-shaped pendants were more linked to males. For the female items, these appeared almost uniquely in female burials – meaning that it was more common for females to adopt ‘male’ items than for males to adopt ‘female’ items. To this end, in an absence of osteological remains, it is more accurate to estimate an individual’s sex based on the burial orientation rather than the grave good context (Müller 2001). Such similarities in funerary culture over a large geographic area pose many questions concerning the relationship between these societies and the glue that binds them together. When looking at funerary and pottery traditions in terms of population mobility, the pottery demonstrates this phenomenon with its similarities in typologies, but differences in some of the finer details. However, the variations in burial technique exhibit not only movement, but also diffusion, creating a shared identity throughout a given region (Vander Linden 2015).

Two new items appear in Bell Beaker burials that did not have a precedent: stone wristguards and bow-shaped pendants.² Both items relate to archery, and together with the continued presence of arrowheads, they begin to create what could potentially be an ‘archer’s package’. From an archaeological perspective, researchers commonly label these inhumations as ‘archer’ burials and archery has two primary functions: hunting and warfare (there is no evidence for competition archery during prehistory). However, this interpretation raises two problems. The first is that history and ethnoarchaeology indicate that the majority of hunters and warriors would have been men (Coomaraswamy 1943; Miller *et al.* 1986), which is problematic considering the presence of female and child burials with such items. The second problem concerns the functionality of archery-related goods, specifically stone wristguards. The practicality of wearing a stone wristguard when leather and fiber ones are both easier to make and less cumbersome is debatable.

In archaeology, the presence, quality and quantity, of grave goods usually defines an individual’s wealth and/or social status. For the Bell Beaker period, stone wristguards seem to be especially prestigious, mainly as they are relatively rare. To this end, there tend to be two main assumptions for Bell Beaker burials: 1) any burial with grave goods indicates that the individual had a higher level of prestige or wealth than those without grave goods and 2) those with stone wristguards possibly had an even higher status. This could therefore indicate a link between an archery burial context and the individual’s position within a stratified Bell Beaker society.

² There has been some debate over this association, and this will be discussed later in Part 1. However, this work considers bow-shaped pendants to be archery-related.

Part 1: Neolithic warfare

The term 'warfare' needs clarification as it can apply to many different types of conflict. The first question therefore involves figuring out how to classify it during prehistory, before the existence of defined states, because modern definitions describe the military and legal organization of a specific, recognized territory (Brothwell 2004). Secondly, motives and the level of individual involvement can also vary. Tainter (1990) speculates that one motivation stems from an increased population size, which requires greater resources leading to the competition for territorial expansion. So the question is, what defines warfare? In order to understand it in terms of the Bell Beaker period, a few definitions are necessary. Keeley (1996: page 75) described early, or primitive, warfare in the following sense: 'Primitive war was not a puerile or deficient form of warfare, but war reduced to its essentials: killing enemies with a minimum risk, denying them the means of life via vandalism and theft... terrorising them into either yielding territory or desisting from their encroachments and aggressions... It is civilised war that is stylised, ritualised and relatively less dangerous. When soldiers clash with warriors... it is precisely these 'decorative' civilised tactics and paraphernalia that must be abandoned.' Essentially, war acts as an instrument for a centralized power to gain territory or materials (Nash 2005; Sahlins 1963). At the same time, the archaeological record shows that warfare was not as prevalent during prehistory as during the modern era; it is rather associated with an increased political presence and population density (Haas 2004). For this reason, it is possible that identifying the presence of warfare also acts as evidence for the presence of a social hierarchy.

For Neolithic warfare, it is perhaps more prudent to use a general definition from Guilaine and Zammit (2008: location 372), 'bloody clashes between small groups, raids carried out on neighboring parties, ambush attacks, and even individual murders'. This definition leaves space for a society to need and value a specialized warrior no matter the context. In this sense, 'warfare' represents simpler and more general terms such as 'conflict' or 'confrontation'. These terms therefore apply to the six types of aggression classified by Moyer (1976) and Weisfeld (1995): fear-induced (defensive), maternal, predatory (feeding), territorial, dominance, and angry (frustration or rage) (Brothwell 2004).

Recognizing warfare in a society means recognizing three things in the archaeological record: violence on the human body (skeletal trauma), weapons or an object capable of inflicting bodily harm, and a visual representation of violence (Lull *et al.* 2006; Soriano *et al.* 2015; Thorpe 2003). The first is fairly straightforward – signs of trauma on the skeleton, most notably cases where arrowheads are still embedded in the bone, clearly indicate violence. The second type encompasses not only weapons, such as daggers, bows, and spears, but also defensive structures like hilltop settlement sites and fortifications. The third category includes primarily artistic depictions, such as in caves and on stelae.

Guilaine and Zammit (2008) speculate that during the Neolithic, the life of a warrior was likely not a full-time job, even if artifacts and imagery seem to glorify the role. This idea is vital to the subject of specialization. During the times of smaller 'clans', while violence and the ability to capture and defend may have been valuable, smaller settlement sizes would likely not have

allowed for an individual to have been a full-time warrior – meaning he or she likely also had other responsibilities (e.g. farming). When needed in times of violence, it is very possible that all people worked together to accomplish a particular task or conquest. If this were the case, ‘warrior’ contexts could rather be indicative of an early ‘hero’ status in the sense that they represent some level of prestige or accomplishment.

In this first part, a primary question to consider is the function of various items and their interpretation as objects for warfare. Chapman (2004) makes a point to distinguish between tools, tools that can also be a weapon, weapons, and weapons that can also be a tool. For example, the copper items, such as daggers and palmela points, associated with the Bell Beaker period could easily serve in construction, wood-working, and meat processing – traditional ‘tool’ functions’ (Soriano *et al.* 2015). The same dagger or point could also defend a herd against predatory animals, making it a ‘tool/weapon’. For this reason, one must consider all possible functions and for that, language matters. Is it a knife or a dagger? In the case of the Amesbury Archer, Fitzpatrick (2011) refers to a recovered object as a copper knife, whereas other archaeologists would refer to the same item as a dagger (i.e. the copper daggers of the Bell Beaker package). This is an example of two different and accurate words for the same object that connote a completely different function. As another example, archaeologists do not necessarily interpret adzes and stone axes as weapons, but rather tools commonly used in farming and building. However the skeletons found in the Linear Pottery Culture (LBK) mass burial (including men, women, and children) at Talheim (Germany) showed signs of injury caused by such items (Meyer *et al.* 2014; Turek 2017a; Wahl 1984). Just because an item is not explicitly intended for violence does not mean that individuals did not use it as such. An object’s function remains independent of the user’s needs and is more than capable of any necessary adaptations. Therefore, signs of violence, such as trauma on skeletons, remain a better indicator for early warfare than an absence of what modern archaeologists perceive as intended weapons (e.g. swords, shields, and armor).

Since this work looks so closely at warriors and warrior culture in terms of personal identity, sex is also a necessary consideration. Ethnoarchaeology often identifies men as the most likely warriors or hunters of a given culture (Coomaraswamy 1943; Miller *et al.* 1986), which is a credible theory that often even applies to modern societies (many modern countries only started allowing women roles in active combat in the 21st century). However, figures such as Boudicca, Joan of Arc, and the Amazon warrior women prove that this is a guideline rather than a strict rule. In fact, ethnoarchaeological evidence in the Americas and Asia show that women were not only warriors, but sometimes even war chiefs (Holliman 2001; Koehler 1997; Thorpe 2003). Therefore sweeping conclusions about leadership and occupation based solely on sex is inadvisable. This work will consider all roles and burials significant to the problematic, but the expectation remains that more men will present a ‘warrior/hunter’ and ‘archer’ context.

While Part 1 aims to address warfare and archery, these two concepts could or could not be mutually exclusive. The presence of ‘archer’ burials insinuates at least some level of prestige around the individual, as well as a general archery importance. Based on the archaeological context of the Neolithic in general and the Bell Beaker period in particular, it seems that warfare was not only a common aspect of life, but that warriors were valuable members of the society. However, while the anthropological perspective of this work deals primarily with the

identification of specialized archery, it cannot prove the function of said archery. Therefore, the question remains as to whether specialized Bell Beaker archers would have been hunters, warriors, or both. In the case of an osteological archer identification, Ryan-Despraz (2021) tends towards a warrior and warfare interpretation. The following sections will therefore discuss the evidence for both archery and warfare, firstly throughout the Neolithic period and secondly specifically during the Bell Beaker period. Following the example and criteria previously mentioned in Thorpe (2003), Lull *et al.* (2006), and Soriano *et al.* (2015), the thematic elements for each part include: Anthropological Evidence, Fortifications, Imagery, Weapons, Bows, and Arrows. A short supplementary discussion on horses will take place for the Neolithic period and one on wristguards with the Bell Beaker period.

During the Neolithic period

This section will outline the evidence for warfare and archery beginning with the transition into the Early Neolithic period up until the Final Neolithic, before the arrival of the Bell Beaker peoples.

Anthropological evidence

Much evidence for warfare comes from the identification of obvious signs of violence found on human remains. Since accidents can also cause traumas, the most conclusive indications come in the form of an arrowhead embedded in the bone or cranial fractures resulting from blunt force trauma. However, it is necessary to note that conflicts did not have to end in death, and injuries do not always leave a mark on bone. According to Milner (2005), only 2% of arrows shot into the trunk of the body embed in bones and only one out of three leave a mark on bone. Therefore, while clear signs of trauma suggest violence, an absence of trauma does not necessarily mean an absence of violence.

The oldest known case of mass and violent death comes from the Vassil'evka 3 cemetery situated at the Middle Dniepr Rapids dated to the Mesolithic (dated to c. 10,000 BP) (Dolukhanov 2004). Of the dozens of individuals recovered, several had arrowheads lodged in the ribs and spine. Archaeological analyses on the cemetery layout and the skeletons concluded that the society was both male- and military-oriented (Dolukhanov 2004). In close proximity to this site is the Mesolithic cemetery at Voloshkii near the Dnepr River. This area contained 19 individuals, three of whom had suffered from injuries caused by flint points (Guilaine and Zammit 2008). Two other interesting Mesolithic sites are from Vlasac (Serbia) and Schela Cladovei (Romania), both along the Danube. At the latter, 56 graves yielded six with injuries caused by a projectile and six with skull trauma; proportionally, this consists of about one third of all adults in the cemetery (Borić *et al.* 2014; Boroneanț *et al.* 1999; Thorpe 2003). However for the region, these sites are exceptional, with few instances of violent injuries in other contemporary cemeteries. As a last example of skeletal trauma indicative of violence from the Mesolithic period, it is interesting to look at the 38 Ofnet skulls from Bavaria (approximately 6500 BC) (Frayer 1997; Orschiedt 2015, 2005; Schmidt 1909; Schulting 2013; Thorpe 2003). The majority of these are children, and two-thirds of the adult skulls are female. Blunt force traumas seem to be the cause of several wounds seen on the skulls and intentional cut marks are visible on many cervical vertebrae, likely caused from decapitation. The demographic indicates an absence of men, which could have been for a number of reasons; however one theory speculates that

this very absence is a sign of conflict, with an enemy group having decided to attack while the defenders/warriors (men?) were away. However, while this is a sure example of physical violence, it is not irrefutable proof of warfare. Other cultural practices, such as sacrifice, could also provide an explanation. It is important to mention these Mesolithic examples because one primary theory for the rise of conflict and warfare during the Neolithic period is that it was a result of the increase in sedentary lifestyles and the need for territory and expansion. However, if these Mesolithic sites do fulfill the criteria for establishing conflict between groups, then this argument may require additional explanation and space for nuance. And interestingly, there does not always seem to be a dramatic increase in violence during the Neolithic (Thorpe 2003). In this sense, it is interesting to note the recent study by Bowles and Choi (2019) looking at the establishment of private property as a driver for the first farmers.

Arriving into the Neolithic, the LBK is the first farming culture in Central Europe and many examples for violence exist during this period. One of the most well-known is the German site of Talheim, dating from the end of the 6th millennium BC, which exhibits a collective burial of at least 34 individuals (18 adults and 16 children) all having died violently (Junkmanns 2001; Vencl 2004; Wahl and König 1987). Extensive anthropological analyses performed on these skeletons have found many serious wounds that likely resulted in the individual's death, and findings have concluded that many were attacked from behind while standing, such as when fleeing an aggressor (Guilaine and Zammit 2008). Interestingly, analyses have also found that the majority of blows came from right-handed individuals. The majority showed signs of violent ax blows and a few had traces of arrow wounds, however evidence also exists that flat adzes caused mortal wounds (Junkmanns 2001; Vencl 2004; Wahl and König 1987). This group displayed a total of 22 strikes and one older male aged 50-60 years also had traces of healed traumatic injuries, possibly from previous conflicts (Vencl 2004). In addition, comparisons between the morphology of the weapons used in the attack and fragments of pottery in the burial derive from the same culture, so a cultural link is possible between the victims and their attackers (Guilaine and Zammit 2008). The lack of a proper burial also suggests that the entire group died where they fell (as there was no one left to perform a ritual burial), which could be a sign that this was a territorial dispute aimed at obtaining land (Guilaine and Zammit 2008).

In addition to skeletal trauma, some of these massive and violent deaths have also emerged from ditches, something that appears consistently more often as time progresses into the historic periods (Vencl 2004). One example comes from the LBK period in Schletz, Austria where archaeologists found 67 skeletons with violent injuries in the ditch of a settlement site with a double oval enclosure (Figure 4) (Lenneis 2001; Windl 1994). As these individuals were in a ditch, there was no ceremony surrounding their burials, and body positions indicate that they remained unmoved after their deaths. Like at Talheim, the majority of the wounds appear to have come from adzes, which could indicate that early killing devices were everyday tools, not necessarily intended for violence (Guilaine and Zammit 2008; Teschler-Nicola *et al.* 1996; Vencl 2004; Windl 1994). Perhaps at this time, war was not yet commonplace enough to necessitate an economy producing items specifically for battle. Sites such as this leave little room for interpretations other than the existence of warfare. Additional examples of violently killed individuals found in ditches also surface during the Stroke-ornamented Pottery and Lengyel Cultures succeeding the LBK (Vencl 2004).

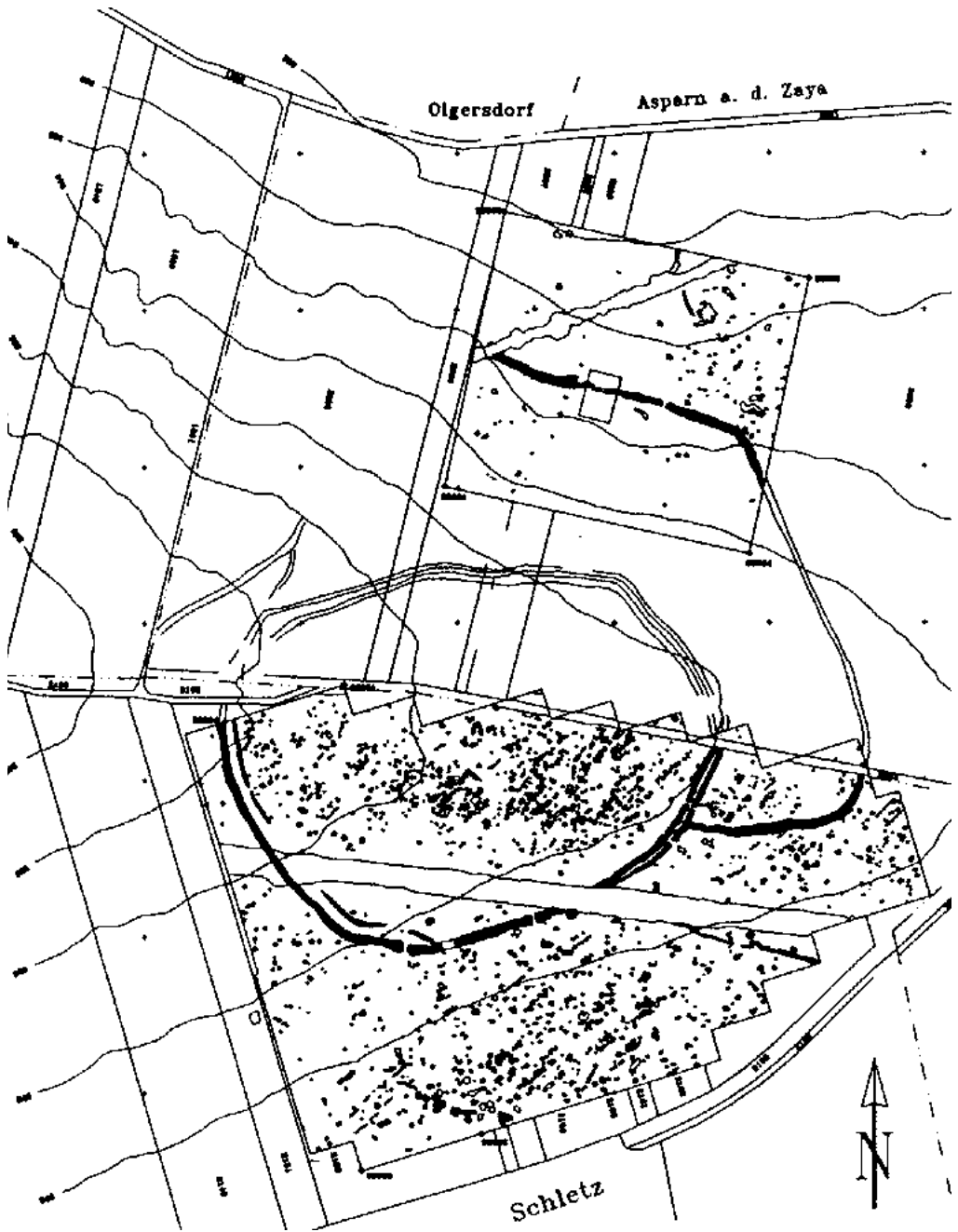


Figure 4: Geomagnetic survey of the Austrian site of Schletz showing a double enclosure where several skeletons were found, from Lennis (2001: Figure 7)

The site of Halberstadt in Germany also dates to the late LBK period and contained nine individuals: 7 adult males between the ages of 26 and 40 years, one probable male between 16 and 20 years, and one female 21 to 26 years (Meyer *et al.* 2018). The absence of women and children is different from other mass graves of the LBK, such as those previously mentioned at Talheim and Schletz. All individuals from Halberstadt showed signs of trauma, especially on the skull, though many lesions existed throughout the body. There is no sign of ritual with the burial and most of the individuals show signs of rodent gnawing, indicating a lack of ceremonial treatment after death. Strontium isotopes also conclude that these individuals were not locals. This together with their biological identities leads to the conclusion that this was more likely an attacking group rather than a defending group. After presenting the context, Meyer *et al.* (2018) discusses the idea of warfare during the Early Neolithic, stating that warfare during this period would have been between independent yet organized groups. There is no indication of a centralized power, but likely rather local communities connected through familial lineages. The author also points out that climate drops during the LBK would have placed stress on the land and its resources, which would not only increase tension between neighboring groups, but also place importance on land inheritance; thus contributing to the hierarchies witnessed in later periods. Lastly, the lone young woman in the group needs recognition as an illustration for the possibility of female warriors.

A study by Meyer *et al.* (2015) analyzed the site of Schöneck-Kilianstädten (Germany) for signs of LBK collective violence. This site revealed 26 individuals (13 adults and 13 children) commingled in a ditch all having died traumatically, either from blunt force trauma or arrow wounds (Figure 5). No arrowheads were embedded in bone, but proximity indicates that at least two had been in an individual's body, and much of the blunt force trauma is consistent with an adze. Signs of grave goods or ritual burials were absent, but fragments of other materials could indicate that the ditch may have functioned as a garbage pit. What sets this site apart are the traces of perimortem fractures in the lower limbs. Violent trauma crushed many tibia/fibula before the final deposition in the pit. This could be simple torture, or it could have been a message. Finally and as with Schletz, a lack of young women and teenagers could be a sign of kidnapping, such as for wives or slaves, though a lack of teenagers could also be a sign of escape, since this demographic would likely have been the quickest and most likely to evade enemies, especially if older adults had to remain with children. Or, as with other sites, the younger individuals could have been warriors away on some mission, thus leaving the home settlement open to attack. A similar finding was also noticeable at the site of El Trocs (Spain); of the 9 people killed violently during a single event, none of the four



Figure 5: The LBK ditch burial at Schöneck-Kilianstädten (Germany), from Meyer *et al.* (2015: Figure 1)

children were over the age of about 7 years, and all of the adults were over the age of 30 years (Alt *et al.* 2020). This unbalanced demographic indicates that for some reason, older children and younger adults were not part of the massacre.

One last interesting site from the German LBK period is the 5-hectare Herxheim surrounded by a double trench (Boulestin *et al.* 2009; Boulestin and Coupey 2015; Guilaine and Zammit 2008; Orschiedt and Haidle 2006). This site is special because it presents traces of a settlement and a clay extraction pit as well as burials. In addition, archaeologists found skull fragments from at least 300 individuals in the surrounding trenches (300 is a low estimate, but the minimum number of individuals remains inconclusive) (Boulestin and Coupey 2015). Strangely enough, some of the skulls were from children and mostly only the tops of the skulls were present, with other parts of the skeletons missing (Boulestin and Coupey 2015; Guilaine and Zammit 2008). The sheer number of skulls is both unique and compelling; especially because of how the skulls were cut, a ceremonial cause cannot be ruled out. However, so many sets of human remains in a likely protective ditch surrounding a settlement does support an argument for violence regardless of the motivation behind it.

Later during the Michelsberg Culture in Germany another interesting case appears at Ilsfeld near Heilbrunn (Gronenborn 2006; Nickel 1997). In excavations of a moat near a settlement gate, archaeologists recovered the skull of a 30–40 year-old male who was exceptionally robust. The skull showed signs of traumatic injury, but what is especially noteworthy is a postmortem widening of the foramen magnum and a puncture near the sagittal crest. A likely explanation for such features is the placement of the skull on a stake. Its recovery in a moat near a gate indicates that it could have served as a warning to potential aggressors.

As the Neolithic period progressed, violent deaths continued to become increasingly more common, with causes ranging from arrow wounds to blunt force head trauma (Vencel 2004). A study by Neustupný (1983) looking at the demographics of a Corded Ware Culture cemetery at Vikletice noticed that many men died sooner than their estimated life-expectancy, perhaps due to a violent lifestyle. One other interesting question concerns the presence of trepanations. The first ever recorded in Europe dates from the 6th or 5th millennium BC, however they increased during the second half of the Neolithic period (Guilaine and Zammit 2008). These numbers then decreased during the Bronze Age, and one common hypothesis speculates that this was due to the use of helmets. However, helmets were rare before about 1000 BC, though this could be an example of a prestige good and that common helmets were rather something more organic such as leather. Yet this remains conjecture, as some other studies of demographic distribution disrepute a link between warfare and trepanations because of a lack of significant differences between the occurrences for men, women, and even children (Guilaine and Zammit 2008).

A study by Schroeder *et al.* (2019) analyzing a mass grave of fifteen individuals of the Globular Amphora culture in Koszyce (Poland), all of whom were killed violently, is significant both in looking at violence during the Late Neolithic and in examining social organization. Advanced grave dating places the burials between 2800 and 2776 BC. The fifteen individuals all showed cranial fractures likely caused by hits to the head, but no fractures on the upper limbs that would indicate conflict or defensive wounds. Therefore the primary theory is that an unidentified group captured and then killed these individuals, the majority of whom were women and

children. The notable absence of men could be a sign that they were away during the time of the attack, perhaps a reason for the attack's timing. However, the presence of grave goods and the carefully positioned bodies demonstrate a level of regard paid to the burials. DNA analyses showed that the individuals were members of an extended family, including women with their children, for a total of four nuclear families. Each subgroup or family was buried next to each other, indicating familiarity by those who buried them. The only father in the group was with his partner and son. On a larger scale of familial relations, this indicates that social relationships were highly linked to genetic relationship (i.e. familial ties). There was only one unrelated female and her burial was in close connection to a young male. This example of female exogamy provides evidence for patrilineal society. However, while isotope analyses do not indicate that the females were not local, the presence of several mtDNA lineages and only one Y chromosome lineage does correspond to the presence of a patrilineal system. Genetic studies also provide evidence for the fact that the Globular Amphora people belong to the Neolithic European gene pool based on Anatolian farmers, with 30% of their DNA linked to Western hunter-gatherers and 70% of their DNA linked to Neolithic farmers; however, they lack ancestry with the European steppe region. In accepting previous studies, (Szmyt 2010) suggests that the peoples of the Globular Amphora Culture focused mainly on cattle, and this pastoral life would have made groups highly mobile and likely cause them to split up for parts of the year. If such groups were moving into undefined territories, this would have raised the prospect of conflict with neighboring groups. This constant possibility for aggression is one hypothesis for the rise of patrilineal societies and values placed on warriors and warrior-related objects. Such a conclusion is important when looking at social organization because it implies the presence of patrilineages before the arrival of the Corded Ware Culture. With this idea, it should be noted that this event at Koszyce did occur at the Corded Ware expansion into Central Europe and this violence could have been linked to inter-group violence over territory. The fact that these two cultures would have been hostile could be supported by their genetic differences, with no signs of admixture, and how during this period there was a sharp decrease in Neolithic genomic ancestry (Schroeder *et al.* 2019).

From the 3rd millennium BC, the cave site Baumes-Chaudes (Lozère, France), first excavated in 1888 by E.-A. Martel, contained between 300 and 400 individuals, 17 of whom had confirmed arrow injuries and one with a copper dagger embedded in the thorax (André and Boutin 1995; Guilaine and Zammit 2008; Prunières 1878). In Eulau, Saxony-Anhalt, Germany, four multiple burials (13 individuals, including men, women, and children) in very close proximity dating to the Corded Ware Culture all show signs of trauma (Meyer *et al.* 2009). Archaeological analyses concluded that each of these people died from trauma during a singular event. While some traumas had healed, meaning they occurred well before time-of-death (these were only seen on the two adult men), five out of the thirteen also showed signs of violent perimortem injuries. An adult woman had an arrow embedded in a lumbar vertebra and a second was found next to her ribs. Interestingly, both of these arrowheads were transverse, a style not typically associated with warfare, at least during the succeeding Bell Beaker period.

For additional examples of confirmed cases of injuries caused by arrows during the Neolithic period, Guilaine and Zammit (2008) compiled a complete list of individuals found in France. There are a total of 44 sites with a total of 67 bones and 66 individuals either killed or injured. Unconfirmed sites could also contribute an additional 8 individuals to these lists. An overall trend shows an increase in injuries linked to arrowheads from about 3500 BC in France, with

Site	Date	Details
Els Trocs (Spain)	5300 BC	5 older adults and 4 young children all killed violently during a single event; adults had arrow wounds to the skull; all with blunt force trauma (Alt <i>et al.</i> 2020)
Talheim (Germany)	LBK	34 adults and children all deceased from violent traumas, many of whom were likely hit from behind; few signs of arrow wounds; one male also had healed traumas (Wahl and König 1987; Junkmanns 2001; Vencl 2004)
Schletz (Austria)	LBK	67 individuals with violent injuries found in a ditch; most likely killed by adze strikes (Windl 1994; Teschler-Nicola <i>et al.</i> 1996; Vencl 2004)
Halberstadt (Germany)	LBK	9 adults, including 1 female, all with traumas mostly to the skull; they were non-locals (Meyer <i>et al.</i> 2018)
Schöneck-Kilianstädten (Germany)	LBK	26 adults and children in a ditch, all with traumas; likely arrow strikes; several perimortem fractures in lower limbs (Meyer <i>et al.</i> 2018)
Herxheim (Germany)	LBK	Skull fragments of at least 300 individuals in a ditch, including children (Orschiedt and Haidle 2006; Boulestin <i>et al.</i> 2009)
Vaihingen (Germany)	LBK	A dozen individuals found in garbage pits, most of whom demonstrated skeletal trauma (Golitzko and Keeley 2007)
Lake Zurich (Switzerland)	3700 BC	Individual with unhealed arrow wounds on the scapula and ribs (Junkmanns 2001)
Ötzi the Iceman (Italy)	3300 BC	Male killed by an arrow (Pernter <i>et al.</i> 2007)
Ilsfeld (Germany)	Michelsberg Culture (3400 – 3100 BC)	Skull of adult male showing traumas consistent with having been mounted on a stake (Nickel 1997; Gronenborn 2006)
Hetzenberg moat (Germany)	Michelsberg Culture (3400 – 3100 BC)	At least 12 individuals with pottery: 1 male with cranial trauma, several children with skeletal trauma, 1 child likely struck by an ax, child cranium with a perforation, severed child's head (Wahl 2005; Gronenborn 2006)
Heidelberg-Handschuhsheim (Germany)	Michelsberg Culture (3400 – 3100 BC)	6 individuals (2 males, 1 female, and 3 children), 4 of whom had cranial trauma, interred partially flexed in a pit (Gronenborn 2006)
Location unknown (Denmark)	3000 BC	Male killed by 2 arrows: 1 to the chest and 1 to the face (Junkmanns 2001)
Baumes-Chaudes (France)	3rd millennium BC	17 out of 300-400 individuals with confirmed arrow injuries, 1 with copper dagger in thorax (André and Boutin 1995; Guilaine and Zammit 2008)
Koszyce (Poland)	2800 (Globular Amphora Culture)	15 individuals killed violently, many with cranial traumas; no defensive traumas (Schroeder <i>et al.</i> 2019)
Eulau (Germany)	Corded Ware Culture (3rd millennium BC)	13 men, women, and children in 4 tombs, all died from trauma resulting from a single event; 2 men also had healed traumas; 5 people with violent perimortem injuries; 1 woman with arrowhead in vertebra (Meyer <i>et al.</i> 2009)

Table 1: Examples of violent deaths identified on European Neolithic skeletons

a peak around the mid-Copper age, or the Bell Beaker period. (Cordier 1990) also provides a catalog of wounds caused by projectiles in both prehistoric humans and animals. A summary of the previously discussed sites as well as other examples from Europe of human-driven violence are in Table 1.

Lastly, a study by (Gronenborn 2006) found a temporal correlation between sites exhibiting signs of violence and changes in the climate. Of course correlation does not equal causation, but if future studies manage to support this finding, it could provide evidence for territorial disputes. If the climate were unstable, agriculturally dependent societies would have had to compete for local resources, thus inciting violence. It is also worth noting certain isotopic studies that have found diets consisting of domestic animals and plants (e.g. the study by Oelze *et al.* (2011) on the LBK period in Central Germany), which therefore indicates that hunting was not a significant part of the food economy.

There are a few important points to summarize concerning signs of anthropological evidence for prehistoric violence. While arrows in bone and weapon-induced trauma provide the surest proof of violence, being shot by an arrow does not necessarily lead to marks on bone. Some people could have been shot or killed by arrows that researchers never realize because they left no physical trace. This is one likely interpretation for graves such as at Herxheim in Germany and Vikletice in Czechia (Neustupný 1983; Orschiedt and Haidle 2006). At these mass burials, arrowheads were not embedded in the bones, but on the ground intermingled with the bodies. The theory is therefore that they were originally lodged in an individual's flesh, but then fell out during decomposition. Another point to consider is the position of the bodies. An absence of ritual indicates an impersonal burial such as what one might expect from an enemy. Bodies that appear to have been found where they died (no postmortem displacement), such as at Asparn/Schletz in Austria, is also indicative of a battle or massacre in which no one remained to perform a proper burial. However, some researchers also argue that instances such as cannibalism, the torture of captives, and the mistreatment of slaves could be a cause for violence besides warfare (Gronenborn 2006; Vencl 2004). Lastly, it is interesting to look at the demography of the individuals violently killed. Historically speaking (for example as demonstrated in Roman mythology's the Rape of the Sabine Women), it was fairly common for warrior men to kidnap the women of the people they conquered and take them as wives. Assuming the presence of Neolithic warfare, this same practice remains possible for prehistory as well. In this case, such a burial demography would also provide further evidence that the majority of warriors would have been men. This point is also interesting to consider in the other sense. Some burials such as that at Halberstadt, or the study by Neustupný (1983), exhibit higher levels of males between the ages of 15 and 40 years, which would indicate both warfare and the fact that it would have been a more masculine activity. However, while relatively minimal, evidence does still exist for the presence of some female warriors.

Fortifications

Fortifications or enclosures begin to appear more often in the archaeological record from the LBK, though archaeologists have identified ditches at earlier sites, such as at Bicske (Hungary) and Eisleben (Germany) (as well as other sites previously mentioned with regard to anthropological evidence for warfare, see Table 1) (Vencl 2004). The fortifications of the LBK tend to be around villages, lending credence to their interpretation as defensive

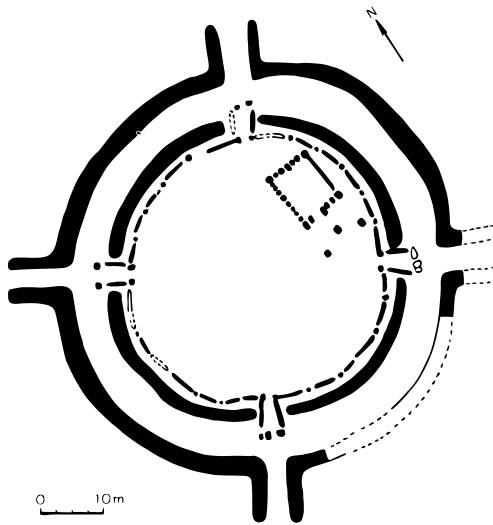


Figure 6: Middle Neolithic enclosure around a settlement at Bucany (Slovakia). Image adapted from Pažinová (2007: Figure 1); original drawing from Bujna and Romsauer (1986: Figure 2)

structures. However, some of these sites are single ditches approximately one meter deep, causing some researchers to believe that they are kraal rather than fortifications (Kaufmann 1997), though this interpretation has lost popularity as other studies have shown that such structures could still have functioned as a fortification (Golitzko and Keeley 2007). In total, a survey by Golitzko and Keeley (2007) identified 84 sites from the LBK period with enclosures, six of which exhibit multiple phases. During the succeeding Lengyel Culture in Central Europe, fort construction started at higher elevations, showing more strategic defensive planning (Vencl 2004). Such enclosures are usually linked to warfare because of their ties to defense in adding an additional layer of protection. While the reasons why people felt the need to protect themselves remain unknown, one very likely possibility is the existence of human conflict (Vencl 2004).

During the Middle Neolithic, populations began to move farther from water sources and situate themselves on plateaus where they then built fortifications (Howell 1987). Enclosures of this period in the western part of the Eastern complex and the Lengyel Culture exhibit high numbers of circular ditch systems called roundels (Pavúk 1991; Pažinová 2007). One example of this comes from the site of Bucany (Slovakia) where archaeologists identified two ditches with a palisade surrounding a village (Figure 6). Most are either v-shaped or u-shaped, with the former being most common during the Early and Middle Neolithic and the latter dominating the Final Neolithic (Petrasch 2015). The v-shaped system corresponds to a defensive rather than domestic function because while they are difficult to dig and erode more quickly, they also expose attackers to interior defenders (Golitzko and Keeley 2007). The u-shaped systems are less clear because they could serve a variety of functions with a number of advantages and disadvantages depending on the intended function. However they did not last long before palisade systems replaced them. Eventually they became so common in Central Europe during the Neolithic period that they are now part of the complex's overall classification description (Petrasch 2015). The combination of a palisade and a ditch is a common feature of the Late Neolithic period throughout Europe (Petrasch 2015).

Fortifications of the Late Neolithic can be separated into Northern and Southern traditions. The Northern tradition is between the Rhine and the Elbe with the Michelsberg, Wartberg, Salzmünde, and Walternienburg Bernburg Cultures. The Southern tradition includes the regions of Bavaria and Bohemia with the Münchshöfen, Altheim, and Cham/Řívnáč Cultures (Petrasch 2015). This contrasts with the Early Neolithic which had mainly ditches but no

palisade. One example from the French Copper Age (Final Neolithic) at Fontbousse, implicated in the Lébous castle in Trévières, represented a small community constructing stone walls and ditches (Arnal and Martin-Granel 1961). However, it seems likely that another group suddenly replaced the original population around 2300-2200 BC (Guilaine and Zammit 2008). Whether an incoming culture seized it from the first group or the first group abandoned the site remains unknown. Archaeologists have also identified fortifications and eyries from the 3rd millennium BC in the Cyclades, as well as hilltop fortifications and towers in Asia Minor (Guilaine and Zammit 2008). Table 2 contains a list of example fortification sites in Europe throughout the Neolithic period.

While the most common interpretation of these structures is defensive, it is not the only one. Other suggestions include corrals for animals such as cattle, enclosed market spaces, astronomical purposes, and a high-status residence (Petrasch 2015). One main argument for such sites having been a defensive purpose is the occasional presence of human skeletons and arrowheads found inside, as previously seen with sites such as Herxheim.

Site	Date	Details
Langweiler 9 (Germany)	LBK	Small ditch, no internal building at settlement edge (Petrasch 2015)
Langweiler 8 (Germany)	LBK	Small ditch, no internal building at settlement edge (Petrasch 2015)
Köln-Lindenthal (Germany)	LBK	Large enclosure, likely with houses inside (Petrasch 2015)
Erkelenz-Kückhoven (Germany)	LBK	Large enclosure, likely with houses inside (Petrasch 2015)
Bylany near Kutná Hora (Czechia)	LBK	Inner and outer circular enclosures with traces of a settlement (Midgley <i>et al.</i> 1993)
Passo di Corvo (Italy)	5000 BC	40 ha, ditch 850 m x 500 m and 4 m deep (Guilaine and Zammit 2008)
Urmitz (Germany)	4000 BC	>100 ha, 2 parallel ditches 10 m wide with a palisade (Guilaine and Zammit 2008)
Habasesh (Romania)	4000 BC	1.2 ha, two adjacent ditches 2-5 m wide (Guilaine and Zammit 2008)
Künzing-Unternberg (Germany)	Middle Neolithic	Circular v-shaped ditch system, inner ditch larger than outer ditch (Petrasch 2015)
Bucany (Slovakia)	Lengyel Culture (4th millennium BC)	2 ditches with a palisade surrounding a village (Petrasch 2015)
Sormás-Törökföldék (Hungary)	Late Neolithic (Lengyel Culture)	2 round-ditch systems and a settlement (Barna and Pásztor 2010)
Wiesbaden-Schierstein (Germany)	Late Neolithic	100 ha, ditches and palisades (Petrasch 2015)
Krsy (Czechia)	Cham Culture	Hilltop ditch fortification (John 2008)
Kříše (Czechia)	Cham Culture	40 m hilltop ditch with an outside rampart and palisade (John 2008)

Table 2: Examples of fortification sites throughout Europe during the Neolithic period

Imagery

Perhaps the best iconographic evidence for archery and warfare in Europe comes from Levantine cave paintings, though their exact dates remain unclear. Some argue for a Mesolithic date based on the high hunting focus of much of the content while others argue for Neolithic dates based on the spatial distribution of the rock shelters with regard to known settlements (Fairén-Jiménez 2015; López-Montalvo *et al.* 2014; Villaverde *et al.* 2012). Some of the warrior contexts also seem to be more compatible with a Neolithic date. Certain authors, such as those cited in Sarriá Boscovich (1989), discuss the likelihood of several phases of artwork dating over thousands of years, such as at the Cove Remigia (Spain). While precise dating methods have yet to confirm these theories, there are new attempts at extracting elements of the images' black pigment, which is carbon-based, and applying radiocarbon dating techniques (López-Montalvo *et al.* 2014).

Even though Levantine rock art is a primary source for depictions of both archers and warfare themes, only 49 out of more than 700 known rock shelters and caves can affirm actual human violence (López-Montalvo 2018). However, scenes of archers in the act of hunting account for many more. There are five types of scenes associated with confirmed acts of violence: executions, battles, ambushes, hand-to-hand combats, and wounded individuals (usually illustrated with projectiles protruding from the body) (López-Montalvo 2018).

The rock art of the Mediterranean basin in Spain dates back 40,000 years to the Paleolithic period and then continues through the Epipaleolithic and the Neolithic periods. Throughout each, the themes of these artistic representations change and evolve. During the Paleolithic, paintings are mostly found in caves and consist mainly of animals (horses, bison, prehistoric bulls, deer, and goats) as well as a few images of humans and large predatory animals (e.g. mammoths, rhinoceri, big cats) (Benedito *et al.* 2013; Dams 1984). Depictions of humans, including images of hunting and archery battles, become more prominent in rock shelters of the Epipaleolithic. Neolithic paintings on the other hand are much more abstract, often making their identifications more unsure (Benedito *et al.* 2013; Dams 1984).

One famous rock painting from the Spanish Levant is from the Cingle de la Mola Remigia in Are del Masetre, rock shelter 9 (Figure 7). This image shows a battle between two groups of archers and in the top corner, it appears that five more people are arriving at the scene, with a character that appears to be the leader wearing a hat or headdress (Guilaine and Zammit 2008). This artistic depiction is interesting not only as evidence for a battle between archers, but also for the possible presence of a leader, indicating some semblance of a hierarchy. It is also worth pointing out that four of the five individuals, including the leader, have possible portrayals of penises, but one clearly does not. Could this be an indication for a female warrior? A second painting in the rock shelter Molina de la Fuentes is also a battle between two groups of archers, however they appear to have different styles (Dams 1984; Garcia Guinea 1963). This is interesting because it may indicate two different populations (Guilaine and Zammit 2008). Lastly, in the Abric Centelles (Albocàsser) there is a scene with a group of archers accompanying three women and three children, perhaps portraying the movement of a family group (Benedito *et al.* 2013). While this is not a battle scene, it does indicate the importance of archery in everyday life as a means of protection. A brief summary of cave art examples are in Table 3.

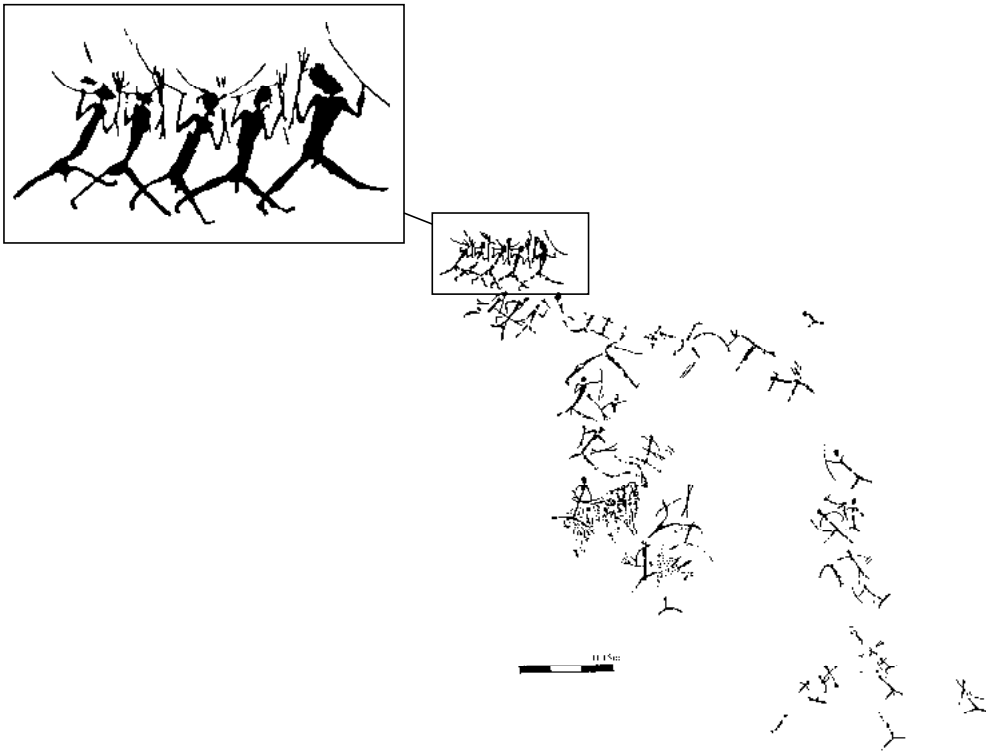


Figure 7: Battle image from El Cingle de la Mola Remigia (Spain), including what seems to be an arriving group (or phalanx) of 5 individuals, 4 of whom appear to be men due to the visible detailing of a penis, image adapted from Nash (2005: Figures 1b and 3)

Whether it be for hunting or warfare, many rupestrian images, such as at Monte Bego in Italy (de Lumley and Echassoux 2009), exhibit seemingly ‘masculine’ themes, most notably strength as represented by the animals. There are also images of swing plows pushed by men and one can also note the high occurrence of daggers in nearby sites. In these images, not only is there a seeming emphasis on power and male superiority, but there is also an absence of women (Guilaine and Zammit 2008).

Of all these artistic depictions listed above, the warfare scene at El Civil is the only one that definitively identifies women (López-Montalvo 2018). Current studies examining female representations in the battle and hunting scenes of cave paintings find a marked dichotomy between the presence and roles of males and females (López-Montalvo 2018). This supports suppositions based on ethnological studies that the vast majority of warriors and archers would have been men. However, the ‘phalanx’ painting from El Cingle de la Mola Remigia, assuming the drawing does in fact illustrate male anatomy therefore denoting one of the figures as female, directly contrasts this idea. Perhaps, as attested with the anthropological evidence (e.g. Halberstadt), the traditions regarding the sex of warriors was not black-and-white. The majority of warriors may have been men, but that does not completely exclude women.

Cave	Image Content
Abric Centelles (Spain)	Archers accompanying 3 women and 3 children (movement of a family group?) (Benedito <i>et al.</i> 2013)
Cingle de laMola Remigia (Spain)	Battle between 2 groups of archers, with 5 people arriving on the scene; possible depictions of leaders and a female (Ripoll Perello 1963; Dams 1984)
Coves dels Ribassals o del Civil (Spain)	Many depictions of archers, including a scene that appears to be a competition, either real or simulated; there is also an archer approaching a deer and nearby there is a horse (Benedito <i>et al.</i> 2013)
El Cerrao, Obón (Spain)	2 groups of archers running towards each other (Andreu <i>et al.</i> 1982; Guilaine and Zammit 2008)
El Civil (Spain)	An illustration of more than 70 warriors, most of whom are archers (Obermaier and Wernert 1919; López-Montalvo 2018)
Fuente del Sabuco I (Spain)	2 groups of warriors engaged in a battle (Martínez 1972; Guilaine and Zammit 2008)
Los Dogues (Spain)	Some of the warriors shown are archers, many of whom appear to be wearing some type of decoration, perhaps feathers; depictions of both long bows and composite bows (Porcar 1953; Guilaine and Zammit 2008)
Minateda (Spain)	The largest painting from a rock shelter, with over 500 figures, both human and animal; here there is also a battle, complete with many arrows, and some of the attackers appear to have tattoos or body paint and are wearing jewelry (Breuil 1920; Guilaine and Zammit 2008)
Molina de la Fuentes (Spain)	Battle between 2 groups of archers, but each with a different style (different cultures?) (García Guinea 1963; Dams 1984)
Pech-Merle (France)	A person with arrows piercing both the front and the back (Lorblanchet 1979; Guilaine and Zammit 2008)
Roure in Morella la Vella (Spain)	A battle with 8 archers (Guilaine and Zammit 2008; Benedito <i>et al.</i> 2013)
Solana de las Covachas (Spain)	8 archers (Benedito <i>et al.</i> 2013)
Torcal de la Bojadillas (shelters 3 and 6) (Spain)	A fallen archer struck by an arrow; 2 groups of archers engaged in battle (Viñas and Alonso 1978; Guilaine and Zammit 2008)

Table 3: Examples of Levantine cave paintings depicting scenes of violence and an additional example from France

Also of interest for this study is the fact that many archer warriors appear with some type of decoration, such as headdresses (López-Montalvo 2018). Such ornamentation could be a sign of social status or position, and in any case there are no indications from ethnoarchaeology that such items were practical rather than symbolic. At Cingle de la Mola Remigia, there appear to be two individuals, one on each side of the battle, wearing larger headdresses than the others, which could demonstrate their status as that of a leader, a great warrior, or both (López-Montalvo 2018).

Horses: domestication and riding

Horse domestication played a large role in the spread of culture, language, and trade as well as the development of local economies and warfare (Anthony 2007). Horse genetic diversity seems to have its ancestral roots in Western Asia in the region around the Caspian Sea and perhaps partly on the Iberian Peninsula (Warmuth *et al.* 2011). Other genetic studies of modern horses have shown exceptional diversity along the female line and very minimal diversity along the male line (Anthony 2007; Outram *et al.* 2009). This supports the theory that horse domestication started with several females, perhaps due to their more docile natures,

but only a few males likely for reproduction (Outram *et al.* 2009). In most of Europe from the Mesolithic to the Neolithic, signs from horse skeletons show that hunting was minimal, making up only about 5% of the animals in France, Germany, and Poland (Anthony 2007). However, this was not the case in the Eurasian steppe, where they were the dominant grazing animal and likely made up more than 40% of the local meat diet (Anthony 2007; Outram *et al.* 2009). This dependence on horses very possibly led to their domestication in this region.

The earliest evidence for horse domestication or exploitation in the Eurasian steppe dates from about 4800 BC (e.g. Krasnyi Yar, Kazakhstan), which is well after that of sheep and cows (Anthony 2007; Gaunitz *et al.* 2018). Anthony (2007) postulates that this domestication was probably due to a need for food during the winter because horses are more capable of foraging for food and water in the snow and ice than sheep and cows, which are much more dependent on humans (at this time, transportation was likely not a consideration for horses due to their aggressive natures). Incidentally, climatology studies observe a surge of colder winters occurring between 4200 BC and 3800 BC, which could have driven the need for animals better adapted to the climate (Anthony 2007). A study by Outram *et al.* (2009) examined pottery residue from the sites of Botai, Kozhai, Kumkeshu, and Kent in Kazakhstan (dated to 3500 BC) and found traces of horse milk, which is a strong indication for horse domestication. Another study by Ludwig *et al.* (2009) looking at genetic variation in coat coloring (a sign of domestication) established the probable presence of domestic horses in the Eurasian steppe before 3000 BC.

Working with the assumption that the first domestic horses come from the Botai Culture (the Western Eurasian Steppe in Kazakhstan), it is interesting to note the results of a study by Gaunitz *et al.* (2018) showing that Botai horses are not the ancestors of modern horses. The study concludes that another group of horses from the 3rd millennium BC is the likely ancestor of recent horse populations. Horses begin to appear regularly in Maikop and Early Transcaucasian culture settlements between 3500 and 3000 BC before spreading to the lower and middle Danube. By 3000 BC horse bones account for 10-20% of the animal bones in parts of central Germany and over 20% in Bavaria (Anthony 2007). At the Bell Beaker sites of Csepel-Hóros and Csepel Hollandi út (Hungary), large numbers of horse bones were found, making up about half of all recovered bones (Bendrey 2012; Bökönyi 1974).

When considering the possible functions of horse domestication, especially as it concerns warfare, one must look at horseback riding. One sign of this is beveling on the premolars caused by wearing a bit. The earliest known examples of these facets come from the Botai Culture and date to between 3700 and 3000 BC (Anthony 2007; Gaunitz *et al.* 2018; Outram *et al.* 2009). An additional indication that this culture used at least some horses for riding or pulling wagons is that archaeologists found skeletons in the Botai settlement. If they were strictly hunted, an entire carcass would likely have been too cumbersome to drag all the way home. As seen in North America, the Native Americans would butcher the large buffalo on-site (Calloway 2006). The conclusion therefore is that in order to get so many large horses into the settlement, the people would either have ridden them inside or used other horses to drag their carcasses inside. However, if the horses were tame enough, they also could have entered on a lead. A soil analysis of this site also found significant traces of horse dung, indicating a substantial amount of time spent inside the settlement (Anthony 2007; Gaunitz *et al.* 2018). Lastly, due to their size and nature, controlling a herd of horses without also riding

them, at least to an extent, would have been difficult. When it comes to herding and animal exploitation, the ability to ride would have been a valuable tool. Of course, the Standard of Ur (later mentioned in Part 3) does demonstrate prehistoric horse exploitation for pulling carts as well.

Trautman *et al.* (2019) examined the skeletons of individuals from the Yamnaya Culture (from the Late Neolithic to the Early Bronze Age) in Romania and found morphological evidence indicative of regular horseback riding practices. As a practical example, the site of Dereivka (Ukraine) from the Sredny Stog Culture (5th millennium BC) contained a horse burial and a crescent-shaped tin made out of antler with a worn perforation rested near the skull (Anthony 1986). Archaeologists have found similar objects in other graves of the same culture and one of the primary interpretations is that they were pieces of a bridle. Experimental research on similar objects from Funnel Beaker graves in Germany supports this interpretation (Anthony 1986; Lichardus 1980). These objects are also comparable to Bronze Age objects with a confirmed function as cheek-pieces or bridles for horses (Anthony 1986; Hüttel 1977). While Neolithic examples are limited, especially in Central Europe, the presence of bridles is strong evidence for horseback riding. A last example refers back to the Levantine cave painting at Caves dels Ribassals o del Civil (Tírig, Spain). This cave portrays an archer approaching a deer, and a horse is nearby (Benedito *et al.* 2013). This could indicate the exploitation of horses at this time, although this scene is hunting-related rather than battle-related. This also does not mean that the character rode the horse, it could have served other purposes. In any case, its presence was noteworthy for the artist, implying its relevant role in the activity of the depicted individual. Lastly, a non-Neolithic period study by Berthon *et al.* (2019) analyzed acetabulum shapes in order to attempt to link morphological variations to repetitive horseback riding. As studies such as this develop, their findings could be applied to Neolithic collections and the question of mounted archery.

While the first confirmed cavalries date from the Iron Age (about 1000 BC), it remains possible that groups exploited horses for smaller, less uniform attacks before then (Anthony 2007). However, where does mounted archery fall into this timeline? Anthony (2007) cites three primary reasons why hunters and warriors probably did not practice mounted archery before the Iron Age. The first reason lies in the fact that there is little evidence for the smaller, composite bows necessary for practical use from horseback. The second reason refers to the fact that arrowhead fabrication displayed a variety of shapes and sizes, indicating a lack of uniformity. As a side note, this observation seems to support more a lack of an organized army rather than a lack of overall mounted archery. There is no vital link between mounted archery and the uniformity of arrowheads. Thirdly is the fact that arrowheads of this period attached to a slit in the arrow shaft. This would have increased the probability of an arrow splitting upon high impact – though this simply means that one could not reuse the arrow, not that it was in any way less effective. So again, this seems to show more a lack of mastery on the part of arrow fabrication rather than an indication against mounted archery. These latter two arguments are therefore insufficient for denouncing the existence of mounted archery – they rather support, but not definitively, a lack of large-scale, organized warfare. An organized, military cavalry would not have simply developed overnight, it would have started gradually with disputes between villages or territories at a time when horse exploitation began to rise and the role of warriors began to take shape. This is the difference between state-organized warfare and tribal conflict. Concerning the existence of composite bows, it is true that the first

solid evidence does not appear until the Iron Age, however various iconography does present the possibility. In any case, while mounted long bow archery would have been cumbersome, it also would have been possible, therefore there is no reason to discuss the two as having been mutually exclusive. When considering the evolution of warfare techniques, it makes sense that the creation of composite bows was in response to a need for more effective mounted archery, rather than inventing a composite bow and then realizing that it would be useful from horseback. However, mounted archery during the Neolithic Bell Beaker periods remains speculation, with currently no definitive evidence for or against it.

Weapons

One of the biggest problems surrounding the question of weapons during the Neolithic period is the identification of function. As previously mentioned, the question is when did objects specifically intended for warfare appear and what about tools that could also function as weapons? As previously mentioned, Chapman (2004) classified ancient tools and weapons into four categories: those that would only have been tools (Tool), those that were tools but could also have been used as a weapon (Tool-Weapon), weapons that could also function as tools (Weapon-Tool), and uniquely weapons (Weapon). What were the order of appearance and the driving factors for change? For example, it could be that people started agricultural practices, which led to inter-group disputes over land and resources. If these disputes led to violence, perhaps the weapons of choice were the practical farming tools already available. As violence became more prominent and a part of everyday life, objects specifically for defense and combat emerged. This level of craftsmanship could also have been possible due to the nature of sedentary societies that would have allowed for specialization in a variety of crafts. This is confirmed during the Bronze Age, but what about the Neolithic period? Later in this section there will be a discussion specifically on bows and arrows, but here will briefly mention other items.

As seen with the mass burial at Talheim, many individuals died from blows likely caused by adzes and axes, with a few instances of arrow wounds. Arrows are also part of a hunting package, but adzes and axes are typical items of farming equipment, but in the case of Talheim, they also acted as instruments for violence (Junkmanns 2001; Vencl 2004; Wahl and König 1987). This is one reason why it is interesting to consider the polished battle axes of the Corded Ware Culture. The ax started as a practical farming tool, and in cases such as at Talheim, also functioned as a weapon. This culminated in the Corded Ware Culture's emphasis on the object, placing it as a polished, symbolic (because they often show little evidence of use) grave good in single inhumation burials. While the stone wristguards seemingly replaced this ensemble during the succeeding Bell Beaker period (refer back to Figure 1), this could have represented a warrior's burial, or acted as a representation of the warrior ideal.

Weapons are rarely found in a context obviously marking them as weapons, let alone weapons for war rather than, for example, hunting. In addition, it is very possible that many weapons have existed throughout prehistory and history that did not survive into the modern era. Much like the bow, objects such as wooden javelins, stones for throwing, slings, and clubs would not have survived due to their organic natures (Vencl 2004). One of the best examples of Neolithic life frozen in time comes from the remains of Ötzi (Italian Alps). Ötzi, dated to about 3200 BC, possessed numerous weapons, including a yew bow, a quiver with unfinished arrows

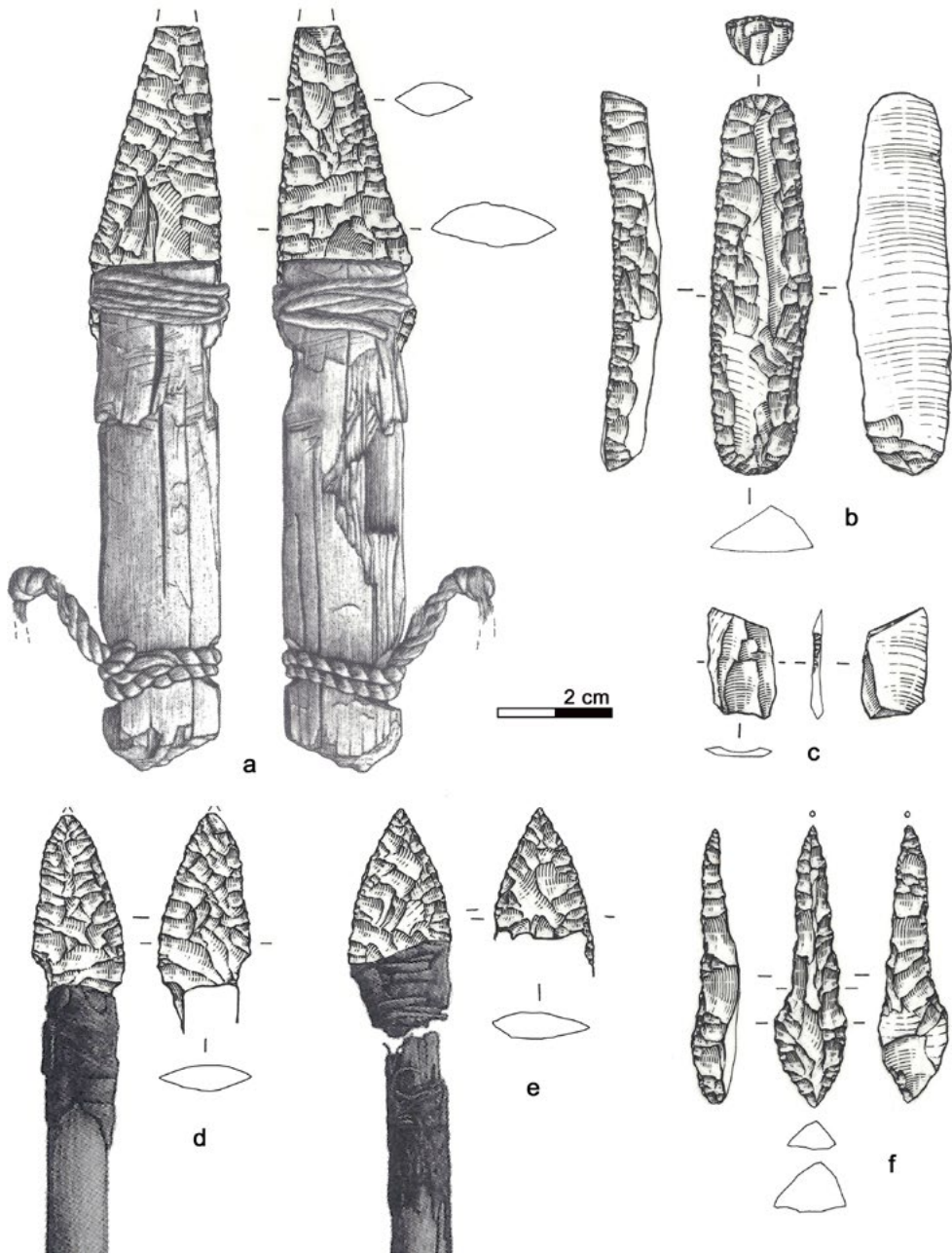


Figure 8: The lithic assemblage found with Ötzi (Italy, second half of the 4th millennium BC); a: dagger, b: endscraper, c: borer, d-e: arrowheads, f: small flake, from Wierer *et al.* (2018: Figure 1)

(Viburnum style), a flint dagger, and a copper-bladed ax (Figure 8) (Guilaine and Zammit 2008; Hafner 2012; Höpfel *et al.* 1992; Müller *et al.* 2003; Vanzetti *et al.* 2010). The function of these items as weapons or tools will likely remain unconfirmed, but one cannot ignore the fact that Ötzi was killed by an arrow shot to the torso. Since his body lay high in the mountains where there would not have been a settlement, it is possible that this is either a case of a pursuit or an unfriendly random interaction between mountaineers.

While complete armor is only confirmed from the Bronze Age, the earliest possible example of a shield comes from a tumulus at Langeneichstädt dating to the Globular Amphora Culture (McIntosh 2006; Vencl 2004). Unfortunately this shield has very little documentation as it did not survive the excavation. Other than this vague example, shields only definitively exist from the Early Bronze Age (Klochko 2001), but this is not their confirmed origin and they could have developed during early periods.

Copper swords first emerged in the Near East during the late 4th millennium BC, but they do not appear in the European archaeological record until well over a thousand years later (Klimscha 2018). The first identified personal metal weapons in Europe appeared in burials of the Balkans and Carpathian Basin and date to around 4400 BC, such as those seen at Varna (e.g. spearheads and hammer-axes) (Heyd 2007; Krauß *et al.* 2017). The Final Neolithic cemetery of Varna in Bulgaria is known for its exceptional gold deposits in a fraction of its burials. With regard to warfare, Carman and Harding (2004) identify four levels of status based on grave goods: graves with no weapons, those with either an ax or a blade, those with both, and those with both as well as additional weapons. As a side note, the fact that metal was primarily only used for weapons well into the Bronze Age is also an indication for the importance of war. As a valuable material, the craftsmen reserved it for the most important tasks (regardless of whether those tasks were practical or symbolic). For the domestic sphere, stone tools remain in use well into the Bronze Age.

Bows

The first bows probably appeared during the Upper Paleolithic (12,000-10,000 BC); however some scholars debate that it could have been as early as the Solutrean (20,000 BC) due to the discovery of stemmed arrowheads and flint barbs that could have been attached to an arrow (Junkmanns 2001; Guilaine and Zammit 2008). However since bows rarely survive into the modern era, the evidence for Paleolithic archery is similarly limited – the morphologies of some arrowheads from this period indicate that they would have fit onto an arrow shaft. The first definitive evidence for bows comes from the Mesolithic, when archaeologists uncovered actual bows, such as the Holmegaard bow in Denmark (Holmegaard is the name of both the type and the site), the Mulbjerg and Braband bows in Scandinavia (associated with the Ertebølle Culture), as well as fragments of others (Becker 1945; Cattelain 1997; Guilaine and Zammit 2008; Junkmanns 2013). Each of these bows is between approximately 1.5 and 1.8 meters in length and made from elm. These bows were resistant to tension, with a draw force of approximately 21-32 kg (Junkmanns 2001). This would generate enough force for an arrow to travel at speeds of 120-180 km/h. Any bows with lower draw strengths would not have produced enough force to kill a large animal and thus would only have been effective against smaller game (Junkmanns 2001). Interestingly, the Mesolithic site of Vis-Moor I in Russia revealed bows between 1.4 and 1.5 meters long, a fragment of a bow with a double curve (composite bow),

and a third bow measuring 1.5 meters (Burov 1981; Cattelain 1997; Guilaine and Zammit 2008). Because composite bows are much more technically advanced than longbows, being able to confirm the presence of such a bow already during the Mesolithic would have major implications for both specialization in craftsmanship as well as functionality. These ideas and the significance of such a find will come up again in later sections.

From about 4500 BC in Europe, yew wood seems to have been the main material for all bows (Junkmanns 2001). This wood is structurally ideal because it consists of two layers: an external layer that is more elastic and a more rigid internal layer. For bows, this means that the exterior is flexible enough to bend, yet with a solid interior that will not easily break, all while maintaining the desired power. This also allowed the bows to be thinner, though the overall method of fabrication remained constant from the Mesolithic into the Neolithic (Junkmanns 2001). A few examples of recovered bows from sites dating to the 4th millennium BC include: Twann (Switzerland 3838-3768 BC), Feldmeilen-Vorderfeld (Switzerland 3800-3600 BC), Thayngen-Weier (Switzerland 3822-3584 BC), Similaun (Italy 3350-3300 BC), and Zürich-Mozartstrasse (Switzerland 3126-3088 BC) (Junkmanns 2013). Two examples from the 3rd millennium BC are Nidau-Schlossmatte (Switzerland 3007-3979 BC) and Zürich-Mythenschloss (Switzerland 2600-2500 BC) (Junkmanns 2013).

Current knowledge, including interpretations from iconography, identifies two types of bow during the Neolithic: straight longbows (Figure 9) and curved/composite bows. As previously discussed, longbows had been present since the Mesolithic, and composite bows perhaps developed either during the Mesolithic or the Neolithic. No Neolithic composite bows exist at this time in the archaeological record and the possible composite bow from Vis-Moor I (Russia) dates to the Mesolithic, therefore evidence remains scarce. Hypotheses concerning the presence of composite bows during the Neolithic derive largely from artistic representations (e.g. Levantine cave paintings, bow-shaped pendants, and images on stelae -- the following section looking at the Bell Beaker period will discuss the second two examples in greater detail). Identifying the presence of composite bows is important because their morphology acts as a possible link to warfare. However as this primarily concerns the Bell Beaker period for the scope of this study, the following section will discuss this idea in more detail. For now, it is simply important to understand that bows existed throughout the Neolithic and composite bows may or may not precede the Bell Beaker period. Overall, a lack of evidence (due to their organic nature, bows rarely survive into the modern era) and precise dating has made distinguishing a specific chronology and geographic distribution impossible (Dias-Meirinho 2011; Junkmanns 2001). In general, the composite bows are more specialized and imply a more advanced technology, therefore their association tends to be with the Final Neolithic, specifically the Bell Beaker period. Long bows are more traditional, with a continued usage well into the Middle Ages (famously practiced by the English during the Tudor dynasty). As seen with the depictions from cave art, bows, whether for hunting or warfare, were prominent throughout the Neolithic period. Additionally, these images seem to show both long bows and bows with a double or triple curve (composite structure), which provides evidence not only for the existence of composite bows during the Neolithic, but also for their use in battle. In fact, the battle scene at Les Dogues clearly portrays both longbows as well as composite bows (Nash 2005; Porcar 1953). Interestingly, the rock shelter of Minateda in Spain clearly depicts bows with a double curve, however some scholars speculate that this site could date to the Mesolithic (Breuil 1920; Guilaine and Zammit 2008).



Figure 9: An example of a Neolithic long bow recovered from the Schnidejoch passage (Alps), from Hafner (2012: Figure 7)

In terms of bow construction, the bodies (i.e. form and length) are technical aspects that relate to technique and function. Contrarily, the forms of either end (for attaching the strings) and the handles are aesthetic (not practical) and therefore reflect the different cultures that fabricated the bows (Dias-Meirinho 2011; Junkmanns 2001). In other words, examining the bow's body will identify its function, and examining handle and end forms will identify the specific culture. The bow bodies are normally semi-circular, with a rounded exterior and a flat or concave interior (Dias-Meirinho 2011; Junkmanns 2001). The reasons behind a concave form are a mystery because this decreases resistance to tension (and thus quality). This could only be solved by also lowering the tension, which would make the shots less powerful. Bows of the Final Neolithic seem to solve this problem by making the exterior thin and flat, improving the tension while also reducing the risk of fracture (Junkmanns 2001).

Due to their fabrication in wood, bows rarely survive into the modern era. For this reason, those that do exist usually come from wet environments, such as banks and marshes, that preserve the wood. The area around the lakes of Switzerland fulfills this criteria, where Junkmanns (2001) identifies 49 examples dating from 4000 to 2500 BC (e.g. Twann site (3838-3768 BC), Feldmeilen-Vorderfeld (3800-3600 BC), and Zürich-Mythenschloss (2600-2500 BC)). It is these examples that allow for the categorization of bows as either deriving from the Early or Recent Neolithic based on their forms. Early bows had a rounded exterior with lengths not respecting the natural curve of the growth circles whereas later bows had a flatter exterior that followed the natural form of the tree (Junkmanns 2013, 2001). Some of these recovered bows were also smaller and therefore would not have been powerful enough for hunting or war, such bows possibly belonged to children (Dias-Meirinho 2011; Junkmanns 2013, 2001). In this case, whether they were a toy or a way to train even at a young age, the fact of producing unusable bows are an additional indication as to the importance of archery during the Neolithic.

Arrows

Projectile points associated with hunter-gatherers first appear in North Africa and the Levant around 40,000 years ago (Pontzer *et al.* 2017; Shea 2006; Shea and Sisk 2010). The first flint arrowheads in Europe small enough to be associated with archery emerged in Spain and Portugal around 17,000 BC; however since the wooden shafts are not preserved, the possibility remains that they were part of an assegai or other object (Junkmanns 2001; Larsson *et al.* 2016). The oldest sure examples of arrows come from Stellmoor, Germany (near Hamburg) and date to 10,000 BC during the Upper Paleolithic (Cattelain 1997; Junkmanns 2001). Incidentally, around this site are also instances of skeletal traumas and projectile-inflicted wounds (Cordier 1990; Thorpe 2003). These arrows, as well as other early examples, were made from pine until eventually other materials, such as viburnum and hazel wood, became prominent (Junkmanns 2001). Some of these early arrowheads, called transverse arrowheads (Figure 10), did not have a point, but rather a bulge making it like a club. This morphology associates it with hunting as it would have incapacitated a small animal without destroying fur or feathers (Junkmanns 2001).

Triangular arrowheads made from flint become the most common type during the Neolithic and they seem to have required more time and care to make than the preceding transverse arrowheads (Junkmanns 2001). Three primary fabrication features mark the technological advancement, and therefore importance, of arrowheads: penetration optimization, blade sharpness, and blade symmetry (for maximum directional stability) (Chapman 2004; Fischer 1989). This is in contrast to the older and more blunt transverse arrowheads.

A study by Saintot (1998) examined arrowheads in the Jura region of France from the Middle Neolithic to the Final Neolithic. In this collection, simple and triangular points (piercing points) dominated the Middle Neolithic, and tanged arrowheads started to appear at the beginning of the Final Neolithic. The overall findings demonstrate that the Middle Neolithic arrowheads followed a regional tradition whereas those from the Final Neolithic became more intricate and symmetrical. In general throughout the complex, arrowheads become more numerous with more morphological variations.

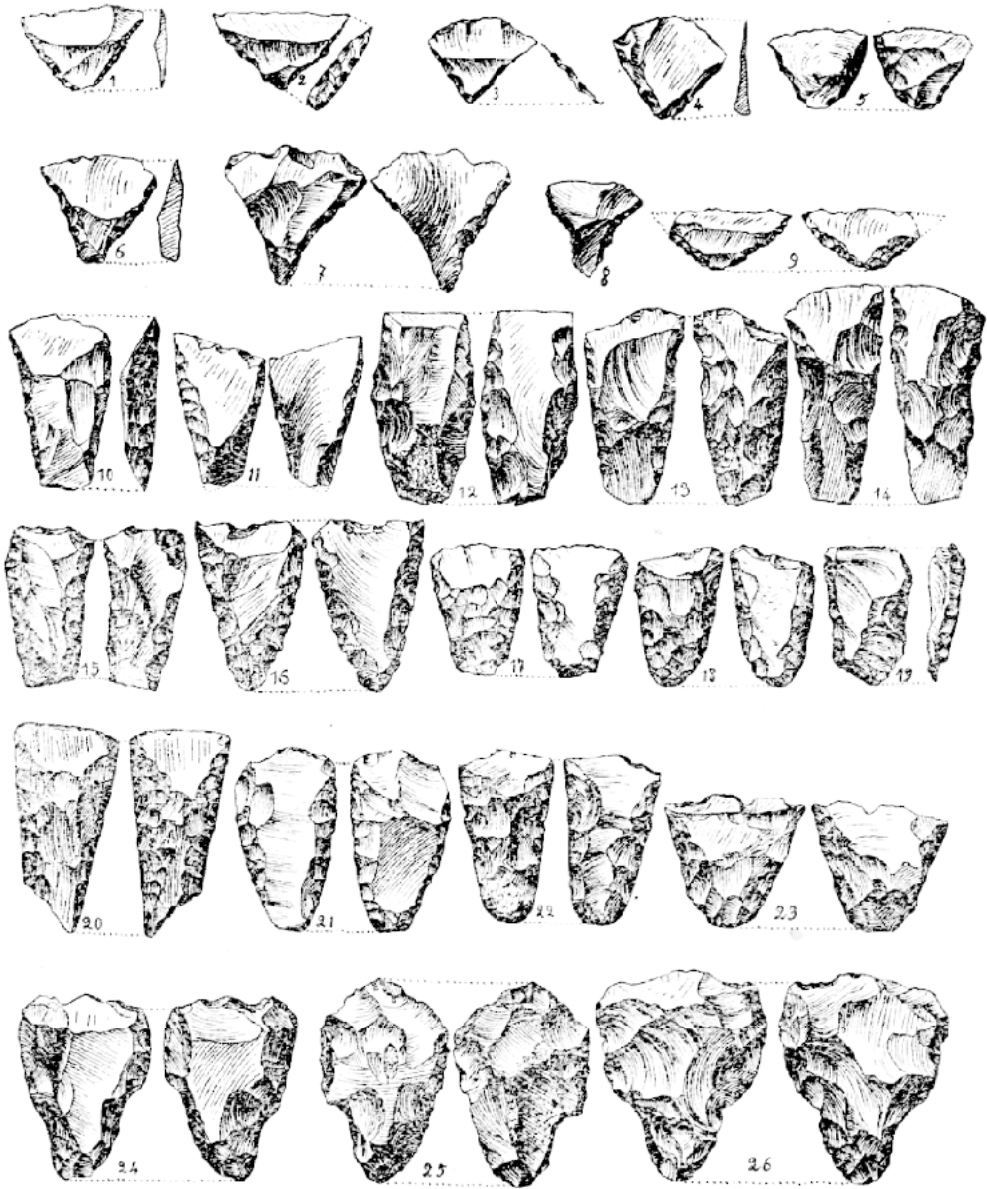


Figure 10: Examples of early transverse arrowheads (Dordogne, France), from Cheynier (1946: page 209)

During the Bell Beaker period

The majority of Bell Beaker artifacts come from burials and the commonly associated ‘Beaker package’ consists of stone wristguards, arrowheads, bell beakers, copper daggers, and v-shaped buttons; though these objects rarely appear all together. During the earlier days of Bell Beaker research, burials with wristguards and arrowheads drove interpretations of the culture’s origin, with the supposition that these individuals were warriors who spread the Bell Beaker Culture through invasions (Castillo Yurrita 1928; Childe 1929; Nicolas 2019). By the middle of the century however, archaeologists viewed these objects as symbolic and prestige items that appeared through long-distance exchange (Hájek 1957; Heyd 2001; Nicolas 2019; Shennan 1977; Sherratt 1972). Now more modern literature often views these contexts as symbols of social status, which would imply the presence of a social hierarchy and some social value placed on warriors, a warrior ideal, or both (Lemerancier 2011; Nicolas 2019).

A study by Lemerancier (2011) acts as a general template for the patterns and relationships of objects within Bell Beaker burials. His study examined a total of 951 burials of which 224 contained a weapon (i.e. dagger, wristguard, arrowhead, palmela point, ax). The most common objects were flint arrowheads falling into two principal categories: the Western type with a square base and the Eastern type with a concave base. Secondly was the archer’s wristguard identified in 76 tombs and of those 76, 70 contained only one and six had two. In total, 133 tombs had objects related to archery, which equals only about 14% of the total inventory and 59% of the tombs with weapons. The other weapons include 69 tombs with copper daggers and 24 with flint daggers for a total percentage of 42% of the tombs with weapons. Almost all tombs with a dagger contained only one, with one tomb having had three and two having had two. There is also very little mixing of grave goods – only 25 tombs with wristguards also had arrowheads and only 34 tombs with daggers also had an object related to archery.¹ Figure 11

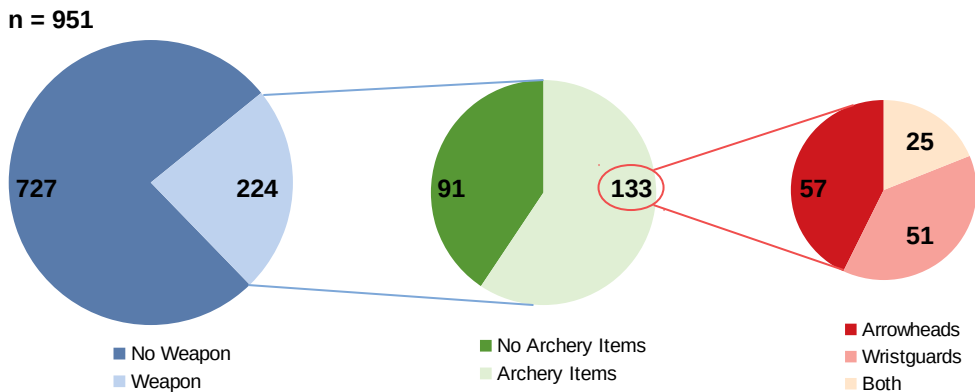


Figure 11: A summary of the findings from Lemerancier (2011). The pie chart on the left shows burials with and without a weapon; the middle chart shows burials with archery-related items; the right chart shows the number of graves with wristguards, arrowheads, or both

¹ The upcoming section looking at the distribution of grave goods for the individuals examined in this study do not show such a marked difference between contexts.

presents a summary of these findings. It is also worth noting that the vast majority of these tombs were adults and there appears to be no link between the grave goods and the overall richness of the burial. This grouping of weapons in less than one quarter of the overall burials serves as an indicator that the choice of grave goods could be less culturally significant in the sense that there is not some broad symbolism but is rather directly related to the individual.

Whether these burials belonged to warrior invaders, represent long-distance trade, or signal a social status, they are some of the first, well-defined individual burials of the Neolithic period and it is very possible that the richest of them belonged to chieftains (Nicolas 2019). As with the Amesbury Archer in England, the richness of these graves is not necessarily due to the individual quality of the objects, but rather in their numerousness (Fitzpatrick 2011). This next section will look at aspects and artifacts linked to warfare and archery specifically during the Bell Beaker period.

Anthropological evidence

The Roaix hypogeum (France) dates to late 3rd millennium BC, and while it did not have Bell Beaker pottery confirming it to be a part of the Bell Beaker Culture, it is contemporary in both time and space to Bell Beaker groups. This site contained about 200 skeletons over several layers, including what could be a 'war layer' (Bouville 1980; Courtin 1974; Guilaine and Zammit 2008). While some of the layers appear well-organized with the bodies carefully laid-out, the 'war layer' has bodies stacked on top of each other and facing different directions,



Figure 12: Arrowhead lodged in vertebrae (case 7) at San Juan ante Portam Latinam (Spain), from Soriano *et al.* (2015: Figure 9), original photo from Etxeberria and Herrasti (2007: Figure 66)

as if they were all placed quickly and at the same time. Some bodies from this layer also still had arrowheads embedded in the bone. Just above these individuals, the succeeding layers returned to the previous level of organization, including the removal and placement of skulls against a wall. A similar phenomenon turned up at San Juan Ante Portam Latinam (Spain), for which the occupation dates to 3800 - 2800 BC, therefore the final stages corresponded to the earliest phases of the Bell Beaker period in the region. Here, there is also a difference between organized and disorganized layers and many of the bodies in the disorganized layer have arrow wounds as well as ulnar and cranial traumas. However, the overall proportion is small, with just nine individuals exhibiting arrowheads lodged in bone out of 338 (Figure 12) (Etxeberría and Herrasti 2007). At the same time, some of the arrowheads found at the bottom of the tomb were also chipped, as if they had hit something or someone. And while the tomb contained both men and women, each of the individuals with confirmed arrowhead traumas was male (Guilaine and Zammit 2008; Soriano *et al.* 2015).

A second hypogeum at Costa de Can Martorell (Spain) contained 195 individuals. None showed obvious signs of trauma, but stratigraphic and osteological studies have concluded that all individuals were buried simultaneously (Mercadal 2003; Soriano *et al.* 2015). Additionally, while no arrowheads appeared stuck in the bones, several still emerged during excavations. The arrangement was disorganized and other grave goods were almost nonexistent, therefore it is very possible that these arrows fell from soft tissue as the body decayed. However, the authors still speculate that a lack of obviously violent deaths during the Bell Beaker period indicates a lack of warfare.

A study by Hukelova (2016) looked at 34 sites in Slovakia and Czechia (152 adults and 136 subadults) and found an overall trend of more lesions and traumas on men than women throughout the Neolithic, including the Bell Beaker period, indicating that they experienced more violence and physical activity. The presence of traumas linked to brutality also increased throughout the study period, with more during the Bell Beaker period than the rest of the Neolithic, and more during the Early Bronze Age than the Bell Beaker period. The previously mentioned study by Cordier (1990) also supports these findings.

Studies examining signs of impact on arrowheads also support the theory that acts of violence occurred during the Bell Beaker period (Soriano *et al.* 2015). However, signs of impact do not reveal how the impact occurred. Proof of usage is not proof of function and these studies cannot rule out hunting or simple target practice. Of the confirmed archaeological findings for violent deaths, Table 4 outlines those previously mentioned as well as lists a few additional examples.

In contrast to these examples, some other studies have found limited signs of violence during the Bell Beaker period. Farkašová (2011) looked at 104 Bell Beaker skeletons housed in the Prague National Museum and found that only seven individuals showed signs of trauma linked to violence. These seven individuals include four adult men, two adult women, and a subadult. The study hypothesizes that such small numbers of trauma demonstrate that warfare was not widespread throughout the culture. However, 6.7% is neither necessarily insignificant nor that variable from previous cultures. At the same time, many other such studies have also concluded that violence played less of a role during the Bell Beaker period than in previous periods. While this is entirely possible, it is worth pointing out again that not all violent deaths

Site	Violent Deaths
Brandýsek (Czechia)	Grave 2: healed ulna trauma (defensive wound?) (Farkašová 2011)
Brandýsek (Czechia)	Grave 25: healed ulna trauma (defensive wound?) (Farkašová 2011)
Fengate (United Kingdom)	Grave with 2 children, 1 woman, and a man with an arrowhead between his ribs (Pryor 1976; Christensen 2004)
Kněžves (Czechia)	Grave 8: cranial trauma (Farkašová 2011)
La Fare (France)	Wound in ulna caused by flint fragment (Soriano <i>et al.</i> 2015)
Longar (Spain)	4 individuals out of 112 with arrowhead trauma (Armendáriz <i>et al.</i> 1994; Soriano <i>et al.</i> 2015)
Offingen (Germany)	Grave 4: arrowhead embedded into a lumbar vertebra (Schröter 1997)
Plotiště nad Labem (Czechia)	Grave LX: 3 total skull traumas–2 healed, 1 possible cause of death, 2 from blunt objects, 1 from cutting object (Farkašová 2011)
Ring Ditch 201 (United Kingdom)	Male with arrowhead in rib cage (Harding 2007; Soriano <i>et al.</i> 2015)
Roaix Hypogeum (France)	Presence of a 'war layer' (Courtin 1974; Bouville 1980; Guilaine and Zammit 2008)
Saint-Martory (France)	1 out of 4 individuals with a flint arrowhead lodged in a lumbar vertebra (Wells 1964)
San Juan ante Portam Latinum (Spain)	9 out of 338 skeletons with arrowheads lodged in bone (Etxeberría and Herrasti 2007)
Stonehenge (United Kingdom)	Young male in ditch, arrow stuck in rib (Harding 2007; Soriano <i>et al.</i> 2015)
Sulejovice (Czechia)	Grave 2: healed skull trauma (Farkašová 2011)
Tišice (Czechia)	Grave 3: 2 skull traumas (Farkašová 2011)
Tuchoměřice (Czechia)	Grave 1: healed ulna trauma (defensive wound?) (Farkašová 2011)
Tumulus of the Gendarme (France)	Flint arrowhead in femur (Lemercier 2011; Soriano <i>et al.</i> 2015)
Weimar (Germany)	Fatal cranial trauma (Christensen 2004; Soriano <i>et al.</i> 2015)

Table 4: Examples of violent deaths dated to the Bell Beaker period

leave marks on bones (Milner 2005) and the existing analyses on such skeletons are relatively small and not automatically representative of the population. There are signs of violence during preceding periods and during the Bronze Age (Homer's *Iliad* takes place during the Bronze Age), therefore a lack of skeletal trauma is not entirely sufficient for labeling the Bell Beaker period as one of peace. However, classifying the complete range of Bell Beaker skeletal trauma is outside the anthropological scope of this study, and the possibility remains that the Bell Beaker period was relatively less violent than preceding and succeeding cultures.

As with previous periods, the question remains as to whether or not specialized Bell Beaker archers would have been hunters, warriors, or both. There are countless indications for the presence of warfare and conflict, but that does not mean that hunting was not also important. Two examples come from the Danish Bell Beaker period, where two animals, both red deer, were found in lakes with pressure-flaked arrowheads embedded in the bone (Sarauw 2007; Skaarup 1985). While this is solid evidence for hunting, it is exceptional. There is very little reason to believe that hunting was a part of the daily life or economies of these groups. As argued by Harding (2007), archery existed throughout the Neolithic, but the transition from hunter to warrior was likely very gradual. The implications of these theories will appear in more detail later in this book.

Fortifications

While the number of fortifications increased throughout the Neolithic leading up to the Bell Beaker period, most Bell Beaker societies were much more open throughout Europe, with the occasional group re-using a previously constructed fortified settlement (Vander Linden 2006). Therefore, unlike with previous periods, there are fewer instances of remains recovered from such ditches. One unique and non-osteological example from Basly (Normandy, France) contained a burned-down fence with several arrowheads (both transverse and barbed/tanged) alongside it (Fromont *et al.* 2014; Nicolas 2019). If the Bell Beaker period were a more peaceful time, fewer fortification sites could go together with fewer findings of traumatic deaths.

Three confirmed examples of Bell Beaker fortifications come from the Portuguese sites of Zambujal, Vila Nova de São Pedro, and Leceia. The first site at Zambujal presents two levels of occupation, the second of which dates to the Bell Beaker Culture (Kunst and Lutz 2008). This site is exceptionally well-preserved and exhibits advanced architectural achievements, including round stone towers. The size and nearby evidence of extensive Neolithic farming indicates it likely surrounded a small village. Archaeologists recovered several arrowheads near the exterior wall, many of which were fragmented as if from impact. The second site, Vila Nova de São Pedro (Figure 13a), also has a stone construction complete with an inner wall, two lines of defense, and semi-circular bastions (Müller and Monge Soares 2008). There were caches of arrowheads scattered around the site and an exceptional amount of metal finds makes this place ideal for studying early metallurgy. The third site, Leceia (Figure 13b), also contained stone walls and semi-circular bastions (Cardoso 2008). This structure likely surrounded a small village and evidence points to a high presence of domestic cattle. As with the Zambujal and Vila Nova de São Pedro, archaeologists uncovered several arrowheads at Leceia as well as axes and adzes denoting a strong farming economy. Studies have also found evidence of deer and boar hunting as well as the presence of wild horses (Cardoso 2008). This could affirm the existence of a hunting culture alongside a warrior culture. Raw materials used for construction also indicate significant and long-distance trade, perhaps in exchange for flint which was a common local resource. For each of these three sites, there is little doubt that these were defensive structures. It is also worth noting that the appearance of each of these fortifications coincides with the first appearances of copper and gold objects in the region (Müller and Monge Soares 2008).

Two examples of hillforts from Czechia are Rmíz (Moravia) and Kutná Hora (Bohemia) (Vencel 1997); however, while these sites date to the Central European Eneolithic with possible occupation dates contemporary to regional Bell Beaker sites, no bell beakers have emerged directly linking them to the culture. In fact, the only pottery found at this site is from the Moravian Painted Ware Culture, so their association with the Bell Beaker Culture is not confirmed. However, these two sites are worth mentioning because they were relatively advanced, with architectural elements comparable to those seen in medieval castle construction (Vencel 1997).

The fact that the Bell Beaker Culture, and even the preceding Corded Ware Culture (in Central Europe), did not build fortifications is an interesting contrast to the fact that these are also the first cultural graves with possible weapons. This could be a sign of their symbolic function, such as within a hierarchy, but it remains interesting to consider the economic and social

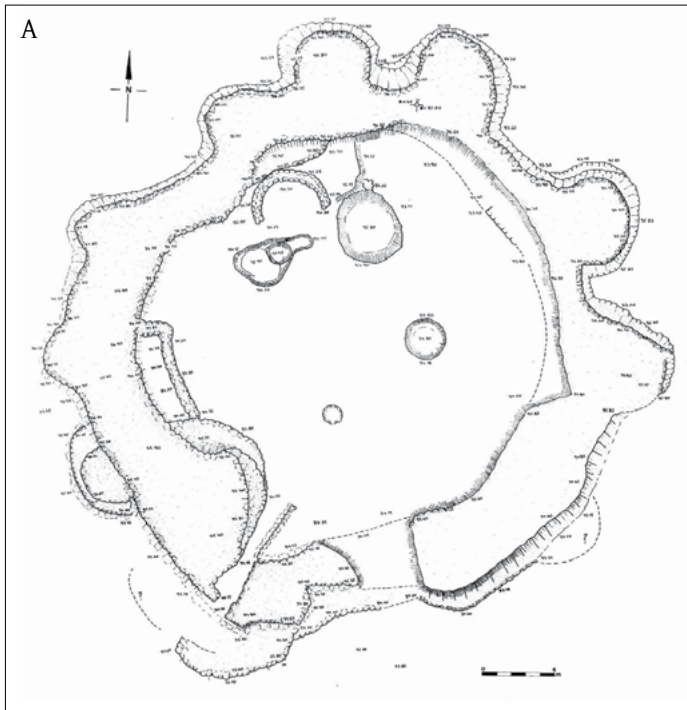


Figure 13: Bell Beaker fortification sites from the Iberian Peninsula, images from Cardoso (2008: Figures 4 and 1 respectively); a. Vila Nova de São Pedro (Portugal); b. Leceia (Portugal)

conditions that rendered some periods (e.g. the LBK) seemingly more prone to violence than others (e.g. the Bell Beaker period).

Imagery

Some of the most important examples of archer and warrior imagery during the Bell Beaker period come from the stelae at the Petit-Chasseur site (Switzerland). These stelae are part of dolmens (collective burials) whose overall occupations spanned the Final Neolithic, Bell Beaker, and Early Bronze Ages. The type 'A' stelae date to the Final Neolithic of the region and present images of Remedello copper daggers and spiral pendants (Figure 14a) (Corboud 2009). The type 'B' stelae date to the Bell Beaker Culture and illustrate more detailed personifications and depictions of bows and arrows and other adornments (e.g. belts and necklaces) (Figure 14b) (Corboud 2009). The images seen on these stelae that are most important to this study

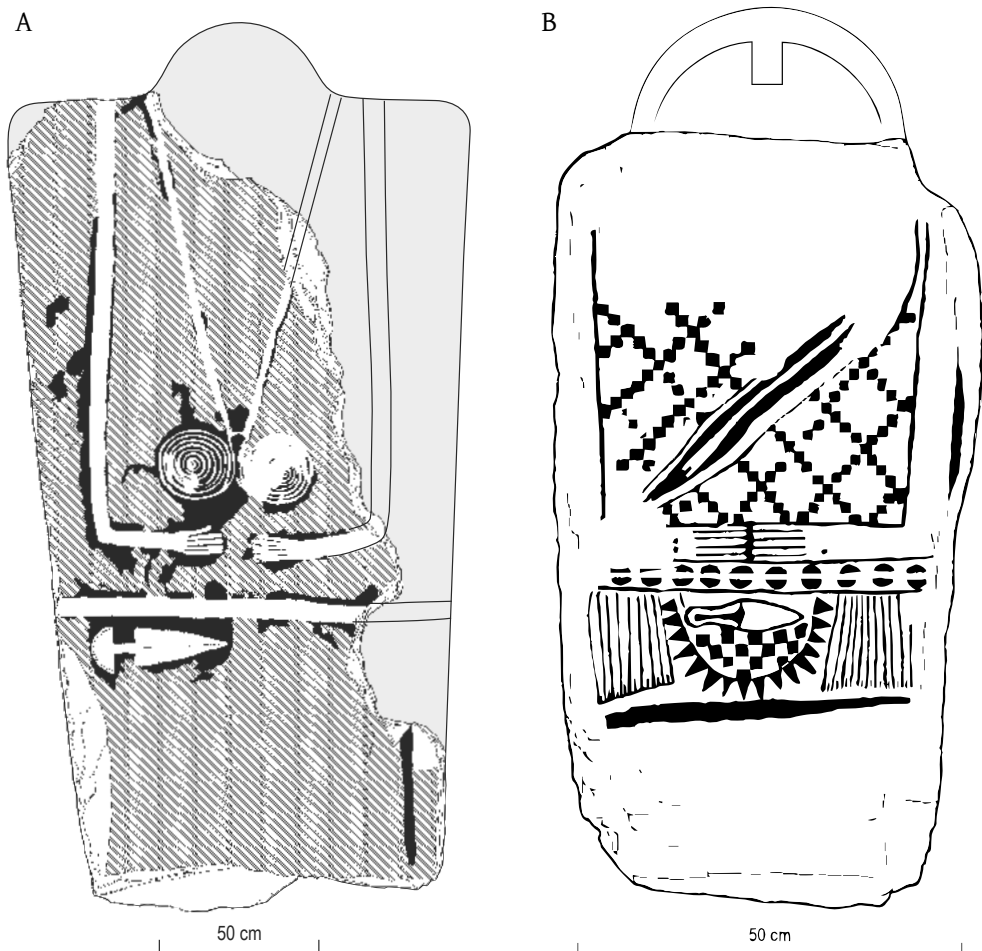


Figure 14: Examples of types A and B stelae from the Petit-Chasseur site (Switzerland), from Corboud (2009: Figures 21 and 44 respectively) ; a. Type A, stele 2 ; b. Type B, stele 18

Stele #	Type	Imagery
2	A	Dagger
7	A	Dagger
8	B	Bow and arrow, ax
14	A	Dagger, ax
16	A	Dagger
18	B	Bow and arrow, dagger
20	B	Bow and arrow
24	A	Dagger
25	B	Bow and arrow

Table 5: Stelae from the Petit-Chasseur site (Switzerland) with depictions of daggers, axes, and bows and arrows (Corboud 2009)

are daggers, axes, and bows and arrows because they are most commonly linked to warriors. Table 5 summarizes the distribution of these depictions.

Just as a symbolic shift happened between the polished axes of the Corded Ware Culture and the stone wristguards of the Bell Beaker Culture, the shift from style A to style B with the stelae from Petit-Chasseur is also indicative of a cultural transition. In this sense, type B depicting bows and arrows aligns with the appearance of stone wristguards, both of which represent the Bell Beaker Culture. Many archaeologists also refer to these images as evidence for the presence of composite bows during the Bell Beaker period. Especially with stela 18, this does appear to be the case. However, the forms are not exaggerated and the surface erosion helps make the lines appear less precise and difficult to reconstruct. For this reason, there remains some doubt as to whether these truly do illustrate composite bows or whether the forms are simply an effect of the rock and the limitations of the artist. Lastly, it is interesting to note that, as on stela 18, a bow, an arrow, and a dagger all appear together on the same surface. In comparison to burial contexts, it is less common to find arrowheads and daggers in the same tomb.

A second well-known example is the anthropomorphic stelae from Saint-Martin-de-Corléans (Italy). Images from these stelae also illustrate personifications with geometric forms and decorations (e.g. belts and jewelry) as well as bows and arrows, daggers, and axes (De Gattis *et al.* 2018; Mezzena 1998). While these depictions do not necessarily represent warriors, they do valorize archery, and since these stelae also clearly illustrate individuals, one could even say that they valorize the archer.

Bow-shaped pendants

The identification of the function of bow-shaped pendants and what they represent is highly debatable, and terminology is important throughout the literature. In 1936, K. Willvonseder made a list of known pendants found in Bavaria, Moravia, and Austria, and coined the term ‘semi-lunar pendants’ (*halbmondförmige Anhänger*) (Růžičková 2009; Willvonseder 1936). However in the same year, K. Schirmeisen wrote a paper debating the functionality of these items, preferring to refer to them as ‘fasteners’ rather than pendants (Růžičková 2009;

Schirmeisen 1936). In his 1946 article comparing two of these objects from Praha-Vršovice with other finds from elsewhere in Europe, Hájek agreed with Schirmeisen's analysis of functionality, also labeling them as 'fasteners' (Hájek 1946; Růžičková 2009). Ten years later, Hájek (1957) again examined these fasteners throughout the Bell Beaker complex, noting their large distribution and chronology, as well as the fact that they appear primarily on the right side of inhumations. He also hypothesized that their function was mainly decorative and not simply as buttons/fasteners. Piggott (1971) postulated on the functionality of these objects and proposed that they were representations of bows, and that the wearers were likely archers. He also returned to the theory that they were, in fact, pendants and not fasteners. This is currently the theory widely used today, hence the common term 'bow-shaped pendant'. However, this does not mean that other terms have disappeared. For example, Patay (2013) refers to the findings at Szigetszentmiklòs (Hungary) as 'decorated lunular amulets'. While this study cannot comment on the true function of these items, it does consider them to be related to archery. For this reason, the term 'bow-shaped pendant' will appear throughout this work.

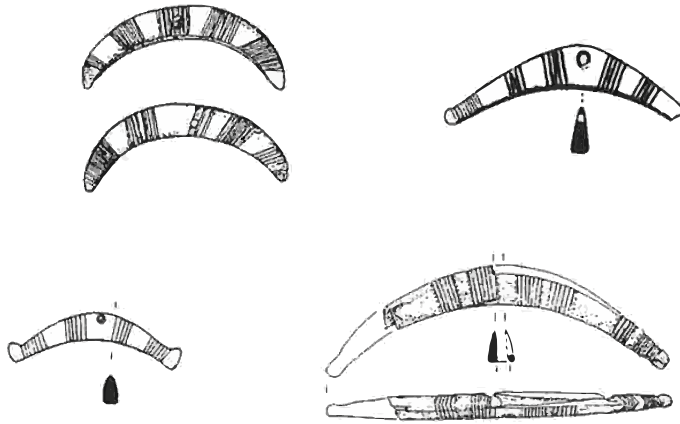
These pendants mostly appear in male burials of the Eastern complex, ranging from the Upper Rhine Valley to Budapest and from Southern Switzerland to Southeast Poland. They are commonly made out of boar ivory (such as at Tödling), though three made of out amber have also been found (Kern 2016a). These amber pendants are interesting because they serve as an indication that the form (a bow?) was important rather than the material. One primary criteria for classification involves whether or not the perforations are vertical or horizontal, with the vertical only appearing in earlier graves of Phases AI and AII (e.g. Samborzec, Poland and Altdorf, Germany). Their positions in the burial also indicate a possibly different function, with the majority of vertically-perforated pendants placed at the back near the pelvis and horizontally-perforated pendants tend to be near the breast or shoulder (Heyd 2007; Kern 2016a). While the majority of all pendants are decorated, vertical pendants exhibit vertical lines and triangles whereas horizontal pendants have groups of parallel lines with x-shapes and triangles (Kern 2016a).

Heyd (2000) classified the pendants into three groups based on their decorations (Figure 15).

- Group 1: a simple motif of individual lines grouped into bundles.
- Group 2: similar to group 1, the main difference being that the bundles contain more individual lines (up to 25). There are no other complicated motifs.
- Group 3: contains line bundles similar to Group 1, but also presents more complicated motifs, such as X-shaped crosses and triangles.

Růžičková (2009) examined 55 sites in Europe with bow-shaped pendants, 24 of which were in Czechia. All of these pendants came from flat burials, with only a few found in settlement structures, and almost all contexts only contained one pendant. Additionally, all of the graves used in the study, with the exception of two, also had pottery (mainly jars, beakers, and bowls). A look at the spatial distribution within the tombs found that the overall most common area was around the chest and neck, with very few placed near the hips. Specifically, they were found at the neck, on the chest, and next to the upper arms.

Vezierungsgruppe 1



Vezierungsgruppe 2



Vezierungsgruppe 3

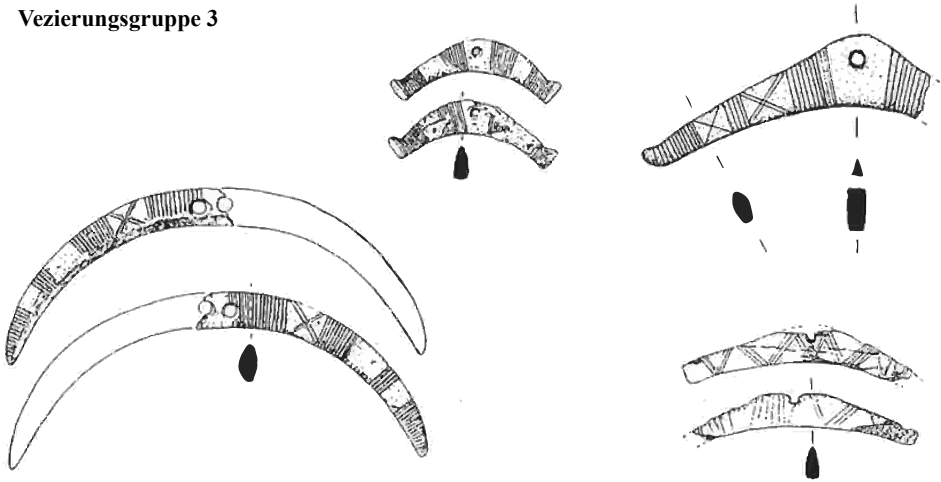


Figure 15: The three classified groups of decorated bow-shaped pendants, from Heyd (2000: Figure 79)

The bow-shaped pendants from Tödling (Austria) and Altenmarkt (Germany) are also associated with rod-shaped pendants (Kern 2016a). Rod-shaped pendants appear in a broad geographical region, stretching from England to Greece and from Germany to Spain, though there is a concentration in Northern Italy. Their classification involves the existence of either a perforation or a loop as well as the forms of the tips (Kern 2016a). Their positions in tombs and appearance in the archaeological record are similar to bow-shaped pendants, however they rarely appear together. In Italian burials, they are predominantly found in female graves (whereas the bow-shaped pendants are almost exclusively male) (Kern 2016a). Kern (2016b) speculates that bow-shaped pendants started out as practical equipment for men holding together clothing and/or bags before becoming more decorative and appearing in more and more male burials. However by the Bronze Age, the symbolism had shifted and they became almost uniquely a part of the female ornamentation package.

When it comes to bow-shaped pendants, there is debate concerning their links to bows and archery. Piggott (1971) and Corboud (2009) believe that they are related to archery based on their decorations (similar to the bindings of a bow) and their association with flint arrowheads in burials. However, Kern (2016b) believes that their shape is more related to the confines of the material – the pendant is curved because boar ivory is curved, therefore extrapolating meaning based on shape is gratuitous. Of course, just because the material influenced shape does not mean that the object did not still represent a bow, but it remains speculation.

The fact that bow-shaped pendants usually come from boar tusks could be one argument for a hunting relationship to archery, especially if the individual made his own. Even into the Renaissance period, boar hunting was a prestige activity done for sport. So while the animal bones found in burials are often domestic, the presence of a boar's tooth object could be the exception.

Weapons

Personal metal weapons first appeared in Central Europe during the Final Neolithic period, mostly in burials (Heyd 2007). It is very rare to find more than one copper dagger in a grave, with two primary examples in continental Europe: Brno-Holásky-II 60/38 and Předmostí Pit B grave 1, though both contexts are unsure due to poor documentation (Fitzpatrick 2011). A few other examples exist from the United Kingdom, most notably that of the Amesbury Archer (Figure 16). The majority of daggers appear in masculine graves, though some examples of female burials with daggers do exist, such as grave 7 from Landau-Südost and grave 2 from Oberstimm-Ost, and one example from Weichering grave 9 was a cenotaph (Carman and Harding 2004; Heyd 2007). When looking at the German example, copper daggers appear in a very small percentage of Bell Beaker graves (<5%) and usually only one of these graves per cemetery (a similar pattern is true for the appearance of wristguards) (Heyd 2007). This distribution indicates a possible link to social status within a group.

The copper daggers seen in Bell Beaker burials raise some debate over their function, most specifically whether they would have been useful in a battle. Case (2004) discusses the possibility of them having been used by hunters to deliver a *coup de grâce*. This would fit in with the theory that specialized archers practiced hunting and therefore would have required a sturdy knife, not unlike modern hunting. Zimmerman (2007) postulates that they could have



Figure 16: Copper knives/daggers from the Amesbury Archer burial (United Kingdom) before conservation, from Fitzpatrick (2011: Plate 40)

been used in close combat or worn as a status symbol, thus linking them to a warrior context. In this sense, the dagger almost serves as a precursor to the Bronze Age swords.

Researchers have also hypothesized that copper daggers do not represent hunting or archery, but rather metalworking (Fitzpatrick 2011). From this perspective, its presence in a grave symbolized the grave of a metal worker. However, this interpretation only goes so far because even if the individual were a metal worker, the question remains as to why he or she made a dagger. Some studies, such as that by Fitzpatrick (2011) on the Amesbury Archer even go so far as to refer to the item as a knife rather than a dagger, which is linguistically more ambiguous. While this study focuses on archers and the archer burial context, it still takes into account the presence of daggers since they are also linked to both hunting and warfare.

Lastly, it is important to mention the presence of a few halberds. While the function of daggers is debatable, halberds are most likely linked to warfare. One such example comes from grave 128 of the Bell Beaker occupation at Szigetszentmiklós from the Carpathian Basin (Hungary). The grave was that of an adult male 23-59 years of age and in addition to the halberd, he was buried with a copper dagger, stone wristguard, two bell beakers, a bowl, a bow-shaped

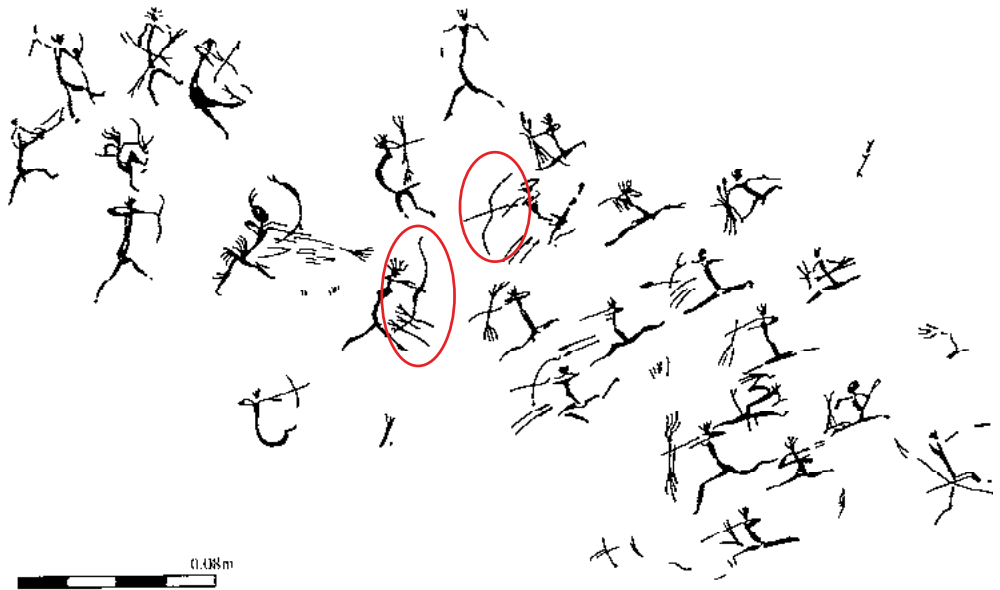


Figure 17: Battle scene from Les Dogues (Spain, date unconfirmed) with what appear to be composite bows (circled), image adapted from Nash (2005: Figure 3), original from Ripoll Perello (1963)

pendant, and several blades (Patay 2013). Patay (2013) argues that this halberd is a sign of contact with the Czech-Moravian basin and other more Western cultures during the Late Bell Beaker period.

Bows

It is difficult to discuss Bell Beaker bows because very few exist. Interpretations for them largely come from imagery, most notably the forms seen on stelae and bow-shaped pendants (Turek 2006). These images, along with wristguards and arrowheads, provide solid evidence that archery was still a part of daily life, just like in the preceding and succeeding periods. Where the question of Bell Beaker archery differs is in the presence of composite bows, which are capable of reducing the draw weight by 30-35% thus making them easier to use (Kaynaroglu and Kiliç 2012). Whether or not these bows existed during the Bell Beaker period is a question highly linked to the presence of mounted archery. As previously mentioned with horse domestication, one theory states that the composite bow developed for use from horseback (Corboud 2009; Strahm 2002). Mounted archery existed during the Bronze Age, but the question remains as to whether or not it is traceable to the Final Neolithic and Bell Beaker periods. Confirming the presence of composite bows is one step towards doing that. However, referring back to the curved bow found in Russia (Vis-Moor I),² its Mesolithic dating would push the current understanding of composite bow development back several thousand years. While archaeologists have recovered no other composite bows (and indeed very few

²This bow did not survive excavation and very little documentation exists, therefore it is not possible to consider this item as confirmed evidence for archery.

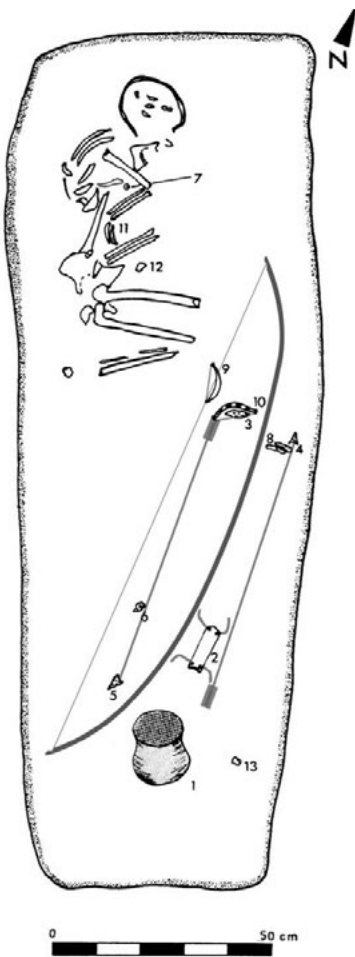


Figure 18: A reconstruction of child burial grave 1 from Landau-Südost (Germany) with a hypothesized bow placement, from Heyd (2007: Figure 15)

longbows), possible depictions such as stela 18 from Petit-Chasseur (Switzerland) and the cave painting from Les Dogues (Spain) (Figure 17) provide some indication for their presence. However, the practice of mounted archery remains a major question.

Of the bows that do exist (all of which are longbows), Dias-Meirinho (2011) examined several of them throughout the European Neolithic. She classified length into three categories: long (>1.5m), short (1-1.49m), and very short (<1m). While bow size can reflect an archer's size and strength, smaller bows were simply not strong enough either to hunt or battle. These bows were therefore possibly children's toys, symbolic in some way, or served another function (e.g. fire-starting). Typology and distribution analyses from this study found that during the second half of the 3rd millennium BC (contemporary to the Bell Beaker Culture), only long and short bows appeared, and from about 2500 BC, almost uniquely longbows. Combined with an overall decrease in the number of form details (e.g. shape and cross-section), this indicates that fabrication may have become more standardized.

While archaeologists rarely, if ever, manage to recover bows in graves, this does not mean that they were not originally there. Sometimes when arrowheads are found in burials, there are several grouped together, indicating that they were perhaps originally in a quiver. Their position in the grave also indicates that a bow would have been in proximity to both the arrows and the individual (Figure 18) (Sarauw 2007). Since arrows and wristguards were grave goods, it seems reasonable to assume that bows would have been as well, though they unfortunately rarely survive, and almost never in a burial context (much like the wooden arrow shafts). While archery certainly existed during the Bell Beaker period, direct evidence for

bows is lacking.

Arrows

Just like a difference is visible between funerary traditions of the Eastern and Western Bell Beaker complexes, a difference also exists between the arrowhead morphologies. While most arrowheads were barbed, those in France and Britain were mostly square barbs with a squared tang (Bailly 2002; Nicolas 2019). In the East, this is much less common and the arrowheads

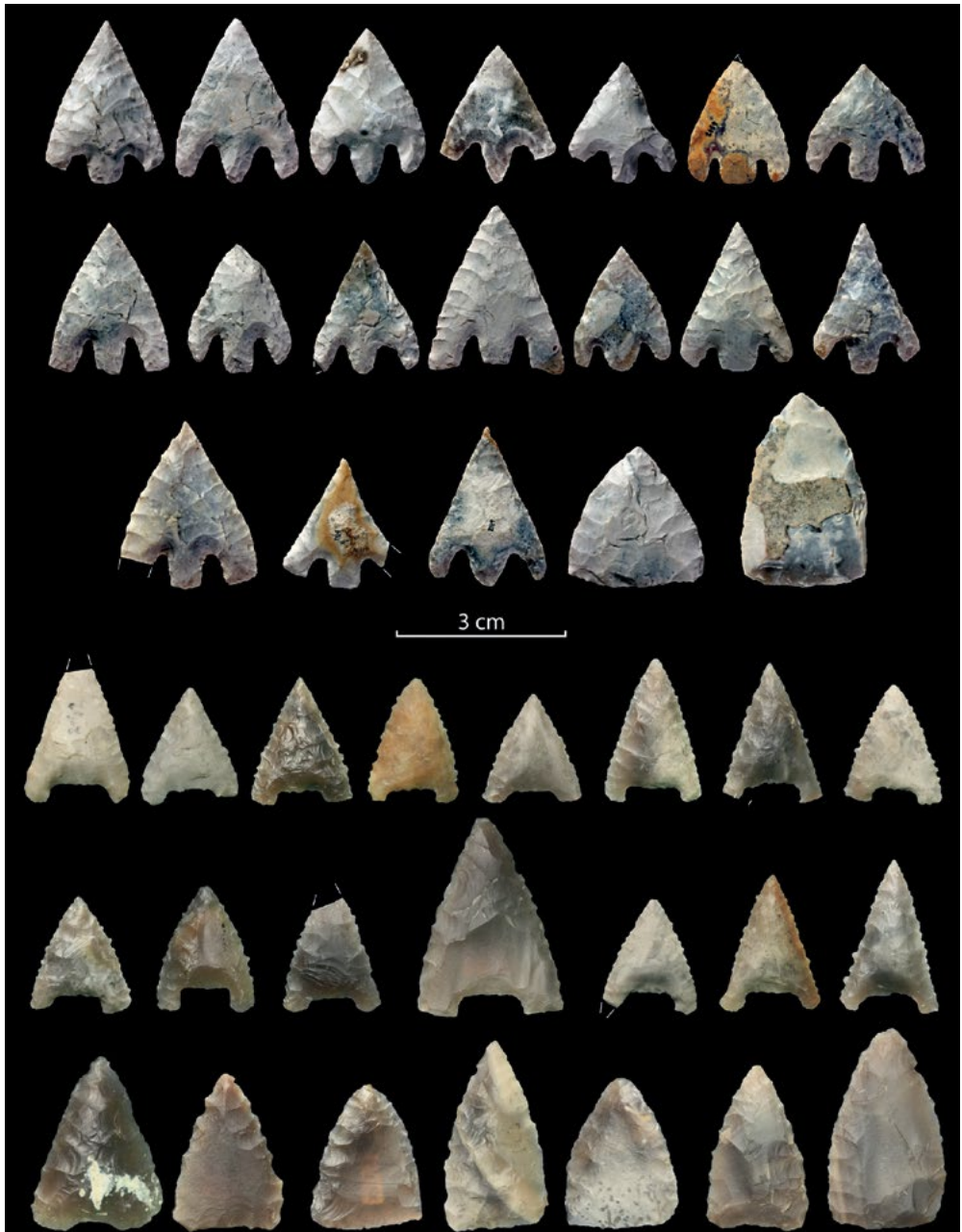


Figure 19: Bell Beaker flint arrowheads from the Amesbury Archer burial in England (top) and burial 2 from Stehelčevy III in Czechia (bottom; includes both arrowheads with a hollow base and rough-outs), from Nicolas (2019: Figure 1)

are often hollow at the base with retouched bifacial points, which could be the result of an evolution from the preceding Corded Ware forms (Figure 19) (Budziszewski and Tunia 2000; Kolář 2006; Nicolas 2019). And, while there are very few known settlement sites, there appears to be no difference in arrowhead forms between graves and occupations.

Arrowheads do not seem to have been highly technical, meaning most people would have been able to craft them (Nicolas 2019). This brings into question previous interpretations concerning a possible artisanal aspect to their production. In fact, some burials contain what is likely an arrow-making kit (Figure 20), including: blanks, preforms, pressure flakes, and arrow shaft smoothers (Nicolas 2019). It is therefore possible that individuals were responsible for making their own arrows.

A study by Soriano *et al.* (2015) on warfare and arrowheads in the Iberian Peninsula also concluded that the high number of tanged and barbed arrowheads at a time and space with minimal indication for hunting was a strong indication for conflict. Their study considered three sites: Can Gol I (megalithic tomb), Can Gol II (megalithic tomb), and Costa de Can Martorell (hypogeum). These three sites are interesting to examine together because they all date to the Bell Beaker period and are all in fairly close proximity to one another. The site of Costa de Can Martorell was previously mentioned because it contained 195 individuals, none of whom showed obvious signs of trauma (though archaeologists did recover several arrowheads from the site). Significantly, all arrowheads from all three sites are barbed and tanged, yet they still have a highly variable morphology.

Sosna (2012) studied arrowheads found at the Moravian site of Hoštice 1, za Hanou and found that 59% of the arrowheads (n=32, from 13 graves) showed no signs of microwear indicating use and 88% had no polishing or striation marks. These overall findings conclude that there was no evidence for these arrowheads having undergone an impact, meaning they had likely never been fired at an object. If these arrowheads did not serve as projectiles, they either had another function that is unknown to modern archaeologists or they acted as a symbolic addition to the 'warrior burial package'. The number of arrowheads found in these graves serves as another indicator for a more symbolic function. Of the 13 graves examined at this site, six contained only one arrowhead. Theoretically, a specialized archer (either warrior or hunter) would have had a complete quiver full of arrows. This point however remains entirely speculative, because of course if one arrow is sufficient for representing an individual's identity, no need to waste a whole quiver that could be put to better use.

Müller (2001) looked at the grave goods for individuals with a confidently identified biological sex that corresponded to the gender indicated by the grave orientation. He found that arrowheads are almost exclusively in male burials whereas copper daggers sometimes appear in female graves. The same is also true of wristguards, though to a lesser extent than daggers. This implies that arrows, like bow-shaped pendants, are even more linked to gender identity than wristguards and daggers. Perhaps this also signals a distinction with regard to function?

In his book, Keeley (1996) cites one ethnoarchaeological example from the Wintu tribe in California (USA) where barbed arrowheads are specific to warfare. The barbs make the arrows difficult to remove without breaking the head and leaving the point inside, which, if the injury alone was not fatal, would help ensure a deadly infection. Additionally, other studies

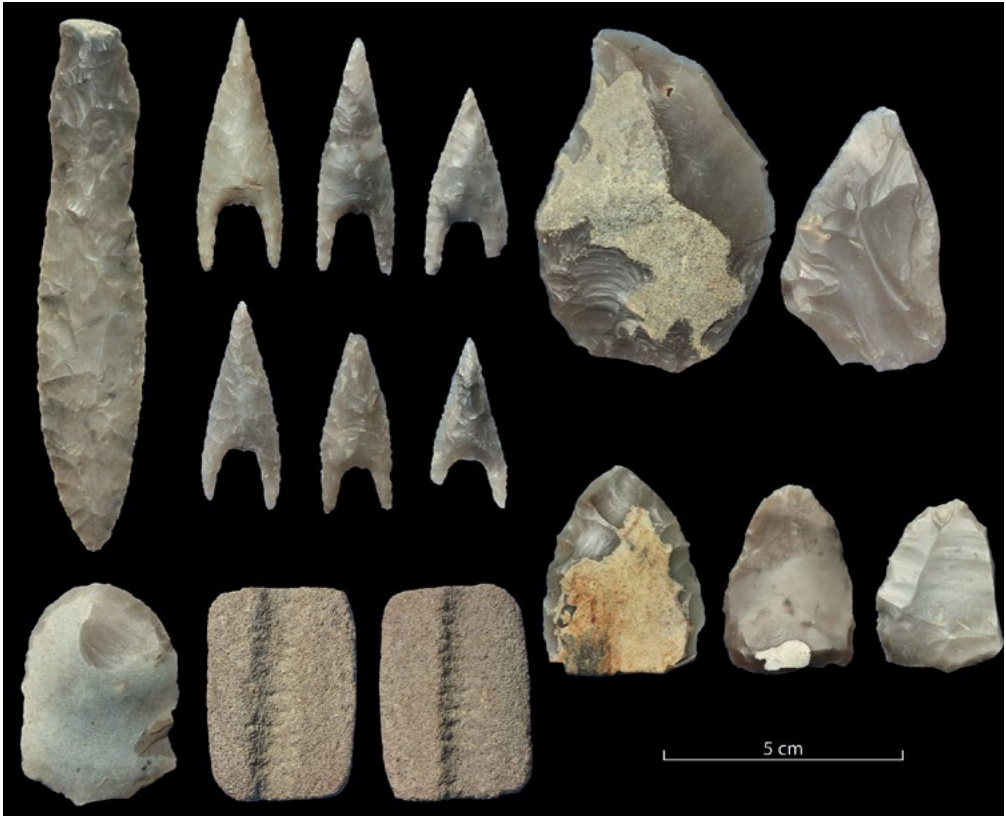


Figure 20: Artifacts making up an ‘arrow maker’s’ kit found at Vorbasse 2a, Ribe, Denmark; Objects include: arrowheads, rough-outs, sandstone arrow shaft smoothers, dagger, scraper; from Nicolas (2019: Figure 3)

note that hunters did not use barbed arrowheads because they were easier to remove from the animal (Sarauw 2007). In the Danish example such arrowheads are not found in ‘archer’ graves (Sarauw 2007). Barbed and tanged arrowheads, while still not requiring artisanal specialization, do require more care and effort than the preceding transverse arrowheads. Another ethnoarchaeological study by Pétrequin and Pétrequin (1990) in Indonesia found that arrowheads such as these are usually specific to warfare. These examples support the possibility that societies could have made arrowheads specifically for conflict.

According to Junkmanns (2001), it is not possible to identify definitively between arrows used for hunting and those used for war until the Bronze Age. However, an archaeozoological study from southeastern France found that there is minimal evidence for hunting during the Bell Beaker period and isotopic studies looking at diet reveal similar findings (Blaise *et al.* 2011). Referring back to the study by Saintot (1998), there is an increase and diversification of arrowheads during the French Final Neolithic period and around 2400 BC, corresponding to the Bell Beaker period in the region, the forms (barbed and tanged) appear standardized. Additionally, barbed and tanged arrowheads require more effort to make than the simpler

triangular or transverse forms. The overall pattern then with Neolithic arrowhead production is that numbers and form diversity increased at a time when hunting appears to decrease, and this is exemplified during the Bell Beaker period (Saintot 1998).

Besides the presence of arrowheads, polishing stones are also present during the Final Neolithic and Bell Beaker periods (see Figure 20). These stones reveal a defined groove running along the middle that would have served as a polishing surface for arrow shafts. Having a well-made arrow shaft is just as important as the arrow point because it allows the arrow to maintain stability and direction once shot. However, it is worth noting that use-wear analyses have not confirmed this theory, raising the additional hypothesis that they were rather used as whetstones (Woodward *et al.* 2005). In either case, the presence of such stones indicates specialization in arrow production.

Wristguards

Wristguards are plates worn on the forearms of archers, even today, in order to protect against the lash of the bow string. Typically they consist of a lightweight, flexible material, such as leather, so as not to be too cumbersome for the archer. For this reason, it is possible, even likely, that such objects existed before the Bell Beaker period, but have not survived into the modern era due to decomposition. The Bell Beaker period however saw these objects being made of stone, and as previously mentioned, they almost seem to act as a replacement for the symbolic polished stone battle axes common to the Corded Ware Culture (Heyd 2007). The first appearances of stone wristguards occur in the archaeological record from the Bell Beaker period until the Early Bronze Age (Fokkens *et al.* 2008; Sangmeister 1974; Turek 2015). Geographically, their regions extend throughout Europe, as well as the British Isles and North Africa (Junkmanns 2013). As seen with both the funerary tradition and arrowhead fabrication, a difference between East and West also exists for wristguards. In the West, they tend to be flatter, narrower, and with two holes whereas Eastern wristguards are more often curved with four holes (Figure 21a) (Nicolas 2019). Additional details, such as the shape and ornamentation, is also quite variable but not necessarily linked to a particular region. Analyses from Czechia found that the rock used to make these wristguards was most likely local (Přichystal 2000). The local nature of the raw material used in wristguard and arrowhead fabrication indicates that rather than a long-distance exchange of items, there was a long-distance exchange of people and ideas, such as with the ceramics (Nicolas 2019).

There are fourteen wristguards associated with the earliest Bell Beakers and all of them have the flat, rather than the arched, form; though at the same time, they provide evidence that other variations, such as in size and perforations, have existed since their beginnings (Heyd 2001; Sangmeister 1974). Heyd (2000) estimates that there are 1000-1500 known wristguards across Europe (as of his publication in 2000), 262 of which Sangmeister had studied and classified in 1974 (Sangmeister 1974). In this, he identified seven different types based on the shape and number of holes (Figure 21b).

As with the arrowheads, there is nothing overly specialized about the fabrication of the stone wristguards. Experimental studies were able to craft elementary flat wristguards in 2-4 hours (van der Vaart 2009). Of course, with the more decorated ones this would not have been the

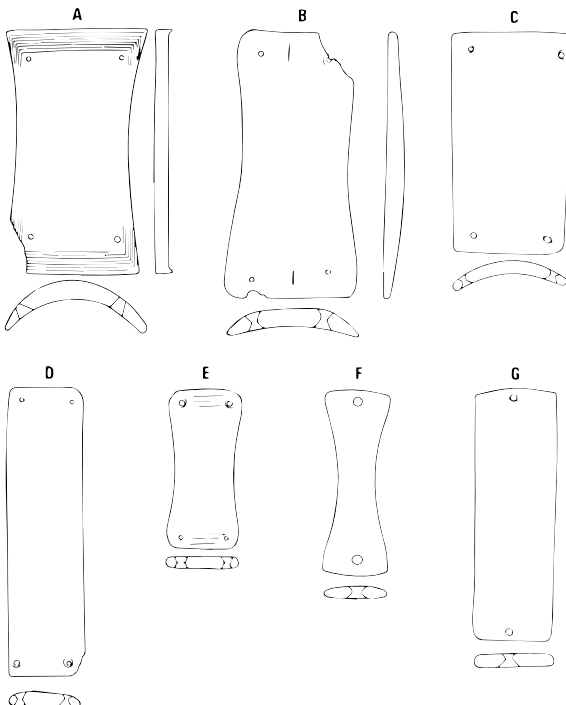


Figure 21: Classifications of Bell Beaker wristguards based on the original typology by Sangmeister (1974); a. Examples of wristguards from the Western Bell Beaker complex (top) and the Eastern Bell Beaker Complex (bottom), from Nicolas (2019: Figure 6) ; b. The seven wristguard classifications from Sangmeister (1974: Figure 8)

case, so at least some wristguards are the product of expertise and specialization (Nicolas 2019). However, it remains possible that an archer made his or her own stone wristguard.

Woodward *et al.* (2006) studied early Bell Beaker (2250–2150 BC) wristguards from England and of the 58 known, only 28 appeared with additional archaeological items. Of these, the most common was a beaker followed by a copper dagger, and then bow-shaped pendants and arrowheads. This study also noted that some of the wristguards exhibited signs of breakage, which was likely not part of the manufacturing process thus indicating usage. Other studies have found that blunt edges and wear patterns show that the individuals either wore them regularly, passed them along through the generations, or both (Nicolas 2016; Woodward and Hunter 2011). At the same time, some of these wristguards were made out of very strong rock with a fine grain, making it harder to identify traces of wear. This difficult raw material would also imply the higher skill set necessary to make such an item, or at least the extra time (as opposed to a leather or fiber wristguard). Some wristguards also had a gold coating at the rivets, one sign that they would have been more symbolic than practical.

The vast majority of all Bell Beaker burials containing a wristguard had only one (Fokkens *et al.* 2008; Heyd 2007; Lichardus 1991; Sangmeister 1974). Eight common exceptions to this pattern in continental Europe are: Předmostí Pit B grave 1, Předmostí Pit C grave 2, Stehelčevy Findspot III grave 1, Turovice, Brno-Holásky-II grave 13/38, Hulín I grave 95/204, Lysolaje grave 6, Prague-West, and Tišice 77/79 (Fitzpatrick 2011). In studies by Sarauw (2007) and Bosch (2008), less than 5% of burials contained both wristguards and arrowheads, and never in Austria and Denmark. It is interesting that objects associated with the same activity do not often appear together, this could be an indication as to their variable functions or societal significance.

One primary interpretation of a stone wristguard is as a prestige or symbolic object (Fokkens *et al.* 2008). A stone wristguard would have been cumbersome and therefore impractical, thus leading to the assumption that it was somehow a symbol of social status (Engelhardt 1991). The gold wristguard of Agua Branca proves that undoubtedly symbolic wristguards existed during this time (gold is not a strong metal, any physical, everyday use would destroy such an object) (Harrison 1980). Additionally, some wristguards are simply too small to have been effective forms of protection; they thus either belonged to children or had a purpose other than functional (Nicolas 2020; Sangmeister 1974; Turek 2015). Lastly, archaeologists have also recovered wristguards without perforations (e.g. Bořitov 1/76 and Holásky 35/38), suggesting that they were either unfinished or did not require stable attachment (Ondráček *et al.* 2005; Turek 2015). For these reasons, it remains plausible that wristguards and the inhumations containing them were prestige burials for important members of society. If this were the case, it would place a direct link between archery and the prominent members of group.

A glance at Bronze Age warfare

While Bronze Age warfare is outside the scope of this study, it is still worth a quick glance because it directly succeeds the period in question and it attests to the existence of both warriors and warrior archers. Since a large part of the interpretations involve the assumption of warfare during the Bell Beaker period, it is important to note the prominence of warfare during the Bronze Age (Horn and Kristiansen 2018). While speculation exists for the Bell

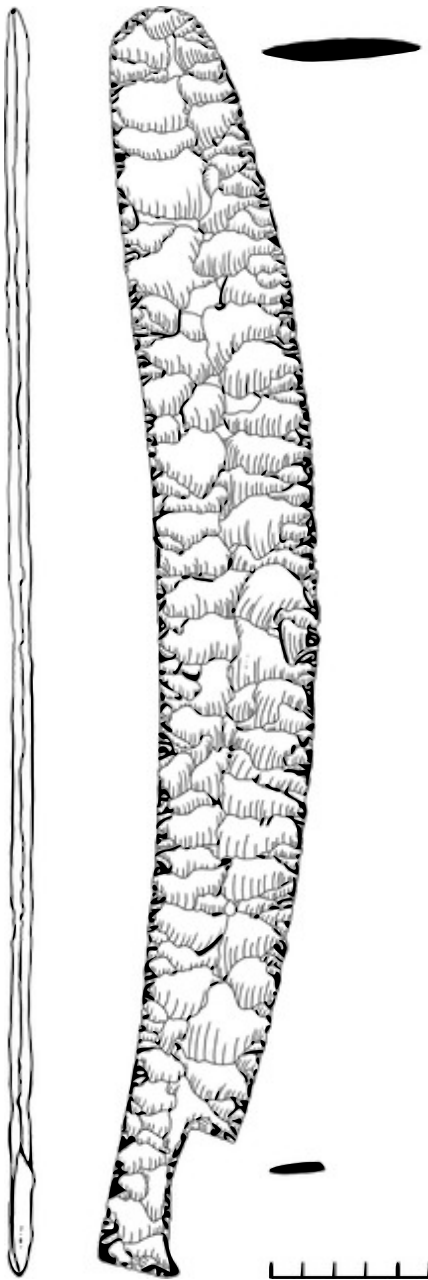


Figure 22: A flint sword from Abydos Umm el-Qaab (Egypt) measuring 72 cm and dating to 3300-2900 BC, from Klimscha (2018: Figure 7.8)

Beaker period having been a peaceful time, the same is not true for the Bronze Age, during which warfare was a part of daily life and the production of weapons an important part of the economy. Even the historic record substantiates this fact, with Homer's *The Iliad* likely dating to the 13th century BC.

The primary economic and social differences between the Bell Beaker period and the Early Bronze Age are the societal stratification, exchange networks, and the economics of producing metal for everyday life (Nicolas 2019). The Bronze Age saw the development of new weapons, most notably the sword, but also the halberd. By the mid-2nd millennium BC in Greece (just a few hundred years after the last traces of the Bell Beaker Culture) rapiers, daggers, spears, and bows and arrows were very common as well as chariots and body armor (Carman and Harding 2004; Klimscha 2018). While these items all seem to profit from metal technologies, many common domestic items are still made from stone. This implies that the most valuable materials made the most valuable items, which in this case was weapons for warfare.

Looking at Early Bronze Age arrowheads, some were strictly for decoration, meaning their fabrication was likely somewhat specialized and their function was uniquely symbolic (Nicolas 2019). The same can be assumed for wristguards made from gold, amber, and jet, all valuable materials that do not coincide with a practical function. Additionally, burial contexts indicate that these items were exclusively for clan chiefs and leaders, giving them not only a symbolic social function, but one within a hierarchy (Heyd 2007; Turek 2015).

To this end, a study of the Bronze Age cemetery at Franzhausen in Lower Austria found that the individuals buried with an archery/warrior context were physically larger and seemingly healthier than other individuals from the same cemetery (Teschler-Nikola 1994). Access to good food for a healthier diet acts as a strong sign of

social standing, even in modern societies. The physicality identified in this study indicates that the individuals were warriors themselves (not simply status symbols), perhaps implying that the group leaders were also the strongest warriors (as seen in Viking civilizations). Many confirmed weapons arise during the Levantine Bronze Age, such as the copper swords and flint which began at the end of the 4th millennium BC (Figure 22). In Jordan, there is proof of a local metal trade as far back as the 5th millennium BC (Klimescha 2018). This was well before the arrival of the Bell Beaker Culture in Europe and about contemporary with the Varna cemetery (Bulgaria). From this region's Chalcolithic period, archaeologists in Israel recovered copper and stone mace heads, some of which were clearly not for practical use (Klimescha 2018). Maces and swords are definitively linked to warfare, with no other known or likely functions. Like bows, swords are especially interesting because mastery requires practice (i.e. specialization). The nature of the close-combat warfare required by sword usage is also one likely reason behind the development of armor. At what rate these traditions spread remains unsure, but what these items do demonstrate is that somewhere in the world, at the same time as the Bell Beakers, warfare and warriors were very much an important facet of daily life.

These concepts, which are facts for Bronze Age society, remain speculation for Bell Beaker society. Just how far back do some of these traditions stretch? And how long did it take them to appear? That remains a question without an answer, but for the purposes of this study, it seems likely that the concept of a warrior and a warrior ideal was alive and well during the Bell Beaker period, and that this could be reflected in specialized archery practices.

Part 2: Neolithic social organization

The primary goal of this study is to identify specialized archery on the skeletons of those buried with an archer context. Because bones are capable of developing according to habitual activity, whether or not an individual was specialized is a key concept to this study. Anthropological studies such as this will not be able to determine occasional activities, therefore the theory of specialization is crucial. Mainly, is it even reasonable to imagine that archery would have been a specialized activity during the Bell Beaker period? What did it mean to be specialized, in any activity, and what would its implications have been on a given society? These questions apply not only to the individual, but also to the goods recovered from these burials. At what point do items such as stone wristguards, copper daggers, tanged and barbed arrowheads, and bow-shaped pendants represent material and economic value within a group?

All of these questions link to the idea of social stratification and the presence of social hierarchies throughout the Neolithic and specifically within the Bell Beaker period. If specialization did exist and was a prominent part of society, and certain grave goods were valuable, either in a symbolic or materialist sense, what does that reveal about Neolithic social identity? Were the 'archer' burials prestige burials? Figure 23 further illustrates this idea. In order to better understand the interpretations that this study could yield by identifying specialized archery, or not, this next section will look closer at the evidence for the concepts of specialization and social hierarchy throughout the Neolithic period.

Specialization

For this study, two types of specialization are important to consider (Figure 23). First and foremost is specialized activity. This is the repetition of physical movement that influences bone development. This concept is the basis of the anthropological study because identifying archery from the skeleton requires physical repetition – it is a study of daily life. From a theoretical standpoint, this needs exploring because the very act of becoming specialized in a physical activity raises the question as to why. Why would an individual and/or a society dedicate the time, energy, and resources for such a thing? For archery, it would mean that an individual were able to dedicate time and resources to practicing an activity rather than doing other tasks vital to survival, such as farming. Therefore it is important to consider the possible conditions within a society that places such importance on archery. Secondly is artisanal specialization. The identifying factor of the study collection is an archery burial context. In this sense, it is necessary to examine a society in terms of how the artisans dedicated their time, especially when that time was spent making items without an obvious practical function.

To this end, it is firstly important to clarify what exactly the term 'specialization' means. Is it economic? Cultural? Technological? A combination? For all intents and purposes, especially in what concerns this study, the idea of specialization likely has at least a couple of layers. The most obvious is perhaps technological; not just anybody could have made objects such as a decorated, curved stone wristguard or carved an intricate stela. Besides having the know-how to do such a thing, a society or an individual would also have to agree that it is worthwhile. A man or woman cannot spend all of his or her time creating such an item if they must also build

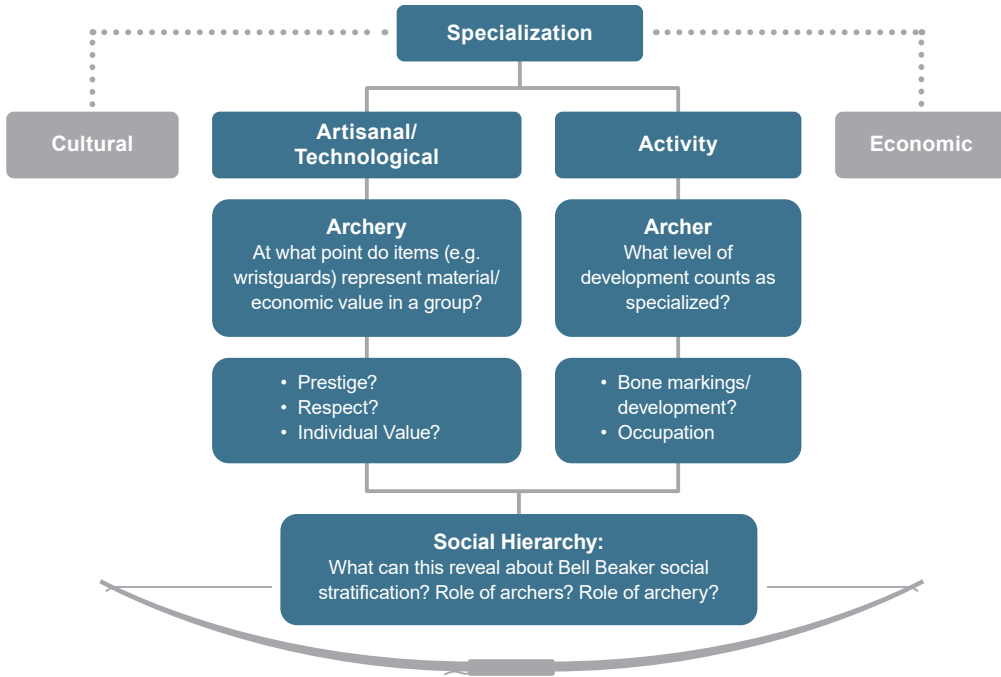


Figure 23: Schema portraying specialization as it relates to this study and how it can be used to interpret Bell Beaker social stratification

and maintain a home and farm. Therefore the presence of such objects also indicates societal-level organization in which the individuals all have a role and are thus interdependent. This is often the basis of many sedentary societies, modern and past – one person will do the farming, another will make clothes, and so on; that is to say, one person is not responsible for all aspects of the daily life. Not all objects, for all cultures, at a given time period, are worth the resources to produce. The average modern individual living in Geneva, Switzerland would not create a stone wristguard because, besides requiring time, proper materials, and know-how, it would not have a purpose, either practical or symbolic. For the same reasons, a prehistoric society would not have had a purpose for fiction adventure novels. For example, oral traditions aside, writing itself was thought to have originally developed for bookkeeping in order to keep track of trade. In his written works, Plato even quotes Socrates as believing that writing things down led to the weakening and degeneration of the mind. The presence of specially-designed products and advanced know-how therefore points to a layer of technical specialization, meaning a unique, ‘specialized’ individual capable of creating desired items, and another economic layer in which the society agrees to allow the creation of such items by providing vital services to the artisan. It would be interesting for future works to explore this point further in terms of monetary distribution and economic dependence.

As an additional note, it is worth considering village size and demographic. A more romantic version of prehistory tends to imagine larger villages with peasants and chiefs. Studies, such as Mittnik *et al.* (2019) (includes Late Neolithic as well as Bronze Age data from Germany),

Schroeder *et al.* (2019) (Globular Amphora Culture of the Late Neolithic period in Poland), and Sjögren *et al.* (2019) (Bell Beaker period in Germany), found that the nuclear family served as a basis for kinship and that it likely constituted a household. This together with domestic Bell Beaker studies (Gibson 2019) indicates that many settlements would likely have contained only 1-2 dozen people. Of course these studies are not sufficient for justifying a generalization of the entire Bell Beaker complex, however they do show that at least some settlements were not overly large. Therefore, when looking at burials with prestige items, such as a copper dagger or a stone wristguard, it is possible that status could originate at the familial/household level. In the Early Bronze Age study by Mittnik *et al.* (2019), the genetic results together with the burial contexts led to three primary interpretations, stating that these complex households consisted of 1) a core family with a higher-status that would then pass along wealth and status to the children, 2) unrelated yet also wealthy and of a high status non-local women, and 3) local low-status individuals. The study compares this possible social organization to the *oikos* of classical Greece. The probable exogamy, also identified and discussed in the Bell Beaker studies by Fitzpatrick (2011) and Sjögren *et al.* (2019), could indicate regional rather than local ties between groups.

As a general idea, Roux (2019) refers to expertise as a whole, linking it to acquired skills, such as those obtained through apprenticeships. The level of expertise is then a question of his or her ability to create 'elaborate, quality, or standardized objects'. In contrast, Pelegrin (2007) uses the term 'expert' for experienced and perhaps gifted lithic carvers during the Paleolithic who created excellent, yet standard and unvaried, tools that did not necessarily have an economic function. He uses the term 'specialist' for individuals of the Neolithic period who produced exclusive objects that were not needed for daily life (Bostyn 2018; Pelegrin 2007). However, this differentiation is perhaps a bit superfluous because it emphasizes the linguistic rather than the functional variation. The question has to do with function and the fact that individuals and societies deemed an unnecessary object, that is to say an object without a practical function, to be worth the resources to produce. Paleolithic arrowheads, while well-made, were not variable because they did not need to be. They needed to perform a job, which they did. Neolithic arrowheads likely become more numerous and variable in morphology because they had a new job to do besides hunting, they had to perform in warfare. With sedentary societies, self-identification and association with a particular group would have been normal. The fabrication styles and techniques of one group would not necessarily have been identical to another.

As Bostyn (2018) so astutely points out, the first question to ask when looking at production is 'why', which for this study means stone wristguards and other archery-related goods. If people did not need or want an item, it would not have been produced. Bostyn (2018) cites the example of schist bracelets that were widespread for three centuries, but then disappeared during the Blicquy/Villeneuve-Saint-Germain Culture around 4700 BC. Objects such as these that are not vital to an individual's survival would likely have had a social or economic representation within the given population. One of the primary purposes of archaeology is to study objects in order to better understand the society that produced them (Bostyn 2018). So what is known about the Bell Beaker groups producing archery-related goods?

Costin (1991) describes four general parameters for discussing the theoretical organization of production (Bostyn 2018):

PRACTICE AND PRESTIGE

1. Context: the nature of the relationship between the producer and the sociopolitical elements
 - Attached: artisans produce goods or services for an elite class in order to maintain a political power and reinforce social differences
 - Independent: artisans produce useful objects that circulate because of a domestic need
2. Concentration: spatial relationship between the producers and the consumers
3. Scale: reaching from the domestic extreme to the workshop in a non-industrial environment
4. Intensity: the relationship with the volume of time spent by the producer on a good with respect to other tasks (i.e. full-time vs. part-time)

It should be noted that a proper analysis and classification for 'Intensity' is not entirely possible for the Neolithic period. The idea of 'full-time' vs. 'part-time' work is a fairly modern, organizational concept that should not serve as a measure for productivity during prehistory. However, the idea of fabrication time and know-how remains incredibly relevant.

With these four parameters, Costin (1991) then proposes eight types of specialization (also in Figure 24) (Bostyn 2018):

1. Individual: an individual produces without restriction for local use (either full- or part-time)
2. Dispersed workshop: artisans work in extensive yet dispersed workshops, producing goods without restriction for a local population
3. Community: aggregated individuals within a unique community producing for the region without constraint
4. Nucleated workshop: the artisans work in larger workshops within a unique community, producing without limitations for the region
5. Dispersed corvée: the artisans work part-time but produce for an elite class within the community
6. Individual retainer: artisans work full-time for the elite
7. Nucleated corvée: part-time work where the artisan is recruited by an elite class for a specific purpose
8. Retainer workshop: large-scale production with artisans working full-time in a separate location for an elite class

One example of early specialization linked to archery is the possible composite bow found at Vis-Moor I in Russia dating to the Mesolithic period (mentioned in Part 1) (Burov 1981; Cattelain 1997; Guilaine and Zammit 2008). Composite bows vary from the traditional long bows because not only would they have been more complicated to make, but they also indicate an understanding of the physical principles behind more efficient archery. Longbows are powerful and easier to make since they consist of a single length of wood, but they are more difficult to shoot and tend to be less accurate. Composite bows not only would have been more difficult and time consuming to make, but would also demonstrate an understanding of how to transfer energy more efficiently through a bow, enabling a comparably powerful shot, but with a lower draw weight and greater accuracy. They also are shorter and therefore more maneuverable, an advantage when performing mounted archery, as hypothesized for

	<u>Context</u>		<u>Concentration</u>		<u>Scale (Composition)</u>		<u>Intensity</u>	
	Attached	Independent	Nucleated	Dispersed	Labor	Kin-based	Part-time	Full-time
Individual		X		X		X	(X)	(X)
Dispersed workshop		X		X	X			X
Community		X	X			X	(X)	(X)
Nucleated workshop		X	X		X			X
Dispersed corvee	X			X	(X)	(X)	X	
Individual retainer	X		(X)			(X)		X
Nucleated corvee	X		X	X			X	
Retainer workshop	X		X	X				X

Figure 24: A typology of production from specialization based on the four primary parameters listed above, from Bostyn (2018: Figure 1.1), originally adapted from Costin (1991: Table 1-1)

the Bell Beaker period. If this bow truly is an example of a composite bow, it would illustrate a case of object specialization dating back to before the Neolithic and support the importance of archery.

The Middle Neolithic site ‘la Porte aux Bergers’ (France) contained a child’s burial (estimated age at death between 5 and 8 years) with lithics of an obviously lower quality to others of the same site associated with adults (Bostyn 2018). This is an important illustration of the fact that children, especially at this age, could not yet have obtained a ‘specialist’ status as artisans or as members of the society. While the pieces buried with the child were of a poor quality, they were likely still too advanced for the child to have made them. In this case, perhaps they were taken from an apprentice’s production contents or donated by non-specialists for burial. But since this child was not a specialist, why did he or she have lithics? Was it an offering for an afterlife? Had the child made them and he or she intended to become a lithic artisan? These questions will remain unanswered because while archaeologists can search for evidence analyzing function, they can only speculate on the intentions of the deceased individuals.

It is possible that, at least in some instances, with specialization comes symbolism. Axes were not uncommon during the LBK period or within later cultures, however the Corded Ware Culture axes are still unique. They represent an identical object, but with a clearly different function. Their smooth, polished surfaces were obviously not for cutting down trees (Heyd 2007), and other, similar examples also exist, such as the polished jade ax-heads from the Middle Neolithic (Pétrequin *et al.* 2012). Could these variations represent a changing ideology? And is this same ideology reflected in the succeeding stone wristguards? A better understanding of the people associated with such objects might help shed some light on such questions.

Fitzpatrick (2011) takes a different approach in terms of interpreting function. Rather than noting the archery goods as part of the principal context, he focuses on the metal items, such as the daggers, and theorizes that these are the graves of metal workers. His interpretation therefore states that the burials are portraying metalworkers as warriors. This view focuses on the individual as a producer rather than a consumer. A similar perspective could apply to the stone wristguards – perhaps the individuals interred with them were their makers rather than their users. However, whether an artisan or an archer, the presence of wristguards

signifies the importance of archery at least as an idea. Looking at these individuals as artisans also does not solve the problem of prestige child burials.

The problem of child burials

When considering the possibility of Bell Beaker archery burials as a sign of archery specialization, perhaps the most glaring problem is the existence of child burials with the same context, a phenomenon that is not rare. Children could not have been warriors or specialized archers (the draw weights of a bow would have made this impossible and smaller bows would not have taken down an animal or an enemy), yet there are cases in which their burials contain a stone wristguard or other items of the ‘archer’ context. This in and of itself is enough to say that at least in some cases, the ‘archer’ burial context was symbolic. Examples of such burials are in Table 6. In the case from Königsbrunn, in a group of five graves that was likely a family, the child was the only burial with a wristguard (Heyd 2007). Besides not having been warriors, these children also could not have fabricated these objects themselves, especially the objects in stone. At the same time, it remains possible that training for such activities began at an early age. Shaw and Stock (2009) found that modern, competitive athletes began training between the ages of 9.6 and 13.7 (largely dependent on the sport). However, the fact remains that children and adolescents would not yet have been advanced enough to be considered ‘specialized’ (or ‘professional’ in the modern capacity), despite any potential intention for the future.

Such child burials eventually disappear leading in to the Bronze Age, as well as other burials that could have been considered the grave of an ‘artisan’. This is perhaps due to the heavy warrior presence during the Bronze Age that no longer allowed for symbolic warriorhood, but rather proven and practical warriors. The existence of prestige child burials during the Bell Beaker period signals personal and social importance in the society from birth, which could also be a strong indication for a social hierarchy, perhaps based on familial ties.

As previously mentioned, it is very possible that at least some Bell Beaker villages were small and consisted primarily of a single family or two. In their study of data from the Late Neolithic to the Middle Bronze Age, Mittnik *et al.* (2019) not only found this to be the case for

Site	Grave Number	Grave Context
Hoštice 1		2 child burials containing daggers (Matějčíková 2012)
Königsbrunn	3	Wristguard, other? (Heyd 2007)
Landau-Südst	1	Bow-shaped pendants, wristguard, 2 arrowheads, flint, beaker (Heyd 2000; Fitzpatrick 2011)
Radovesice	53/80-II	Child cremation with wristguard, bow-shaped pendant, arrowheads, v-shaped buttons (Turek and Černý 2001; Turek 2004)
Tvořiház	2/91	Cremation with at least 5 children; wristguard, dagger, bone ring, 24 vessels including 15 decorated beakers, 2 boar tusks (Bálek <i>et al.</i> 1999; Heyd 2007; Fitzpatrick 2011)

Table 6: Examples of Bell Beaker child burials with an archer/warrior context

their study sample, but also saw a correlation between the number and type of grave good and the number of relatives. Weapons also appeared more often in the tombs of males with relatives than in the tombs of males without relatives. At one of the studied sites (Wehringen-Hochfeld), 3 out of 16 individuals had very significant grave goods and genetic tests revealed that it was a mother and her two sons, implying the existence of inheritance. However, some other sub-adults (age ranges not provided) also had some seemingly high-status objects (type unknown), also indicating inheritance.

Social hierarchy

The previous section notes that many occupations, most markedly those from Bavaria and Czechia, were quite small with only a couple of families in one area. These small numbers are not entirely conducive to the development of a true social hierarchy. However, the value and complexity, even the existence, of certain individual inhumations indicate a prestige surrounding some individuals. The presence of shallow pit graves with no or minimal grave objects appearing in proximity to over-sized and deep wooden chambers with a bounty of goods illustrates at least some level of differentiation. The question remains though, are variations in burial contexts sufficient for identifying the presence of a social hierarchy or other social stratification?

Archaeologists generally accept that the objects found in a tomb reflect assumed social statuses of the interred individual as well as the social organization of the given community (Binford 1972; Bostyn 2018). As introduced in the previous section, the very existence of specialization suggests a work distribution that would have been conducive to hierarchies. It stands to reason, as well as being supported by archaeology, economics, history, ethnology, and existing today, that specialized goods were not for everybody, but rather a select few. These select few, for one reason or another, were important to the society and therefore would have served as the basis for a 'higher' social class because they received special items. While artisans were busy making such objects, the rest of the group, or the 'lower' classes, would be left to compensate by performing the necessary work, such as food production. In other words, a 'food-producing' class of people would have been providing for an 'artisan' class of people, whose products were likely not re-distributed back to the food-producing class (why would a farmer want a complex stone wristguard? Especially if it meant taking on extra work?). In essence, in the question of 'want to have' vs. 'need to have', where is the line and who draws it? In this example, either the entire society, including the 'lower' classes, shared the same values and wanted such items produced for one reason or another, or there was an 'upper' class of individuals forcing their will on the rest of the society. This point can then reference back briefly to an idea previously presented; Haas (2004) linked a rise in warfare to a rise of political presence and population density. While the Bell Beaker societies were seemingly not dense, evidence for Neolithic warfare remains. Accepting this theory therefore implies the presence of a social hierarchy.

Early indications and genetic evidence

The Mesolithic cemetery of Oleneostovskii Mogil'nik (dated to 7700 - 7300 BP) at Omega Lake in modern-day Russia contained more than 400 individuals and already at this time, the material goods and manner of burial indicate social status differentiation as well as an active trade

economy (Dolukhanov 2004). While there appears to have been gender differentiation, it is not clear if one was dominant. The masculine burials often included hunting materials, such as bone daggers, slate knives, harpoons, fishhooks, and quivers, whereas the feminine burials had flint blades, awls, polishers, burins, scrapers, perforated beaver incisors, and snake-like effigies (Dolukhanov 2004). Since not all burials contained all objects, those that did seem to represent an individual's higher standing. What makes this site even more exceptional is its Mesolithic date, leading to questions concerning the organization of an, at least partially, hunter-gatherer society.

Moving into the Neolithic, evidence from the Early Neolithic period in Scandinavia demonstrates both the existence of a likely hierarchy as well as violence (Madsen 1991). Complex long barrows as a part of ritualistic burials, including examples with children, happened throughout the region. One specific case of violence is from the Porsmose man who was killed by two arrows (Bennike 1985; Madsen 1991). Another study by Bentley *et al.*, (2012) looked at strontium isotope data from more than 300 individuals dating to the Early Neolithic in order to better understand the various differences between the first farming communities. In studying the geographic signatures, they found less variation in males than females, indicating that it was primarily women who moved between communities. This is consistent with the belief that patrilineal societies had already begun to develop during this time. An additional layer to this study further looked at the males buried with adzes, a tool used for strenuous farming work and common to the LBK. It is also worth noting that these adzes were made from raw stone and transported over long distances – another indication not only of economic movement, but also of class differentiation. The study shows that men buried with adzes had a less variable strontium signature. This means that men with these tools also had more access to loess soils, whereas the women (always buried without adzes) often grew up in non-fertile regions. This study provides evidence linking the presence of valued equipment, the adze, to fertile soil and by extension, likely health. This study could also contribute to hypotheses on inheritance and the concept of passing land down through the generations. To this point, it is worth referring back to the study by Meyer *et al.*, (2018). They found that in societies where land and agriculture were important, the climate changes seen during the LBK period would have stressed the economy. This could necessitate land inheritance within a family or group, which could have led to some level of social stratification.

A second genetic study by Szécsényi-Nagi *et al.*, (2015) also found variation in the diversity of males and females, signifying reduced male geographic mobility. Higher levels of female migration tend to be associated with moving to be with a mate or partner, which is common in patrilineal societies. Since a patriarchy is a type of hierarchy, proving female mobility in the presence of male sedentarism demonstrates the likelihood of social stratification. Archaeologically speaking, the tomb of the 'widow' in Ponte San Pietro (Italy), dated from 3200 - 2500 BC, supports this idea. This grave revealed a man buried with ochre on his head and multiple weapons, including a copper dagger, 155 arrowheads in a case made from stag antler (hunting?), and possibly a bow (no recovered remains, but burial layout indicates the possibility) (Guilaine and Zammit 2008). Interestingly, there was also the body of a young woman lying at his feet (a position not usually linked to equality and respect). She had some grave goods, but fewer than the man. In this example, the man's grave goods imply an importance on weaponry, perhaps as a sign of masculinity or as an indication for hunting and/or warfare. And the woman's presence at his feet and with fewer grave goods indicates

her inferiority (Guilaine and Zammit 2008). While this could simply be one circumstance, it is difficult to ignore the marked gender differentiation and its likely indication for a patriarchy.

Lastly, Sjögren *et al.* (2019) studied two Bell Beaker cemeteries from Bavaria and found high maternal genetic diversity (23 out of 34 haplotypes were different) yet only a single Y-chromosome haplogroup. Additionally, a dominance of boys among the child burials could also exhibit a masculine superiority. Interestingly, and importantly for this study, of the 41 individuals studied (from both cemeteries), only one, a male identified as IRL 14, showed signs of violence (a healed fracture on the distal ends of the right radius and ulna). This individual was also exceptionally large, well above the average, and the only person in both cemeteries with a copper dagger. The important interpretations coming from this study are: 1) kinship was likely based on the nuclear family, which may have formed an independent household, 2) the groups were patriarchal with female exogamy, 3) an inheritance system revolving around the first-born males, 4) families/households formed regional alliances, likely through exogamy or perhaps the adoption of foster children. Desideri (2007) found similar results, that is to say trends towards female mobility and male sedentarism, for the Bell Beaker period in Bohemia (Czechia) by studying non-metric dental traits. Similar findings also appeared in the Early Bronze Age study by Mittnik *et al.* (2019), most notably exceptionally high levels of female non-locals (exogamy?).

When looking at these examples, it is worth referring again the Polish example at Koszyce. This site provides evidence not only for the existence of conflict between two groups, but of patrilineal societies based on the presence of female exogamy and several mtDNA lineages together with a single Y chromosome lineage (Szmyt 2010). The pastoral life of these societies not only made them mobile, but could also have opened them up to conflict over grazing territories, especially at the cusp of the Corded Ware Culture's expansion. Inter-group violence could lead to a patrilineal society and a resulting value placed on warriors and a warrior culture.

Structures and metalworks

In terms of architecture, the Cerny Culture (France) of the 5th millennium BC presents a fine example of burial monuments (Passy type) that are several meters long. Monuments such as these were clearly intended for select individuals, not the entire populace, therefore providing a solid argument for the presence of a non-egalitarian society (Bostyn 2018; Chambon and Thomas 2010). The same is true for most other burial monuments and megaliths throughout prehistory.

Referring back to the fortified Iberian sites of Zambujal, Vila Nova de São Pedro, and Leceia, examinations of residential structures reveal differences in house sizes (Cardoso 2008). At Leceia, what appears to be the largest house is located at the very interior, the most secure section of the settlement. This fact that larger houses were also less exposed to attack serves as an excellent indicator for social stratification within a defined society (i.e. that of Leceia). In addition, the complex construction and planning required for these fortifications indicates a level of organization seen in more complex societies with a social hierarchy.

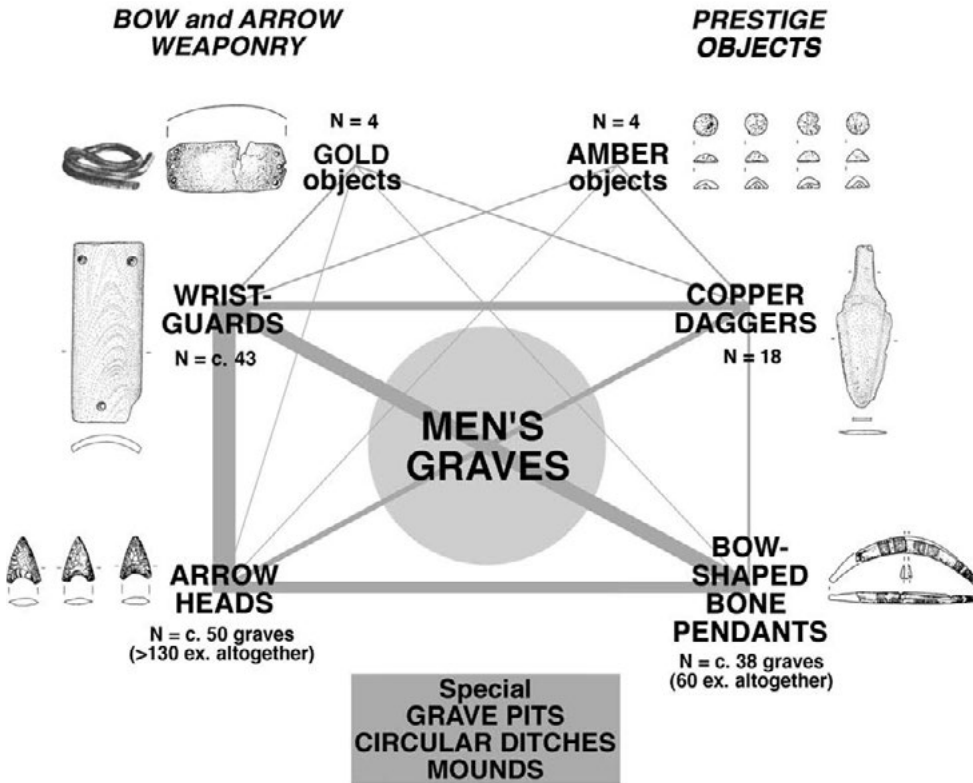


Figure 25: An illustration of the appearance and possible hierarchy of Bell Beaker grave goods in Bavaria (Germany), from Heyd (2007: Figure 13)

When looking at social stratification, especially during the Bell Beaker period, gold merits a closer look. The Bell Beaker Culture is the first north of the Alps to have gold. Before this, the Carpathian basin had gold during its Early Copper Age, but most of this gold often appeared in hoards rather than as an object associated with a specific individual (e.g. the four cenotaphs at Varna) (Heyd 2007). The earliest graves of the Bell Beaker Eastern complex had gold items (e.g. Tvořihřáz grave 1/90), a distinct increase from the rare Corded Ware examples (Heyd 2001). Was a particular aspect of the Bell Beaker Culture responsible for driving these changes?

As previously mentioned, less than 5% of German Bell Beaker graves contained a copper dagger and usually only one per cemetery (irrespective of the size) (Heyd 2007). This denotes a clear differentiation between individuals within the same social and spatial group, and seeing as copper was relatively valuable and the possible association of daggers with warriors, this could serve as a strong indication for not only the presence of social stratification, but also of a warrior (or hunting?) class.¹ Additionally, these daggers are smaller than normal, implying a limited practical function and therefore a more symbolic role.² Of the German

¹ See the example for Sjörgen *et al.* (2019)

² The same is true for stone wristguards – some were too small to have served as an adequate form of protection (Sangmeister type G), though these are uncommon

graves with copper daggers, at least 4 of them also contained either gold or amber as well as at least 13 with a stone wristguard (Heyd 2007). The archer burials are also rare, with no more than four identified in a single cemetery in Germany, and this continues to decrease up to the Early Bronze Age. Looking at all of these objects, Heyd (2007) created a possible ranking of important items from male burials:

gold/amber < copper daggers < wristguards < bow-shaped pendants < arrowheads

This concept is further illustrated for Bavarian burials in Figure 25.

Examples from Bulgaria

It is not possible to talk about Neolithic social hierarchies, and indeed specialization, without further mentioning the Varna cemetery in Bulgaria. While this site dates to the 5th millennium BC, it is part of the region's Copper Age. It is among the first sites in Neolithic Europe to demonstrate wealth inequality, and therefore a semblance of a social hierarchy (Chapman 2015; Mathieson *et al.* 2018). The gold items recovered at the site are exceptional, with over 3000 gold objects weighing more than 6kg. This makes Varna the earliest known site in Europe with evidence for worked gold in addition to copper objects. Additionally, the gold items present no standards, indicating a lack of widespread specialization at this point in time for such objects (Chapman 2015). Of the 310 graves (not all had preserved human remains and some were cenotaphs), only 5 did not have grave goods and only 11 had no pottery (Slavchev 2010). 65 graves had gold objects, but 80% of the total gold recovered was concentrated in merely five graves – only one of which was an inhumation, the others were cenotaphs (Leusch *et al.* 2015). That one inhumation burial, grave 43, was that of a 40-45 year old male and besides gold, contained flint and copper spears, stone and copper axes, and a gold-lined bow and quiver (Slavchev 2010). Other common artifacts from the cemetery include flint tools, polished axes, copper tools, bone and antler tools, and ornaments made from imported materials. The presence of objects made from *Spondylus* shells also provides evidence for long-distance exchange since they are not native to the region (Leusch *et al.* 2015). With regard to such exceptional wealth in the cemetery, Slavchev (2010) points out that these quality items denote social rather than material status and is therefore a strong indicator for the presence of a social hierarchy during this period in the Balkans. This differentiation could derive from the appearance of additional economic outlets, such as mining and metallurgy, as well as long-distance trade. The distinction between agriculture and trade in the economy could have led to a concentration of power in the hands of a select few controlling the local economy, thus perhaps leading to the creation of the first 'chiefdoms' (Slavchev 2010). According to these premises, Slavchev (2010) hypothesizes that such valuable objects were symbolic, and therefore sacred, representations of power within the society, rather than material wealth. One of the conclusions is therefore that objects represent the individual's status rather than his or her financial success. However from a different perspective, wealth and power were not necessarily mutually exclusive, thus making a distinction between the two a bit superfluous. At the same time, Slavchev (2010) does make the interesting point that excavations of occupation sites from the region find no differences in house size or domestic artifacts, which could signify that social status played a minimal role in the overall daily life. To this degree, any social stratification seems more detectable in burials than in domestic structures. Lastly, Slavchev (2010) points out that the prestigious gold and copper items usually accompanied

various weapons, which could be an additional indication of power and those who held it. He points out that it essentially seems as if those with the weapons were also those with the control. The goods discovered at Varna, specifically those of gold, show that in this society, there was the know-how, time, and desire to create such prestige objects.

Interestingly, another study of the Bulgarian Copper Age found a long flint blade in a female burial (Chapman 1996; de Grooth 2015; Stratton 2016). At the cemetery of Durankulak, not far from Varna, there were a total of 184 flint items, not all of which showed signs of use. Seven ‘super-blades’ were ≥ 20 cm and one came from a female burial (number 1162). This was also the largest complete blade measuring 29.6 cm, though a broken edge implies that it was originally more than 30 cm (Gurova 2013; Stratton 2016). In the question pertaining to the sexual and gender identity of likely Neolithic warriors, this study provides another exception to assertions that warfare was uniquely a masculine domain.

A return to warfare

Images from the Levantine cave art discussed in Part 1 serve as one last example illustrating the probability of Neolithic social hierarchies. First of all, many of these paintings portray battles with many warriors. It would have been very difficult to fight as a group without a leader, even a non-permanent one, giving instructions; so in a sense, the very presence of battles (between groups, not ‘fights’ between individuals) serves as a sign of social hierarchy. Secondly, many of these images depict select individuals with headdresses and other decorations, setting them apart from others. The phalanx from El Cingle de la Mola Remigia (Figure 6) seems to be an especially good representation of this idea.

Since the function of Bell Beaker archery is so central to the interpretations of the anthropological study, it is also necessary to discuss hunting in terms of social stratification. While the evidence is limited, one cannot disregard that people hunted, likely with bows and arrows, throughout the Neolithic. Even if it was not for sustenance, it would have been valuable in terms of raw materials, such as for furs and antlers. On that note, there is still no indication that hunting would have been a central part of the economy or daily life. Therefore, the fact that someone had the time and resources to practice an activity that was not necessary for survival continues to signal some level of social stratification. Ethnologically speaking, hunting could also very possibly have been a prestige activity, though some sources have linked it more to respect than to a position of influence within a society (Garfield *et al.* 2019; Jiménez and Mesoudi 2019; Stibbard-Hawkes *et al.* 2018; von Rueden *et al.* 2008). However, the evidence for Neolithic, and Bell Beaker, warfare remains prominent throughout prehistory, and while hunting likely existed, the archaeological record reflects little proof of its presence and influence. Most likely, it is inappropriate to consider the function of Bell Beaker, and indeed Neolithic, archery as a black-and-white concept, just as it is inappropriate to apply the same ‘rules’ of the Bell Beaker Culture across the entire domain without recognizing the autonomy of each group. Perhaps specialized archers were both warriors and hunters, or perhaps some were warriors and others were hunters. And maybe some were neither. At the end of the day, the main conclusion from the archaeological evidence is that archery, in whatever form, was important. It merited the fabrication of numerous types of arrows and wristguards as well as

artistic representations on cave walls and stelae. These first two sections have established the relevance of archery, now the last step will be to look at how focused anthropological analyses of specialized archer activity can contribute to interpretations of Bell Beaker society.

Part 3: The anthropological connection

Ryan-Despraz (2021) examined skeletal remains from Bell Beaker individual inhumations of the Eastern complex. Specifically, this study identified several so-called ‘archer’ burials, or burials with an archery-related item (i.e. wristguard, arrowhead, or bow-shaped pendant), and evaluated them on both a population level as well as an individual level. Population analyses meant comparing ‘suspected archers’ with ‘non-suspected archers’ from the same or similar groups. At an individual level, analyses of each suspected archer assessed the likelihood of the individual having been a specialized archer him- or herself. To perform such determinations, this evaluation gathered information from the fields of kinesiology and anthropology in order to develop a theoretical profile for a specialized archer’s physical development (also see Ryan-Despraz (Accepted)). Working with the principals outlined by Wolff’s Law, which states that bones are able to adapt to their biomechanical environments (Wolff 1869), this study then examined the associated and relevant entheses and scored their surface modifications. Overall, this study controlled for measurements, enthesal changes (modifications at the insertion sites on bone for muscles, tendons, and ligaments), and additional observations including degenerative joint disease (DJD), rheumatoid arthritis (RA), diffuse idiopathic skeletal hyperostosis (DISH), ankylosing spondylitis (AS), septal aperture (SA), and os acromiale (OA). These evaluations allowed for the further classification of the suspected archers into two groups: those with an osteological profile consistent with possible specialized archery (‘confirmed’ archers, C), and those without (‘unlikely’ archers, IA).

This third and final part will consider these anthropological results with respect to prehistoric warfare and social stratification. This will include a brief outline of the study and the osteological collections, its results, and how it contributes to modern interpretations of a Bell Beaker stratified society with regard to the presence of warfare.

The anthropological study

The original PhD dissertation involved three main groups of osteological material: Bell Beaker suspected archers (A), Bell Beaker non-suspected archers (N), and the Simon Identified Collection at the University of Geneva (SC). This final collection is modern and primarily acted as an additional control group for the anthropological methodology and analyses, therefore this work will only consider the Bell Beaker collections. Each individual underwent the following analyses:

- Determinations of age
- Determinations of sex
- Measurements
- Enthesal changes scoring
- Absence or presence identification of select additional osteological observations

The dissertation and all raw data is available online at the Archive Ouverte for the University of Geneva (<https://archive-ouverte.unige.ch/unige:151360>).

The Bell Beaker skeletal collection

The Bell Beaker skeletons come from four institutions housing major collections related to the Bell Beaker Eastern complex: the Vienna Natural History Museum (Austria), the Prague National Museum (Czechia), the Anthropos Institute of the Moravian Museum (Czechia), and the Bavarian State Collection of Anthropology and Palaeoanatomy (Germany). Because studies of enthesal changes require a well-preserved bone surface, there was a limited number of qualifying skeletons. The Austrian collection for this study includes 13 individuals, five suspected archers and eight non-suspected archers, from seven sites in Lower and Upper Austria (Figure 26). From Czechia, the Bohemian individuals represent 21 sites for a total of 18 suspected archers and 32 non-suspected archers (Figure 27). A similar distribution exists for Moravia, with 18 suspected archers and 28 non-suspected archers from 21 different sites. Lastly, the German collection included 28 individuals, 11 suspected archers and 14 non-suspected archers, from 11 sites throughout the region of Bavaria (Figure 28). Tables 7 and 8 contain a complete list of all individuals and their archaeological contexts.

It is worth noting that sites such as Hoštice I did have many animals bones in the graves, however they were all domesticated animals, thus their interpretation is rather as a ‘meat offering’ than a factor linked to hunting (Kyselý 2012). Also, of the nine inhumation burials at Brno-Líšeň, three were present and well-preserved enough to provide data. Each of the three studied were middle-aged females, none of whom had an archery context. A male burial of this group, grave 8 and aged 20-29, was found with a copper dagger and a stone wristguard (Matějčíková 2001). This is interesting to note with respect to what was discussed in Part 1 concerning the distribution of copper daggers and stone wristguards within a cemetery. At the same time, Grave 86 at Hulín 1 was a female burial with a copper dagger and a boar tusk

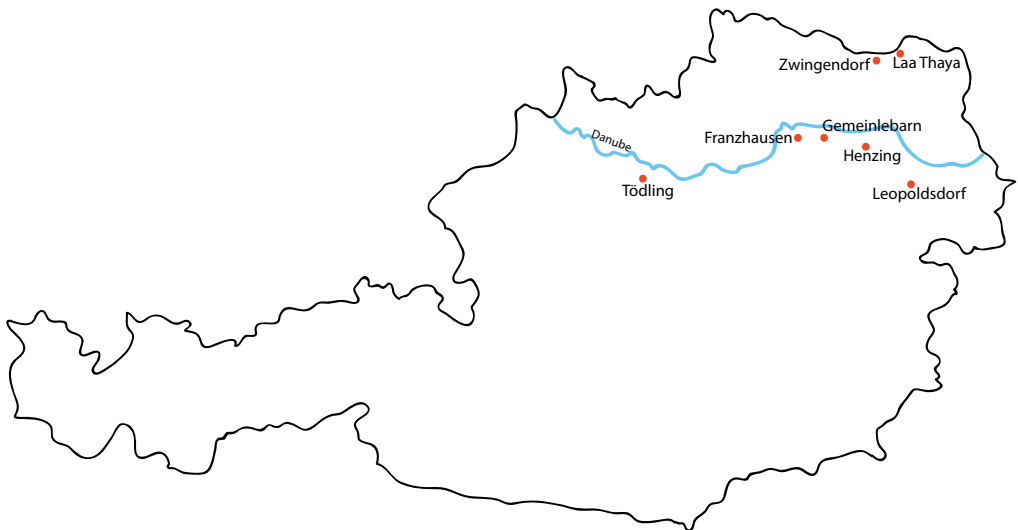


Figure 26: Map of Austria with the sites studied

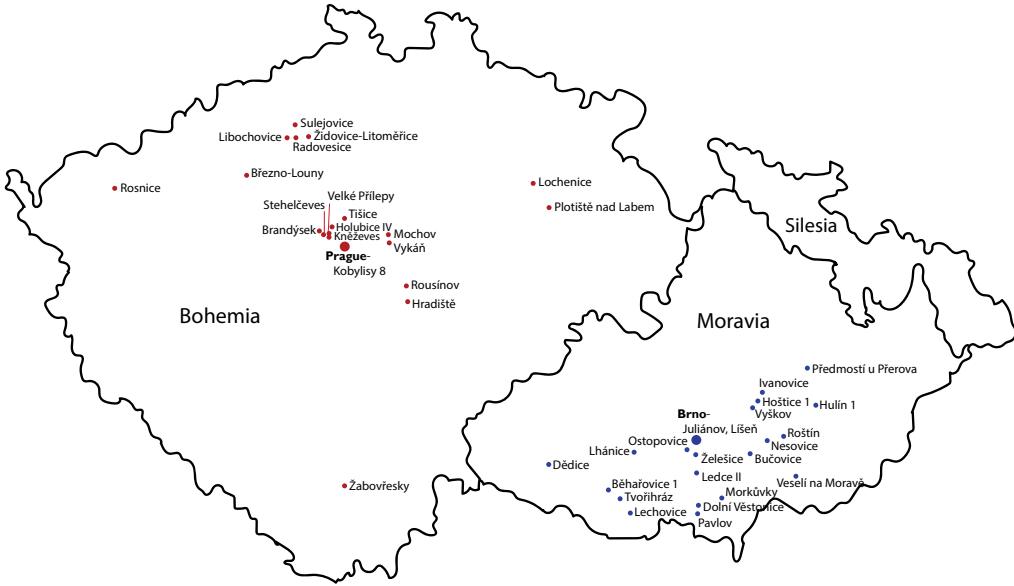


Figure 27: Map of Czechia with the sites studied



Figure 28: Map of Germany with the sites studied

PART 3: THE ANTHROPOLOGICAL CONNECTION

Site	Region	Grave Number	Sex	Age	Grave Context
*Franzhausen	Lower Austria	230	Male	30-40	Wristguard, spherical cup, bowl, bronze, copper, and pearl rings/beads near the neck (Neugebauer and Gatringer 1982)
*Gemeinlebarn	Lower Austria	2071	Male	30-50	Wristguard, 2 bell beakers, cup, handled pot, copper awl ¹ , dagger, 2 metal spiral rings (Neugebauer and Neugebauer 1997; Neugebauer and Neugebauer-Maresch 2001)
*Henzing	Lower Austria	1, 2	ND	19-34	Grave group with Henzing grave 3, bow-shaped pendants, 2 bowls, wristguard (Friesinger 1976; Jungwirth 1976)
Tödling	Upper Austria	4	ND	17-20	Bowl with animal bones (pig), dagger tip, 3 bow-shaped pendants, bit (horse) cross-section, orientation ENE-WSW (Kern 2016b; Kern and Wiltschke-Schrotta, in progress)
Tödling	Upper Austria	5	Male	20-35	2 handled bowls, 5 bow-shaped pendants, flint (blade fragment?), pebble (worked), orientation ENE-WSW (Kern and Wiltschke-Schrotta, in progress)
Brandýsek	Bohemia	71	Male?	Adult	4 flint arrowheads, copper dagger, bowl, jug, 2 flint fragments (Kytlicová 1960; Hájek 1968)
Lochenice	Bohemia	3	ND ²	30-40	2 arrowheads, quartzite blade, bowl, jug, bone pendant, flint fragments (Hájek 1968)
Pavlov	Bohemia	500	Male?	17-21	2 bow-shaped pendants (boar's tusk), copper dagger, jug, pottery shard (Dvořák <i>et al.</i> 1996)
Pavlov	Bohemia	502	Male	16-34	Bow-shaped pendant (boar's tooth), 2 arrowheads, jug, bowl, animal bones (Dvořák <i>et al.</i> 1996)
*Pavlov	Bohemia	519	Male?	15-20	Wristguard, arrowheads, bowl and jug fragments, animal bones (Dvořák <i>et al.</i> 1996)
Praha 8-Kobylišy	Bohemia	36749	Male	<50	Arrowhead, bow-shaped pendant, copper dagger, ceramics ³ (Soudský 1954; Fridrichová <i>et al.</i> 1995)
*Radovesice	Bohemia	53/80-I	Male	20-29	Found in the same burial group as cremated child 53/80-II and grave goods more associated with child than this adult male; however they include wristguard, arrowheads, bow-shaped pendant, bell beaker, jug, ceramic fragments, v-shaped buttons ⁴ (Muška 1981; Turek and Černý 2001; Turek 2004b 2006; Shbat 2013)
*Radovesice	Bohemia	59/80-II	Male	20-29	Found in the same burial group as cremated child 53/80-II; grave goods more associated with child than this adult male, however they include wristguard, bow-shaped pendant, arrowheads, v-shaped buttons ⁵ (Muška 1981; Shbat 2013)
*Radovesice	Bohemia	116/78	Male	<34	Wristguard, arrowhead, copper dagger, bell beaker, jug, antler, boar's tooth, lithics, beaver tooth, flint fragments (Muška 1981; Turek 2003; Shbat 2013)
*Rosnice	Bohemia	1/59	Male	19-34	Wristguard (left association), copper dagger, flint dagger, bow-shaped pendant, bell beaker, small jug, copper ring (Vokolek 1965; Hájek 1968)
*Rousínov	Bohemia	19/2	Male	20-29	Double burial, second individual a male child; wristguard, arrowheads, sharpening stone, bow-shaped pendant, bell beaker, bowl, cup, flint (Geisler 1990)
*Stehelčevy	Bohemia	1	Male?	Adult	2 wristguards, 2 bell beakers, bell beaker shards, jug, copper dagger, copper awl, boar tooth fragment, grindstone, stone anvil, stone hammer (Hájek 1966, 1968)

PRACTICE AND PRESTIGE

Site	Region	Grave Number	Sex	Age	Grave Context
*Stehelčevs	Bohemia	2	Male?	Adult	Wristguard, stone arrowheads, 3 bell beakers, copper dagger, metal hammer, flint scraper, antler ax, flint bevels (Hájek 1966, 1968)
*Sulejovice	Bohemia	3	Male	<60	Wristguard, 3 arrowheads, 2 bell beakers, 2 jugs, chunk of amber (Hájek 1962, 1968)
*Tišice	Bohemia	77/99	Female	30-50	2 wristguards, 2 gold plates, flint, copper dagger, bell beakers, pot, amber fragments, copper awl, cup (Turek 2004a)
Velké Přílepy	Bohemia	2	Male	16-24	Flint arrowhead, bowl, pitcher (Skružný <i>et al.</i> 2000)
*Vykáň	Bohemia	1	Male	<60	Wristguard, bow-shaped pendant, 2 jugs, bowl, flint dagger, pot, leg device (Hájek 1968)
*Žabovřesky	Bohemia	32293 ⁶	Male?	Adult	Wristguard, bell beaker, pot, jug, bowl ⁷ (Blajerová 1962; Zápotocký 1962)
*Běhařovice 1	Moravia	1/1989, A.5866-5883	ND	<60	Wristguard, bowl, 2 jugs (Dvorský 1916; Podborský and Vildomec 1972)
Hoštice 1	Moravia	821	Male	20-27	Bow-shaped pendant, pitcher, bowl, small container, worked stone tip, animal bones (domesticated), worked bone (Růžičková 2008, 2009; Drozdová 2011)
*Hoštice 1	Moravia	862	Male	30-50	Wristguard, copper dagger, bell beaker, pitcher, bowl, bone button (unsure if v-shaped), animal bones (Olivik 2009; Drozdová 2011)
Hoštice 1	Moravia	863	Male	30-50	7 arrowheads, gold and silver fragments, animal bones (Olivik 2009; Sosna 2012; Drozdová 2011; Peška 2013a)
Hoštice 1	Moravia	864	Male	30-50	Bow-shaped pendant, 4 arrowheads, bell beaker, pitcher, animal bones (domesticated) (Olivik 2009; Růžičková 2009; Drozdová 2011; Sosna 2012)
*Hoštice 1	Moravia	884	Male	<50	Wristguard, copper dagger, 3 pitchers, bowl, animal bones (Olivik 2009; Drozdová 2011)
*Hoštice 1	Moravia	915	Male	<50	Wristguard, arrowheads, copper dagger, 2 bell beakers, lithic blade, polishing stone, animal bones (domestic) (Olivik 2009; Drozdová 2011; Sosna 2012)
*Hoštice 1	Moravia	949	Male	30-60	Wristguard, 4 arrowheads, 2 pitchers, bowl, 2 silver spirals, 3 gold spirals, bone object (ring?), animal bones (domestic) (Olivik 2009; Drozdová 2011; Sosna 2012; Peška 2013a)
*Hulín 1	Moravia	66	Male?	<60	Wristguard, boar tusk (Peška 2013b)
Hulín 1	Moravia	73	Male	<60	2 arrowheads, anvils, hammers (smith equipment), bowl, decorated bell beakers (Peška 2013b)
*Hulín 1	Moravia	85	Male	30-50	Wristguard (Peška 2013b)
*Ivanovice	Moravia	812	Male	Adult	Wristguard, 2 arrowheads, copper dagger, two mugs, bowl with animal bones (Tkáč 2008)
Ivanovice	Moravia	814	Male	<60	Arrowheads (Tkáč 2008)
*Ledce II	Moravia	1/52	Male	Adult	Wristguard (left association), stone arrowhead, 2 decorated beakers, boar tusk, bone clasp, bone object (Dvořák 1992)
*Lhánice	Moravia	8	Male	Adult	Wristguard, copper dagger, cup, pitcher (Moucha 2005)
*Nesovice	Moravia	125	ND ⁸	ND	Wristguard, bowls, pitcher, v-shaped buttons ⁹ (Kalušek 1956; Hájek 1956)
Ostopovice	Moravia	14	Male	30-60	5 arrowheads, 4-footed bowl, small jug, animal bones (Dvořák 1992)

Site	Region	Grave Number	Sex	Age	Grave Context
*Veselí na Moravě	Moravia	XVII,158	Male ¹⁰	16-24	Wristguard (left), jug, bowl, pebbles, boar's tooth (Stařa 1959)
*Altenmarkt	Bavaria	gr. 6, object 25	Male	30-60	Wristguard (left), arrowheads, dagger, bell beaker, hematite, flint, boar's tooth (Schmotz 1990)
Buxheim	Bavaria	201	Female	20-29	Bow-shaped pendant, buttons (Rieder 1998; Heyd 2000)
*Landau (Dingolfing 1981)	Bavaria	2118/24, 22/1193	Male	>19	Wristguard, 2 arrowheads, daggers, amber pearls (Heyd 2000)
*Oberstimm II/1982	Bavaria	1, 2	Female	Adult	Wristguard, button, copper awl, animal bones, bell beaker, pots (Rieder 1983)
*Oberstimm II/1982	Bavaria	2118/24, 22/1193	Male	Adult	Wristguard, arrowheads, copper dagger, lithics, bowl, bell beaker (Rieder 1983)
*Osterhofen-Altenmarkt	Bavaria	2118/24, 22/1193	Male	30-50	5 wristguards, 3 arrowheads, 3 daggers, 4 small cups, 1 large cup, flint (Schmotz 1994)
*Osterhofen-Altenmarkt	Bavaria	10	Male	<60	1 wristguard, bow-shaped pendant fragments, 2 copper objects, several small pots, 5 bowls (Schmotz 1994)
Osterhofen-Altenmarkt	Bavaria	116/78	Male	><60	Arrowhead, copper objects, decorated bow-shaped pendants, flint fragments, 9 cups (Schmotz 1994; Kern 2016a)
*Straubing Stadttäcker	Bavaria	1, 2	Male	30-50	Wristguard, bow-shaped pendant, cup (Prammer 1981; Christlein 1982)
*Trieching	Bavaria	670, 22/1193	Male	30-50	Excavation grave 1; wristguard, arrowheads, lithic scraper, copper dagger, amber bead, beaker (Kreiner 1991)
Weichering	Bavaria	17	Male	30-60	Bow-shaped pendant, cup, bowl, ceramic fragments (Weinig 1992)

Table 7: Suspected Bell Beaker archers (A) ; asterisk(*) = wristguard present

¹ A copper awl is an item associated almost uniquely with female burials (Müller 2001; Vander Linden 2015)

² The biological sex determinations were not consistent. Even with the DSP2 method, one os coxal identified as male and the other as female. The Walker method revealed rather female characteristics, but the burial orientation was male (lying on the left side).

³ The storage box also contained animal bones, but there was no information concerning their origins and the publication did not include them.

⁴ The grave goods are seemingly more associated with the child burial. Therefore this individual's classification as A is debatable; however because the general burial context still included archery-related items, 53/80-I maintains an A status.

⁵ As with 53/80-II, the grave goods are seemingly more associated with the child burial. Therefore this individual's classification as A is debatable.

⁶ This is the museum inventory number. There was no listed grave number, but it was a single find.

⁷ The anthropological material did not have an identifying grave number, but it was clearly labeled as a 'Bell Beaker'. The publication lists three findings from this cite: grave 1 is not a Bell Beaker and grave 3 was both destroyed and the remaining bones do not match the skeleton examined. Therefore by elimination, this study uses the archaeological information of grave 2.

⁸ The skeleton was poorly preserved, but a right side burial orientation indicates female.

⁹ Despite the number on the box, all archaeological sources indicate a single burial.

¹⁰ This individual did not follow the traditional male burial orientation. He was on a NW - SE axis on his left side with his head to the southeast.

PRACTICE AND PRESTIGE

Site	Region	Grave Number	Sex	Age	Grave Context
Franzhausen II	Lower Austria	3382	Male	30-50	2 cups, oriented N-S facing East, surrounded by circular ditch (Kern 2011a)
Gemeinlebarn	Lower Austria	3559	Male	30-50	Beaker, 2 jugs, 2 metal rings (Neugebauer and Neugebauer 1997; Neugebauer and Neugebauer-Maresch 2001)
Henzing	Lower Austria	3	Male	15-20	Grave group with Henzing grave 1, 2, animal bones, oriented N-S facing east (Friesinger 1976; Jungwirth 1976)
Laa Thaya	Lower Austria	NL 46	Male	~23	No archery context (Kern (2003b), and personal communication)
Leopoldsdorf	Lower Austria	5	Male	25-35	Grave group of 5: several cups (some decorated), bowls, other ceramic forms, 2 gold burl rings, 2 simple gold rings, 2 faience pearls, amber jewelry, animal bones ¹ (Willvonseder 1937)
Tödling	Lower Austria	3	Male	25-40	Bowl with animal bones, handled cup, orientation NNW-SSE (Kern and Wiltshcke-Schrotta, in progress)
Tödling	Lower Austria	6	Male	15-21	Likely meat offerings (goat and sheep), orientation NE-SW (Kern and Wiltshcke-Schrotta, in progress)
Zwingendorf Alicenhof	Lower Austria	16	Male	35-45	None (Wiltshcke-Schrotta <i>et al.</i> 2001)
Brandýsek	Bohemia	18	Male	16-24	Bowl (Kytlicová 1960; Hájek 1968)
Brandýsek	Bohemia	26	Male?	<50	Bowl, bone pendant (Kytlicová 1960; Hájek 1968)
Brandýsek	Bohemia	66	Female	<60	No archery context, no additional information ² (Hájek 1968)
Březno- Louny	Bohemia	37012 ³	Female	<60	None (analyzed as grave LXXXI) (Pleinerová 1980)
Holubice IV	Bohemia	4	Female	<50	Bell beaker, pitcher, pot, cup (Rakovský 1985)
Holubice IV	Bohemia	7	Male	<50	Bell beaker (Rakovský 1985)
Hradiště	Bohemia	163	Female?	Adult	Not confirmed, no archery context ⁴ (Červinky 1911)
Kněževes	Bohemia	6	Female	20-29	Bowl, small jug, 2 small copper plates, amber buttons (Hájek 1968)
Kněževes	Bohemia	12	Male	30-60	Bowl, jug (Kytlicová 1956; Hájek 1968)
Libochovice	Bohemia	32244	Male?	Adult	Bowl, cup, animal bones (Zápotocký 1962)
Lochenice	Bohemia	8	Male	<60	None (Buchvaldek 1990)
Lochenice	Bohemia	15	Male?	Adult	Jug, animal bones (Buchvaldek 1990)
Mochov	Bohemia	1	Female?	Adult	Bowl, jug (Moucha 1972)
Pavlov	Bohemia	501	Female	20-39	2 jugs, jug fragments, bowl, buttons, animal bones (Dvořák <i>et al.</i> 1996)
Pavlov	Bohemia	506	Female	<50	Bowl, jug fragments (Dvořák <i>et al.</i> 1996)
Pavlov	Bohemia	512	ND	14-27	Bowl, pot, jug, lithic (Dvořák <i>et al.</i> 1996)
Pavlov	Bohemia	516	Male	<50	Jug (Dvořák <i>et al.</i> 1996)
Pavlov	Bohemia	517	Male?	<50	Bowl (Dvořák <i>et al.</i> 1996)
Pavlov	Bohemia	525	Male	<50	None (Dvořák <i>et al.</i> 1996)
Pavlov	Bohemia	566	Male	14-26	Bowl (Dvořák <i>et al.</i> 1996)
Pavlov	Bohemia	570	Male?	Adult	2 bell beakers, copper dagger, lithic industry (Dvořák <i>et al.</i> 1996)

PART 3: THE ANTHROPOLOGICAL CONNECTION

Site	Region	Grave Number	Sex	Age	Grave Context
Pavlov	Bohemia	585	Female	30-60	3 jugs, bowl, bell beaker, pot shards, lithic industry (Dvořák <i>et al.</i> 1996)
Pavlov	Bohemia	588	Female?	<50	Bowl, pot, jug, animal bones (Dvořák <i>et al.</i> 1996)
Pavlov	Bohemia	593	ND	<50	Bowl, bell beaker, jug, lithic industry, animal bones (Dvořák <i>et al.</i> 1996)
Plotiště nad Labem	Bohemia	36100 ⁵	Male	20-29	Bone awl, flint blade, bone clasps (Vokolek 1981)
Radovesice	Bohemia	2/80	Male?	Adult	Ceramic fragment (Turek 2006)
Radovesice	Bohemia	117/78	Female	<60	Cup, goblet, gold plate, silver ring, copper dagger, flint, copper awl (Muška 1981; Turek 2003)
Sulejovice	Bohemia	2/80	Male?	30-540	Found with 2 small children, bell beaker, flint blade, 3 pearls, 2 belt plates (Hájek 1962, 1968)
Tišice	Bohemia	30634	Male?	Adult	Bell beaker, bowl, jug (Hájek 1968)
Tišice	Bohemia	30635	Male?	Adult	Bell beaker, bowl (Hájek 1968)
Židovice-Litoměřice	Bohemia	35629	Female	14-26	No archery context ⁶ (Hájek 1968)
Židovice-Litoměřice	Bohemia	35630	Female?	Adult	No archery context (Hájek 1968)
Brno-Juliánov	Moravia	1/67, 242	Male	Adult	Jug (Peškař 1968; Stloukal 1968; Dvořák 1992)
Brno-Lišeň	Moravia	2/80	Female	<60	Decorated and undecorated bell beaker, bowl, jug, bone buttons, amber piece (Matějčíková 2001)
Brno-Lišeň	Moravia	6	Female	<50	Pot, pitcher (Matějčíková 2001)
Brno-Lišeň	Moravia	9	Female	<60	Decorated bell beaker (Matějčíková 2001)
Bučovice	Moravia	A.73	Female	<50	Bell beaker, bone chisel (Kalousek 1956)
Dědice	Moravia	1/1954, A.274, 52/1957	Female	<60	Decorated bell beaker, bowl, jug, potsherds, bone button, silver awl (Dvořák and Peška 1993)
Dolní Veštonice	Moravia	74	ND	<50	Decorated beaker, jug (Dvořák <i>et al.</i> 1996)
Hoštice 1, za Hanou	Moravia	818	Male	<50	Ceramics, fragments of a copper plate (Drozdová 2011)
Hoštice 1, za Hanou	Moravia	854	ND ⁷	19-34	Ceramics, amber bead (Drozdová 2011)
Hoštice 1, za Hanou	Moravia	856	Female	<50	Ceramics, v-shaped buttons, fragments of a copper plate, animal bones (Drozdová 2011)
Hoštice 1, za Hanou	Moravia	859	Male	<60	Ceramics (Drozdová 2011)
Hoštice 1, za Hanou	Moravia	931	Male	<50	Ceramics, stone tool, animal bones (Drozdová 2011)
Hoštice 1, za Hanou	Moravia	947	Female	30-60	Ceramics (bell beaker, jugs), bone buttons (unsure if v-shaped), animal bones (Matějčíková 2007; Drozdová 2011)
Hulín 1	Moravia	72	Male	<60	No archery context (Peška 2013b)
Ivanovice	Moravia	800	Female	30-60	No archery context (Tkáč 2008)
Lechovice	Moravia	1120	Female	30-40	Amber beads, v-shaped buttons, ceramics, bone ring fragment ⁸ (Medunová and Ondráček 1969)
Lhánice	Moravia	1/1954, A.274, 52/1957	Male ⁹	<60	Pot, cup, sheep bones (Moucha 2005)

PRACTICE AND PRESTIGE

Site	Region	Grave Number	Sex	Age	Grave Context
Morkůvky	Moravia	9544	Male	40-50	Jugs, bowl, animal bones (domestic) (Unger 1984; Dvořák <i>et al.</i> 1996)
Ostopovice	Moravia	18	Female	Adult	Bowl, small jug, animals bones (domestic) (Dvořák 1992)
Ostopovice	Moravia	19	Female	<50	2 decorated beakers, copper object fragment, amber beads, bone button, boar tusk (Dvořák 1992)
Ostopovice	Moravia	20	Male	25-40	None (Dvořák 1992)
Předmostí u Přerova	Moravia	X, 155	Female	20-39	None (Medunová-Benešová 1962)
Roštín	Moravia	1/1954, A.274, 52/1957	Male	Adult	Jug (Spurný 1957)
Tvořihráz	Moravia	1/90	Female	30-60	2 gold sheets, amber fragments, worked stones, cups, jar, bowl, animal bones (domestic) (Bálek <i>et al.</i> 1999)
Vyškov	Moravia	I, 149	ND	30-60	Jug, 2 horse skulls, animal bones (Ondráček 1961)
Vyškov	Moravia	2/1958, 136	ND	20-29	4 jugs, copper pin, 3 bone buttons (Ondráček 1961; Stloukal 1961)
Želešice	Moravia	1/81	ND	Adult	None (Dvořák 1992)
Želešice	Moravia	2/1925?, 100	ND	Adult	2 jugs, bowl (Dvořák 1992)
Augsburg, Uni-Süd 1991	Bavaria	5	Male	20-35	No archery context ¹⁰ (Kociumaka and Dietrich 1992)
Landau SO 1992	Bavaria	4	Female	Adult	No archery items or weapons (Lemerrier 2011)
Landau SO 1992	Bavaria	5	Female	Adult	No archery items or weapons ¹¹ (Lemerrier 2011)
Landau SO 1992	Bavaria	7	Male? ¹²	Adult	Beaker, cup, jug, v-shaped buttons, dagger (Husty 1993; Heyd 2000)
Landau SO 1992	Bavaria	9	Female	35-50	Beakers, gold plates, metal awl, 12 v-shaped buttons, animal bones (domestic) (Husty 1993; Heyd 2000)
Osterhofen-Altenmarkt	Bavaria	4	Female	30-50	12 buttons, decorated bell beaker (Schmotz 1991, 1994)
Osterhofen-Altenmarkt	Bavaria	9	Female	30-50	1 cup, 2 bowls with 3 more cups inside (Schmotz 1994)
Straubing-Lerchenhaid	Bavaria	2	Male	30-60	No archery context (personal contact with archaeologist Prof. Volker Heyd, Sjögren <i>et al.</i> (2019))
Straubing-Lerchenhaid	Bavaria	4	ND	20-29	No archery context (personal contact with archaeologist Prof. Volker Heyd, Sjögren <i>et al.</i> (2019))
Straubing-Lerchenhaid	Bavaria	6	Female	30-50	No archery context (personal contact with archaeologist Prof. Volker Heyd, Sjögren <i>et al.</i> (2019))
Straubing-Lerchenhaid	Bavaria	8	Female	30-50	No archery context (personal contact with archaeologist Prof. Volker Heyd, Sjögren <i>et al.</i> (2019))

Site	Region	Grave Number	Sex	Age	Grave Context
Straubing-Lerchenhaid	Bavaria	9	Female	20-39	No archery context (personal contact with archaeologist Prof. Volker Heyd, Sjögren <i>et al.</i> (2019))
Straubing-Lerchenhaid	Bavaria	13	Male	20-39	No archery context (personal contact with archaeologist Prof. Volker Heyd, Sjögren <i>et al.</i> (2019))
Straubing-Lerchenhaid	Bavaria	16	ND	Adult	No archery context (personal contact with archaeologist Prof. Volker Heyd, Sjögren <i>et al.</i> (2019))

Table 8: Non-suspected Bell Beaker archers (N)

¹The dating is unclear; it could be Early Bronze Age.

²The source presents a catalog of findings, and this grave number is not listed, implying no grave good associated with the burial. However, this study was unable to confirm the context further.

³This is the museum inventory number. There was no grave number, but it was a single find.

⁴The source mentions this site, with an unspecified number of individuals, and only one bell beaker recovered for the site (therefore there were no archery-related grave goods).

⁵This is the museum inventory number. There was no grave number, but it was a single find.

⁶The two skeletons examined from Židovice only had a collection inventory number, not an archaeological grave number. The source used listed two, and only two, skeletons from from this site, allowing for the conclusion that the two skeletons cited were the two examined. For one of the two individuals, a small ceramic item was found, and for the other a bowl. It is unknown which object is associated with which skeleton, but for the purposes of this study, neither is a suspected archer.

⁷Anthropological sex analyses were rather male, but only the Walker method for the skull was applicable. Archaeological burial orientation is female. Analyses from the primary source also established a female sex.

⁸The number on the box containing the skeleton examined appears to contradict the publication. Grave 1 from the documentation is a 5-6 year old child, and this study examined an adult female. However, the publication discusses a grave group of seven, all of which were either burned or children with the exception of grave VII that matches the biological identity for the individual used in this study. For this reason, the listed archaeological context is for grave VII. In any case, there was no archery context for any of the individuals.

⁹Archaeological orientation indicates female.

¹⁰The source only discusses grave 3, implying that all other graves have no additional burial context apart from a few ceramics, which are not relevant to this study.

¹¹Grave 6 was also in the inventory box, but the publication does not specify an archaeological relation.

¹²The pelvis was not available for a DSP2 analysis, however the secondary cranial criteria classified this individual as more likely male. However, Heyd (2000) identifies this skeleton as female. Also note the variable grave context (a dagger which is more often male-associated and v-shaped buttons which are more often female-associated).

(Peška 2013b). Unfortunately, the skeleton was not well-enough preserved to examine for this study, however data was possible for four other male individuals from the same cemetery. Three of these individuals had an archery context and two had a stone wristguard.

One of largest Bell Beaker cemeteries in both Czechia and the Eastern complex is the site of Hoštice 1. Here there were 157 rectangular grave pits and most contained an inhumation (Matějčíková 2012a 2012b), 13 of which were present in the depository and well-preserved enough to include in this study. The site contained many objects made from precious metals, as well as masculine burials with the archer context and copper daggers. This did not cross gender lines, and some female graves contained V-perforated buttons (Matějčíková 2012a 2012b). A study by Vaňharová and Drozdová (2008) looked at 55 child burials from Hoštice 1 in an attempt to link the archaeological sex with the biological sex. Of these burials, 21 were able to give reliable DNA evidence to establish sex. 13/21, or 62%, had an archaeologically

established sex that corresponded with the biologically established sex. This is not incredibly consistent, and while it is outside the scope of this present work, it could be an interesting consideration when looking at child burials and the role of children in Bell Beaker society.

Comparisons between burial orientation and grave goods with biological sex would be interesting to consider in terms of gender identity. For example, of the three female suspected archers (burial context therefore more masculine), Tišice 77/99 and Oberstimm grave 1 were both still lying on their right sides (typical female position). The burial position for Buxheim 201 remains unconfirmed. Also, Rousinov 19/2 was a double burial, with an adult male and a male child. This study did not examine the child and cannot confirm this sex determination; however assuming this to be true, he was buried on his right side while the adult male was buried on the left.

Traumas

Site	Grave Number	Sex	Traumas
Březno-Louny	37012	Female	Fracture of right radius and ulna (likely Colle's fracture)
Dědice	274	Female	Healed fracture of right ulna
Holubice IV	7	Male	3 healed rib fractures, healed fractures of right radius and ulna, fractures of right fifth metacarpal and a phalange (Farkašová 2011)
*Hoštice 1	863	Male	Healed fracture of left ulna
*Hoštice 1	915	Male	Healed fracture of right ulna
Libochovice	1	Male	Healed fractures of distal radius and ulna (Farkašová 2011)
Lhanice	8	Male	Trepanation
Lochenice	8	Male	Post-traumatic bone formation on left clavicle (Farkašová 2011)
Lochenice	15	Female	Fractured left rib, left clavicle, and left proximal ulna (Farkašová 2011)
Mochov	1	Female	Compression fracture of thoracic vertebra (Farkašová 2011)
Ostopovice	19	Female	Poorly healed complete fracture of right femur
Ostopovice	20	Male	Healed fracture of right radius, likely right ulna as well
Pavlov	588	Female	Healed broken foot phalange (Farkašová 2011)
Plotiště nad Labem	LX	Male	Multiple skull injuries (Farkašová 2011)
*Stehelčevy	2	Male	Fractured right tibia (Farkašová 2011)
Straubing-Lerchenhaid	1	Male	Healed fracture of left distal radius and ulna (possible Colle's fracture)
Straubing-Lerchenhaid	16	ND	Healed fracture of left radius and ulna
*Straubing Stadtäcker	1	Male	Healed complete fracture of right radius, also healed fractures of the right ulna and the left radius
Sulejovice	2	Male	Skull injury (Farkašová 2011)
Tišice	3	Female	Healed skull fracture, healed injury (possibly stabbing) on left zygomatic (Farkašová 2011)
*Žabovřesky	32293	Male	Healed fracture of left clavicle (Farkašová 2011)

Table 9: Individuals with signs of traumas identified by the author as well as studied by Farkašová (2011); an asterisk (*) indicates that the individual is a suspected archer

A study by Farkašová (2011) looked at skeletal traumas on several Czech skeletons. Table 51 lists those that also appear in this study as well as other individuals with traumas identified by the author. Many of the traumas are very possibly from accidents and therefore not necessarily linked to violence.

The suspected archers and their contexts

The total of individuals examined for this study includes 52 suspected archers (A) and 82 non-suspected archers (N). For A, the following Table 10 further classifies their grave goods linked to archery, including daggers. The decision to consider daggers alongside the archery-related goods is due to their likely parallel meanings, with daggers also having possible links to warfare, hunting, and social status. Originally this study also tried to control for the burials with animals bones, however often times the publications did not specify the species and those that did revealed rather the presence of domesticated animal bones. This research revealed no definitive study identifying the presence of wild animal bones in the tombs of the studied individuals. Because domestic animals are irrelevant to the question of hunting and unidentified animal bones do not provide usable data, this study decided not to include this information when considering artifacts of interest (i.e. wristguards, arrowheads, bow-shaped pendants, and daggers).

In total, 34 graves had wristguards, 28 had arrowheads, 17 had bow-shaped pendants, and 24 had daggers, and all four items never appeared together in the same grave. In terms of specialized archery, stone wristguards were of particular interest, though this study treats all burials with an archery item as suspected archers. The following pie charts (Figures 29, 30, and 31) further summarize these burial contexts in terms of archery and warfare-/hunting-related grave goods.

Because possible symbolic interpretation is important to this study, the following graph exhibits the distribution of objects in archer burials that also have a dagger (24 out of 52 archer burials also had a dagger) (Figure 32).

The majority of these burials with a dagger also had a wristguard (18/24), meaning that just more than half of the burials with a wristguard also had a dagger (18/34). In contrast, the appearance with arrowheads (12/24, from a total of 28 burials with arrowheads) and bow-shaped pendants (6/24, from a total of 17 burials with bow-shaped pendants) is a bit smaller.

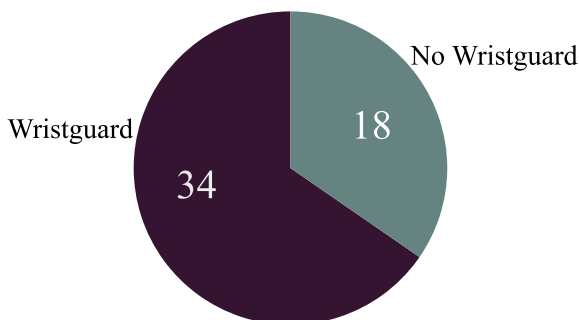


Figure 29: The number of archer burials with and without a wristguard

PRACTICE AND PRESTIGE

Burial	Wristguard	Arrowhead	Bow-Shaped Pendant	Dagger
Altenmarkt, 6	X	X		X
Brandýsek, 71		X		X
Franzhausen, 230	X			
Gemeinlebarn 2071	X			X
Hoštice 1, 863		X		
Hoštice 1, 862	X			X
Hoštice 1, 864		X	X	
Hoštice 1, 821			X	
Hoštice 1, 949	X	X		
Hoštice 1, 915	X	X		X
Hoštice 1, 884	X			X
Hulín 1, 66	X			
Hulín 1, 73		X		
Hulín 1, 85	X			
Ivanovice, 812	X	X		X
Ivanovice, 814		X		
Landau 1981, 2118/24	X	X		X
Ledce, 1/52	X	X		
Lhánice, 8	X			X
Oberstimm II/1982, 2	X	X		X
Osterhofen-Altenmarkt, 2	X	X		X
Osterhofen-Altenmarkt, 10		X		?
Osterhofen-Altenmarkt, 11		X	X	?
Ostopovice, 14		X		
Pavlov, 519	X	X		
Pavlov, 500			X	X
Pavlov, 502		X	X	
Pilsting/Trieching, 670	X	X		X
Praha 8-Kobylisy 36749/obj. 13		X	X	X
Radovesice, 116/78	X	X		X
Radovesice, 59/80-II	X	X	X	
Radovesice, 53/80-I	X	X	X	
Rosnice, 1/59	X		X	X
Rousínov, 19/2	X	X	X	
Stehelčeves, 1	X			X
Stehelčeves, 2	X	X		X
Straubing Stadtäcker, 1	X		X	
Sulejovice, 3	X	X		
Tödling, 4			X	X
Tödling, 5			X	X
Velké Přílepy, 2		X		
Veselí na Moravě, XVII	X			
Vykáň, 1	X		X	X
Weichering, 17			X	
Žabovřesky, P7A 32293	X			
Buxheim, 201 (F)			X	
Oberstimm II/1982, 1 (F)	X			X

Burial	Wristguard	Arrowhead	Bow-Shaped Pendant	Dagger
Tišice, 77/99 (F)	X			X
Běhřovice I, 5866-5883 (ND)	X			
Henzing, 1/2 (ND)	X		X	
Lochenice, 3 (ND)		X		X
Nesovice, 125 (ND)	X			

Table 10: Archery contexts for suspected archers; Females (F) and sex not-determined (ND) appear at the bottom of the table

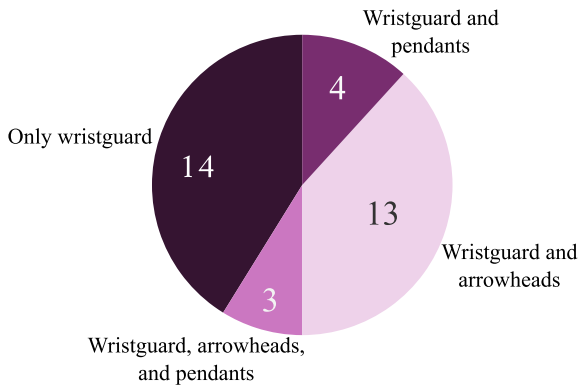


Figure 30: The contexts of the burials with a wristguard

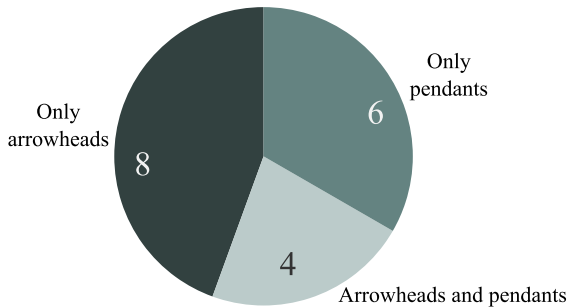


Figure 31: The contexts for the burials without a wristguard

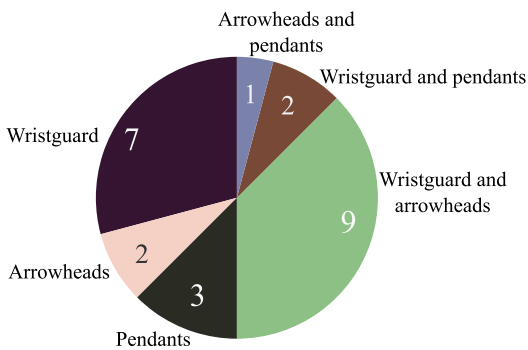


Figure 32: The contexts of burials with a dagger and an archery-related item

Results summary

The results of the anthropological analyses from Ryan-Despraz (2021) contribute directly to the understanding of prehistoric warfare in general and Bell Beaker archery in particular. The original dissertation and raw data are available in open access at the University of Geneva's Archive Ouverte, allowing for an in-depth look into these results and the corresponding methods. However, this section will present a brief outline of the anthropological findings most relevant to the archaeological perspective.

Interpretations at the population level

At a population level, there was no indication for measurement differences between the suspected (A) and non-suspected archers (N). However, a principal component analysis (PCA) controlling for various measurements did find slight patterns distinguishing between suspected archers with and without a wristguard, which was not the case for arrowhead presence, while group N remained intermingled between both groups. For the presence of enthesal changes, non-suspected archers tend to have fewer cases of no development than suspected archers. This means that overall, non-suspected archers demonstrate more muscle development and activation than suspected archers. This finding remained consistent across the four methods used to score enthesal changes as well as for analyses examining both males and females and only males.

The finding that PCA created a slight separation between suspected archers with and without a wristguard, yet found no patterns when controlling for arrowheads could support the idea that wristguards play a more distinct role in the relationship between the burial context and the individual's occupational identity. At the same time, this is not yet enough information to speculate on whether that difference was practical (individuals with wristguards were specialized archers) or social (individuals with wristguards were socially more prominent), though it does provide evidence towards an interpretation signifying the importance of the individual him- or herself, for example placement within a social hierarchy. If it were just the importance of archery in question, then one would expect a similar result for arrowheads as for wristguards, but this was not the case. It is interesting to compare this finding with that of Müller (2001), who noticed that arrowheads are much more consistently masculine than wristguards and daggers. They are almost uniquely located in male burials, whereas daggers and wristguards are occasionally found in female burials. This could be an indicator of gender identity, and perhaps function.

Even assuming the proposed criteria of this study were capable of identifying, at least to some degree, specialized archery, the fact that N was always intermingled is also not surprising. Suspected and non-suspected archers were so classified based on their archaeological context. N could very well have practiced specialized archery, yet for one reason or another did not receive the same burial context. Even when accounting for potential flaws in the methodology criteria, this lack of overall population differentiation with the quantitative data is one indication that the 'archer' burial context is linked to a social aspect rather than a practical aspect. The intermingling of N could represent the fact that there is no significant difference between them and A, and that the burial differentiation is linked to something other than occupation. One main interpretation of this data is therefore that not all A were

specialized archers, and not all N were unspecialized archers. This is further exemplified by the difference between individuals with and without a wristguard. Even within the A group, one subset varied from another subset. Therefore even before looking at the differences in muscular development shown by enthesal changes analyses, there is evidence that some A may have been specialized archers, but not others. In other words, this study's findings do not support the idea that an archery burial context separates individuals by practice (i.e. occupation).

In terms of the analyses of the enthesal change scores, the findings for comparisons for development versus no development are quite striking. In every instance, the suspected archers had more instances of no development than the non-suspected archers, which could be a strong indicator for group N having been generally more physically active. In terms of occupation, this finding is incredibly interesting because it supports the hypothesis that the archery grave context was primarily social. If one equates the grave context with richness, either social or economic, this draws a parallel between muscular development and wealth. Less development usually means less physical activity, and this corresponds to richer grave contexts. All this was during a time when survival meant performing such activities as farming, mining, building, warfare (whether it be offensive or defensive), etc. Not unlike today, people with more wealth, both social and economic, are less likely to perform hard, manual labor. This finding therefore provides a compelling case for a labor differentiation between suspected and non-suspected archers that corresponds to a specific burial context.

An additional reason for why these overall results are interesting is because they contrast with the study by Thomas (2014) which found that in general, the suspected archers had more enthesal changes than the non-suspected archers. One primary difference between these two studies is the time period, with that of Thomas (2014) examining collections from the Middle Neolithic.¹ It could therefore be interesting for future studies to look at any potential patterns in EC throughout the Neolithic for a particular region.

Interpretations at the individual level

The individual analyses involved the reorganization of the symmetry data according to the hypothesized biomechanics for the muscles activated by the draw arm, both arms, and the bow arm (also see Ryan-Despraz (Accepted)). The A test group (suspected archers) was then examined for trends linked to specialized archery. Those observations identified 11 out of 28 individuals as 'confirmed' archers (C) based on biomechanical consistency (23 A did not provide enough data for individual analyses). The 'C' group consists of skeletons with bone morphologies compatible with a theoretical profile of a specialized archer. These individuals include possible right-handed archers: Hoštice 1 (862), Hoštice 1 (821), Oberstimm II/1982 (2), and Vykáň (1), and possible left-handed archers: Hoštice 1 (915), Hoštice 1 (884), Hulín 1 (73), Lochenice (3), Osterhofen (11), Radovesice (59/80-II), and Rosnice (I/59). Analyses using Fisher's Exact test also demonstrate that these two new datasets (right-handed archer and left-handed archer) are indeed statistically unusual. Tests revealed significant differences for the symmetry frequencies of the draw arm vs. the bow arm in right-handed archers, the draw arm vs. the bow arm in left-handed archers, and the draw arms of right-handed archers

¹ The studies by Ryan-Despraz (2021) and Thomas (2014) did not use the same criteria for identifying specialized archery. Some measurements and scores were the same, but not all.

vs. left-handed archers. In contrast and as expected, the test statistic for both arms did not differentiate between the two populations. This means that the biomechanical theory was possibly able to isolate suspected archers, and do so according to handedness. This provides support that these 11 individuals were specialized archers. However, new PCA analyses controlling for C showed no patterns. The remaining 17 individuals were classified as 'IA', or 'unlikely' archer, as they did not demonstrate bone development biomechanics consistent with expectations for specialized archery.

The population analyses were necessary to better understand the placement of the suspected archers within a greater Neolithic society. However, the individual analyses were also able to identify a possible group of specialized archers, and in turn, a group of suspected archers that were likely not specialized archers themselves. This subgrouping therefore serves as an indicator in and of itself that not all 'archer' burials belonged to specialized archers. Additional analyses with respect to these subgroups again found that while C was indeed a closely linked group, N remained intermingled.

The primary problematic of this study aimed to identify specialized Bell Beaker archers based on skeletal morphology with the goal of being able to use such findings to better understand Bell Beaker archery in terms of occupation, function (hunting and warfare), and the role of archers and archery in a stratified Bell Beaker society. The next section will therefore discuss these general anthropological results and contextualize them within the broader archaeological framework discussed in Parts 1 and 2.

The anthropological results within an archaeological framework

Burial contexts

Test groups A and N of this study were so classified because of their burial contexts. Test group N (n=82) did not have archery-related items, though many had other goods such as ceramics. For test group A (n=52), these individuals had at least one archery-related item, which included wristguards, arrowheads, and bow-shaped pendants. Daggers were also noted in these burials because of their possible link to archery and warfare (though no A burial had only a dagger). Looking at the overall grave contexts for the sub-classified group C (n=11), the number of graves with each object is as follows:

- Wristguard: 7
- Arrowhead²: 6
- Bow-shaped pendant: 5
- Dagger: 7 (this includes 5 copper daggers, one flint blade, and one quartzite blade)

Various groupings of these items appeared as follows:

- Wristguard & dagger: 2
- Wristguard, arrowhead, & dagger: 2
- Wristguard, arrowhead, & pendant: 1
- Wristguard, pendant, & dagger: 2

²This study did not differentiate between the number of arrowheads found.

- Arrowhead & pendant: 1
- Arrowhead & dagger: 1
- Pendant only: 1
- Arrowhead only: 1

There are only three graves (Hoštice 821, Hulín 73, and Osterhofen-Altenmarkt 11) with neither a wristguard nor a dagger (Lochenice 3 did not have a copper dagger, but rather a quartzite blade). Hoštice 821 is also the only grave that had only a pendant in terms of archery-related goods and Hulín 73 the only grave with only an arrowhead. No individual had only a wristguard, this item was always accompanied by either arrowheads or a dagger and in all but one case (Radovesice 59/80-II) a wristguard always appeared with a dagger (copper or otherwise). This therefore shows a close association between wristguards and daggers. All individuals had multiple grave goods, including non archery-related items such as ceramics.

It is then interesting to consider these counts in terms of all A burials with a wristguard. Overall there were 34: 3 from Austria, 11 from Bohemia, 12 from Moravia, and 8 from Bavaria. Of those 34, 15 did not present enough datapoints to allow for analysis³ (therefore they remain undetermined). That leaves 12 individuals who were buried with a wristguard but did not demonstrate development consistent with specialized archery (IA) compared to 7 C individuals. For the suspected archers without a wristguard (n=18), 5 presented datapoints not consistent with specialized archery (IA), 4 were classified as C, and 9 did not provide enough information. Additionally, calculating whether or not these frequencies are statistically unusual reveals a p-value of 1, indicating that they absolutely are not. This means that, as with the previous results, there is no black-and-white rule linking grave context with likely specialized archery. That is to say, some individuals with this context were likely specialized archers, and some were not – a finding that is consistent throughout this research. At the same time, this also means that there is no link between wristguard presence and whether or not the individual was a possible specialized archer (C).

Of the 7 C with a wristguard, 5 had one associated with a specific hand – 4 individuals had it on the left and one on the right. Two of the left-side wristguard individuals were classified as possible left-handed archers, which is not necessarily consistent with expected handedness (a left-handed archer would wear the wristguard on the right). However, the one individual with a wristguard on the right was classified as a possible left-handed archer (Hoštice 884). Both possible right-handed archers had the wristguard on the left. Therefore, when comparing results for C with wristguard side associations, 3 out of 5 correspond to expectations. While this is important to note, this proportion does not provide sufficient evidence, either for or against, for any interpretation concerning the results of the individual biomechanics analysis. In other words, a wristguard associated with the left arm is not sufficient evidence for discrediting the results obtained from the biomechanics analysis.⁴ Additionally, an n = 5 is too low for drawing conclusions.

At least two of the three female suspected archers (none of whom were C) were buried on their right-sides, which is the archaeologically feminine orientation. Two of the individuals,

³ This includes Landau 2118/24, who was not included in the anthropological analyses because of a DISH diagnosis.

⁴ Some findings have even shown evidence for a secondary placement, indicating that someone else placed the wristguard on the individual after death. This will be discussed again later.

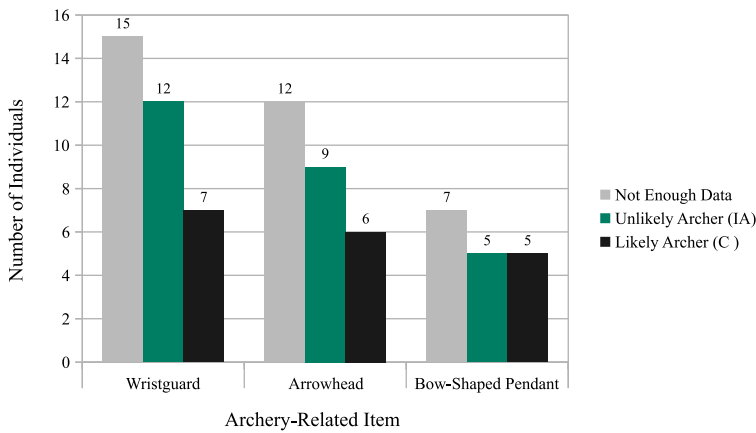


Figure 33: The relationship between burial context and an anthropological archer occupation classification

Tišice 77/99 and Oberstimm II/1982 grave 1, did not have enough datapoints for an archery analysis and the third female, Buxheim 201, did not present development consistent with specialized archery. Therefore in terms of occupation, female archer burials remain ambiguous and this study cannot comment on the presence of female specialized archery occupation. As techniques in activity identification from the skeleton continue to advance, it could be interesting to re-address this question in terms of the N females. However, because this study does not wish to assess occupation without a corresponding archaeological context for support, such an analysis remains outside the scope of this discussion.

Overall, there are minimal links between the grave context and possible specialized archery on the skeleton. Archaeologically speaking, it is not possible to say whether or not an individual was a specialized archer based solely on his or her burial context. This lack of association is also another indication that grave context, and particularly the presence of wristguards, commonly had a more social significance. Figure 33 shows the distribution of wristguards, arrowheads, and bow-shaped pendants in burials for groups C, IA, and those without enough information to classify.

Bell Beaker society

The interpretations of likely and unlikely Bell Beaker archers can all contribute to the broader question about the functioning of Bell Beaker society. Specifically, this study aimed to delve deeper into the questions of warfare and social stratification. The essence of the archaeological implications of this study can be summarized by the following diagram (Figure 34):

This diagram exhibits the interpretative logic for the identification of Bell Beaker archers and its implications on individual symbolism versus social symbolism. The purpose of Ryan-Despraz (2021) was to create a biomechanical profile that can identify specialized archers. In light of those results, the questions become, what do the identities of these people tell us about Bell Beaker society? Were these ‘archer’ burials intended to be prestigious? If so, what does it mean to have been a prestigious archer? The mere presence of archery-related items signifies the importance of archery, but for what purpose? Perhaps to glorify a great hunter

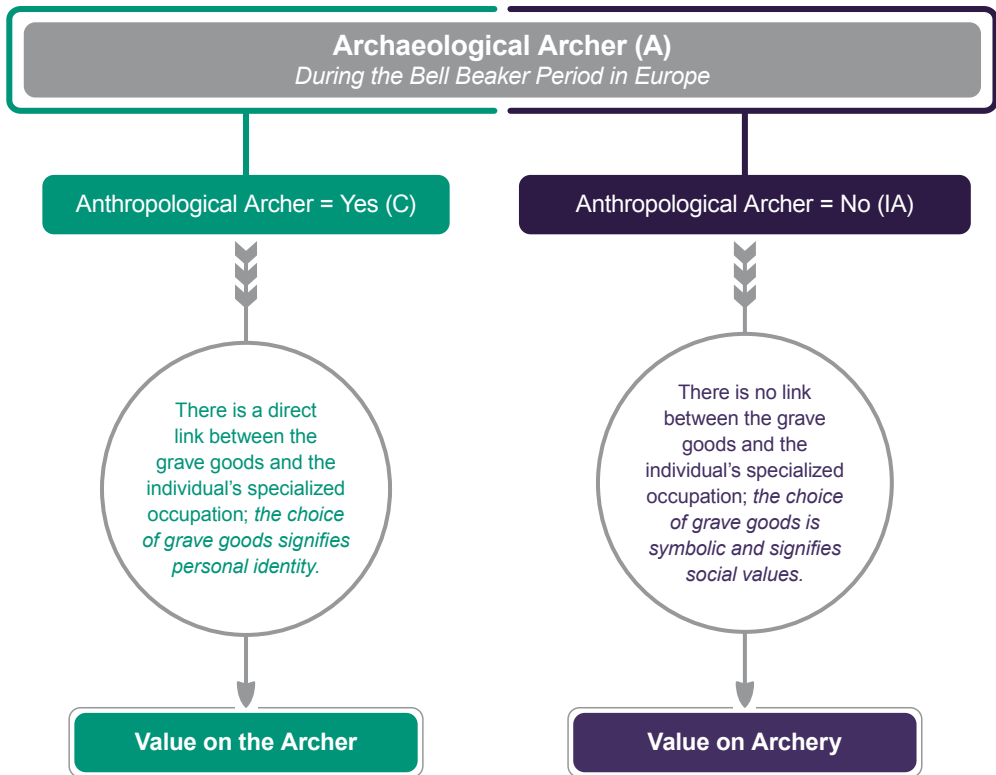


Figure 34: Diagram for interpreting potential societal value of specialized archery

or warrior? Or is it more ideological? The essence of this conversation lies with linking the established anthropological profile with the presence and interpretation of the artifacts, most notably the stone wristguards. The emphasis lies with the stone wristguards because they are possibly both symbolic and specialized, and they did not appear before the Bell Beaker period. This therefore leads to a second interpretative diagram (Figure 35):

This logic leads to three main questions: Was archery practically important or rather an ideological ideal? Was archery important for its ties to hunting or warfare (or both)? And lastly, how will answering these questions contribute to the understanding of Bell Beaker society? This part of the discussion will delve deeper into these questions, most notably the available evidence and how this study has contributed to the global understanding of Bell Beaker society in Central Europe.

To begin this discussion, one question asks whether or not the stone wristguards were practical (worn while practicing regular archery) or symbolic. In terms of whether or not they were practical, it is necessary to consider not only how they would have functioned, but also evidence from the wristguards themselves. For some researchers, their fabrication in stone and position on the arm has been of particular interest. A study by Nicolas (2020) addresses this issue with two very important findings:

The Function of Archery-related Grave Goods *i.e. Wristguards*

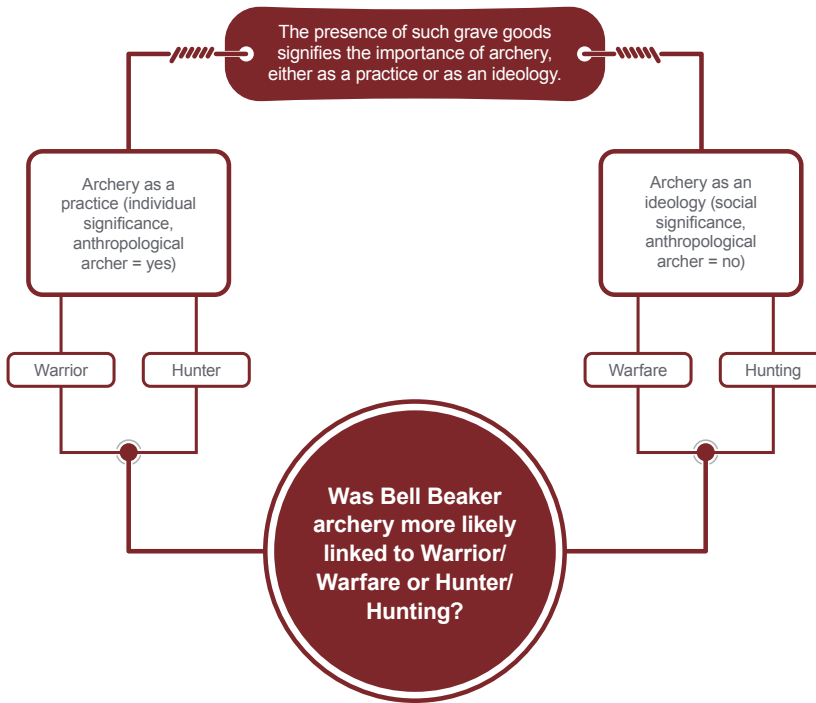


Figure 35: Diagram for interpreting the function of wristguards and archery

1. Most stone wristguards could have been made by anyone and were therefore not necessarily specialized items made by artisans. Of course, some wristguards were more decorated and shaped than others, implying more time and specialization, but this is not the rule.
 2. Most stone wristguards show very few signs of practical use. This means few surface marks indicating their use as a piece of protective gear, however evidence of re-shaping and re-drilling indicates that they were still a long and important part of the wearer's life. Interestingly, none of the wristguards examined in the study were 'fresh', meaning all had at least some level of wear.
 - After examining the arrowheads of Hoštice 1, za Hanou (Bell Beaker cemetery in Moravia), Sosna (2012) found that the majority showed no signs of use, implying that their function was symbolic rather than practical. This could therefore also indicate that wristguards were not necessarily more symbolic than arrowheads.
- To the first point, Nicolas (2020) points out that just because most everyone could have made their own wristguards does not mean that they did. There could still have been a work distribution for such items. On the one hand, if one equates level of artisanal skill and effort involved in making an object with that object's value, then some wristguards are possibly less valuable than what researchers might previously have believed. On the other hand, they are still fairly rare in burial contexts, implying some level of worth whether it be personal,

familial, or societal. Concerning both points, the fact remains that stone wristguards were made at all, therefore they were desired. If they were not desired as a piece of practical archery equipment, as the research suggests, then they must have been desired for some other, more symbolic, reason. The gold wristguard from Agua Branca⁵ (Harrison 1980) is proof that uniquely symbolic wristguards did exist at the time. The re-working and fixing of those in stone is one sign that they were valued, personal objects throughout the individual's life. And for the wristguards that are not necessarily highly specialized, perhaps the individual him or her self made it, thus creating another level of personal attachment. In all cases, a primary conclusion of Nicolas (2020) is that wristguards likely had more of a social significance than a practical one.

Indeed, while the majority of stone wristguards come from burials, that is not always the case. Here are two examples of sites with intentionally deposited wristguards:

- Hostivice, Palouky (Czechia): four post holes separated by about four meters with a large pit in the middle, at the bottom of which were four stone wristguards arranged in a rectangle. There were no other objects or human remains, therefore this was likely not a burial, yet the form is also not reminiscent of a Bell Beaker habitation. One possible interpretation is that this was a foundation deposit (Daněček *et al.* 2014; Nicolas 2020).
- Brodek u Proštejova (Czechia): a rectangular building consisting of two rows of post holes with stone wristguards at the bottom of three. In proximity to this is a smaller structure built with stakes and four rectangular pits. These pits held no remains, but several Bell Beaker items (including four wristguards two of which were burned, arrowheads, and a bow-shaped pendant), thus making them likely cenotaphs (Fojtík 2015; Nicolas 2020).

Depositing stone wristguards at the bottom of post holes goes beyond a plausible individual interpretation and into the realm of symbolic, even ritualistic representation. These structures very possibly had some ceremonial function, for which wristguards were an important symbol. These examples go along with the several examples of cenotaphs, many of which contained stone wristguards. For example at Szigetszentmiklós (Hungary), 29 burials (13%) were cenotaphs containing high numbers of grave goods, including daggers, wristguards, and arrowheads (Patay 2013). One interesting theory for cenotaphs such as these is that they are symbolic, replacement burials for warriors who died far away from the community (Patay 2013). This is a very interesting theory that would also be specific to warfare rather than hunting, because it is unlikely that people, especially so many, would have died during a hunt. Therefore if these cenotaphs are representative of an individual, and an archer based on the goods, then he or she would more likely have been a warrior. In any case, the point is that not all wristguards are associated with an individual, meaning that these deposits have at least some level of symbolism whether it be familial, societal, or ideological.

Both Nicolas (2020) and Fokkens *et al.* (2008) also looked at the position of the wristguard on the arm as a potentially important point for understanding functionality. Mainly, the fact that many wristguards seem to have been placed on the outside of the forearm. The idea

⁵ This gold wristguard did not come from the Eastern complex and it is a rare example.

is that the non-functional position acts as proof that they were non-practical items. While this study agrees with the conclusion, it would additionally like to point out the potential real-life application. First of all, walking with a stone wristguard on the inside of the arm would be incredibly annoying as it hits the hip/leg on every swing of the arm, thus getting jostled. It is therefore easy to assume that any wearer of such an object, when not shooting, would turn it around so it is facing the outside. And assuming it is a symbolic object, one would likely want to turn it anyway so that it is easily visible. Additionally, if someone else had to place it on the person after his or her death, the most logical course of action would be to place it on the outside of the forearm (Peška (2013b) proposes likely examples of such instances). But most importantly, none of this changes the fact that these objects are linked to archery. No other credible theory stating otherwise currently exists. Whether worn by a specialized archer or not, whether they are found on the inside or the outside of the arm, and whether they are practical or symbolic, they are still a piece of archery equipment. A symbolic interpretation immediately seems most likely because of the simple fact that they are made of stone. If it were only practical, it would have been made out a lighter and more flexible material, such as leather. This difference is important because understanding an individual's material associations can contribute to the overall understanding of the individual him- or herself as well as the values of the surrounding community. To this end, here is a summary of reasons why stone wristguards were most likely symbolic rather than practical (from Part 1):

- Their fabrication in stone, a cumbersome material to wear
- The presence of gold wristguards (though this is rare)
- The presence of stone wristguards too small to have been effective as practical pieces of armor
- The deposition of stone wristguards without perforations
- Minimal signs of use in archery⁶
- Decoration and craftsmanship on some of the wristguards are unnecessary for a purely practical function
- Some burials contain more than one, yet a practical archer would only have worn one
- The presence of child burials
- The presence of cenotaphs and other non-grave depositions
- Their distribution in cemeteries – wristguards are not found in a majority of graves
- Their relation to arrowheads → Sosna (2012) found that a majority of arrowheads from Hoštice 1, za Hanou showed no signs of micro-wear, so at least some elements of the 'archer's package' were probably symbolic, and this could expand to include wristguards
- The result from Ryan-Despraz (2021) that not all suspected archers with a wristguard matched the biomechanical profile of an archer – meaning some individuals had wristguards but were probably not specialized archers

In terms of this study, the association of these items as primarily symbolic pieces of archery equipment was not the main question. This study is rather interested in whether or not they belonged to a specialized archer.

⁶ Signs of fixing, such as redrilling holes, are not a sign of their function as a piece of protective archery equipment. They are merely a sign that they were worn, rather than made with the intention of grave deposition.

This moves then to the second question considering why archery was important. No matter how the question is broken down, it still falls to the question of hunting vs. warfare. Was Bell Beaker archery more likely associated with hunters or with warriors? Part 1 already looked at the evidence for this question, both with respect to the Neolithic period in general and the Bell Beaker period in particular. When addressing this issue further, it becomes important to consider other aspects of the archaeological context as well, mainly the presence of arrowheads and daggers. Daggers are not unique to the Bell Beaker period, but they do commonly appear with wristguards, thereby creating an association between the two. While they are not directly linked to archery, their potential interpretations run parallel to those for stone wristguards – meaning they likely represent either warfare or hunting. Many researchers have already proposed theories concerning how daggers, and by extension wristguards, could be linked to various activities. Examples of some of the more prominent ideas include:

- Hunting
 - Case (2004) discusses that hunters would likely have used daggers to deliver the *coup de grâce*
- Warfare
 - Zimmerman (2007) postulates that daggers were for close combat and therefore in a sense, a precursor to the Bronze Age swords
- Artisanal
 - Fitzpatrick (2011) speculates that copper daggers represent the tombs of metallurgists, perhaps implying that metal-workers were also warriors
- Social status
 - Heyd (2007) states that since daggers appear in <5% of burials and usually only one per cemetery, they likely represent the social status of the individual

In the question of symbolism vs. practicality, the first three options fall short as soon as one considers the presence of child burials. Of course child burials are not so common and might be the exception rather than the rule, but the facts remain that child burials with such items exist and that children were not specialized in archery or metallurgy. This is true regardless of any potential interest or future intention. However, the idea of social status remains a prominent theory, and especially considering the distribution of the grave goods classified in this study. Most of the archer burials with daggers also had a wristguard (24 burials with daggers, 18 of which also had a wristguard),⁷ and this also makes up just more than half of all total burials with a wristguard (18 out of 34 burials with a wristguard). These numbers were a bit lower for arrowheads (11/28) and bow-shaped pendants (6/17). This association is interesting in the sense that two seemingly symbolic (prestigious?) and not-necessarily practical items appear together in a grave context.

To all of the aforementioned points, here are two examples from Czechia. First is Hulín 1 and at this site, 11-13% of the burials were evenly distributed cremations. Burial 73 is an interesting case (as well as having been classified as C) with the individual's archaeological context consisting of 'smith's equipment', including small anvils and hammers (with five types of stones), as well as 2 arrowheads (behind the feet), a bowl, and five decorated beakers (Peška 2013b). This context is quite clear, and yet this individual was also classified as C.

⁷The remaining six had either arrowheads or bow-shaped pendants.

Perhaps then this is evidence of multiple levels of interpretation – for example a smith who is also a defender of his community (as a reminder, Guilaine and Zammit (2008) argue that being a prehistoric warrior was likely a part-time occupation). However, this was also not the largest grave in the cemetery. That belonged to a woman (30-40 years old) who was buried with a copper dagger and in the typical female orientation. Does this make her a warrior/hunter/artisan, a community leader, or both? Another large grave (95) contained bow pendants, a decorated plate made from boar tusks, a bone disc, two wristguards, an arrowhead, a copper dagger with a case made of wood, three flakes, and a stamped ceramic vessel – however, there were no human remains (Peška 2013b; Růžičková 2009). This final grave or cenotaph could be symbolic, or it could be a secondary location for a hunter/warrior who died elsewhere, however no matter the reason, the fact remains that some valuable objects are not directly linked to an individual.

The second example comes from Hulín 2, though unfortunately none of the skeletal remains were available for this study. This site is worth a quick mention because of the high number of archery-related graves: 13 out of 45 (presumably, not all graves could be confirmed) (Peška 2013b; Nicolas 2020). These 13 graves, especially those with wristguards, are in a group in the same section of the cemetery. Analyses on potential links, such as familial, would be interesting to explore further. If this physical burial proximity is linked to familial relations, it could be a sign of inheritance and/or a social hierarchy within the community. Interestingly, two burials with a complete male, archer set (wristguard, copper dagger, and arrowheads) were found in the traditionally female position (H54 and H63). Unfortunately additional information on the osteological profile of these two skeletons is not available even though an anthropological analysis would prove invaluable to understanding sex and gender for this small group. In particular, what is the better sex determiner, grave goods or orientation? And does it really matter? Women could have been hunters/warriors/leaders as well, so what determinations are most telling for understanding this particular group? These two burials are an excellent example of the value of collaboration between academic fields in order to better interpret personal identification. One other noteworthy point from this cemetery is that the non-pottery items all seem to be contained in richer burials. Additionally, sometimes the wristguards were found with the interior facing outward, implying that they were placed there by someone else rather than originally located on the individual's forearm (Peška 2013b). This contributes to the previous discussion on wristguard placement because it implies that position is not necessarily an indicator of function (or handedness) because in some cases the wristguard was likely positioned by a third party after death. Most importantly, these are all examples of exceptions to some previous notions on masculine, 'archer' burials. Indeed, the objects are not always linked to an individual and nor are they always masculine. Grave 73 (Hulín 1) provided a context heavily linking the individual to artisanal smith-work, yet this studied classified him as C. So is he both? What would that mean for the societies of Hulín? This further drives forward the conclusion that there is no black-and-white rule for interpreting archers and occupation. Each grave needs to be examined with respect to its own attributes.

However, for both the artisan and social status arguments, they still require a justification for hunting or warfare, either as a practice or as an ideology. Even as an artisan (Hulín 1, grave 73) he or she was still making the objects for some reason. In terms of social status, why was it illustrious to have such items? This study found that at least half of the individuals interred

with an archer's package were likely not specialized archers, so that would mean that the items represent an ideology. But what was the ideal? Was it a hunter or a warrior?

This study supports the theory that warfare was more prominent in Bell Beaker society than hunting, and therefore archery was more often and more likely associated with the warrior ideal. Of course there are no doubt exceptions to this assertion, but warfare seems to be the most plausible option. Admittedly, in terms of evidence this is also due to the fact that warfare has more indications than hunting. Hunting is demonstrated by analyzing diet and finding animal bones. Warfare is a deeply embedded consequence of society such that the mere presence of a settlement or territory indicates the potential for conflict. Conflict naturally enters common life especially as populations began to acquire 'things' and 'territory' that require defending. For these reasons, the presence of warfare can be witnessed in many forms. Of course, these simple facts are yet another reason why it was probably more at the forefront of Bell Beaker life than hunting. This is true even just in the simple consequences of the actions – one cannot compare failing or succeeding in hunting⁸ with failing or succeeding in war because one is literally a question of life and death. It is natural that one would be more at the center of society than the other. This is also why this study looked at the Neolithic period in general alongside the Bell Beaker period. Daily life, traditions, and activities originate somewhere, therefore it is also important to understand the preceding periods. Perhaps violence was less common during the Bell Beaker period, but then it becomes necessary to understand why some periods, such as the LBK, were seemingly more prone to violence. To that same note, it is also interesting to look at succeeding periods – warfare was undoubtedly a large part of Bronze Age life, so perhaps its origins lie further back in prehistory. Part 1 provides an in-depth look at evidence for Neolithic warfare and its potential links to archery, but the main points are as follows:

- There is overwhelming anthropological evidence for violence throughout the Neolithic, including the presence of 'war layers'. It is true that there is less evidence for violent traumas during the Bell Beaker period, but it does still exist. And even if it were a period of relative peace, this does not mean that warfare was not still a consideration of daily life (as easily identified throughout history and the modern era). Also, violence linked to conflict is evidenced before the Bell Beaker period and after it during the Bronze Age (indeed warfare is unquestionable during the Bronze Age), so assuming it did not disappear for a couple hundred years after the Middle Neolithic just to reappear during the Bronze Age is unlikely. Its continued and unwavering presence, even if just as an idea, means that the presence of concepts like defense or preparation remain highly probable.
- Contemporary warfare and hierarchies are confirmed aspects of life in other parts of the world, such as North Africa and the Levant, both of which are in relative proximity to the European Bell Beaker Culture. A relative lack of evidence (compared to the Middle Neolithic and Bronze Age) for Bell Beaker warfare is therefore not sufficient for declaring its absence.

⁸This point is specific to sedentary Bell Beaker societies. Hunting was not a main part of the economy or diet, which means it was generally not necessary to survive. Agriculture was the main source of food, therefore and unlike with hunter-gatherer societies, a failed hunt likely did not mean starvation.

- The existence of fortifications and hilltop settlements point to the presence of defensive preparation (why else would a group place themselves farther from a water source?).⁹
- Imagery of cave paintings depicting battles provide solid evidence for warfare.¹⁰
- The possible finding of a shield dating to the Globular Amphora Culture would indicate the presence of conflict because there is currently no other interpretation, other than for combat, for personal shields.
- Copper swords, objects uniquely intended for warfare, existed in the Balkans and the Carpathian Basin from the 5th millennium BC.
- As with copper swords, the presence of halberds would also be a sign of warfare (though they are uncommon during the Bell Beaker period).
- If composite bows were already in existence during the Bell Beaker period, it is possible that they were developed for mounted archery. However, none have ever been recovered and evidence for such bows derives primarily from imagery.
- The evolution of arrowheads:
 - The transition from transverse arrowheads to barbed and tanged arrowheads would have required more time and effort to make while having been unnecessary for hunting.
 - As the Neolithic period progressed, arrowheads became more numerous and variable, yet hunting was not a principle part of the economy.
- Warfare is confirmed for the Early Bronze Age in Europe.
- A Neolithic rise in political presence¹¹ (hierarchy?) and population density (as seen during the Neolithic) are two signs identified in ethnoarchaeology as having links to the rise of warfare.
- The rival theory for the function of archery is hunting, for which there is an overall lack of evidence. Three specific points from this study are:
 - There are minimal instances of wild animal bones found in burials and domestic sites.¹²
 - No isotopic evidence has identified wild animals as being a regular part of the diet.
 - The Neolithic is characterized by its agriculture, meaning in most societies, hunting was not an important part of the economy.

Taking this one step further, the primary evidence for hunting identified by this study includes:

- The bow-shaped pendants are made from boar's ivory.¹³
- Cave art often depicts archers in the process of hunting.

⁹ There are fewer recorded sites of Bell Beaker fortifications, but again, they were prominent during the preceding Neolithic periods, as well as during the Bronze Age.

¹⁰ However, many of these images do not have precise dates, though all likely precede the Early Bronze Age.

¹¹ 'Political' refers to the idea of complex social organization, and not the more modern ideas that additionally associate it with policing.

¹² This study originally wanted to control for animal bones as a burial context, but further exploration found that all graves either contained the bones of domesticated animals or the species was not identified.

¹³ However they have also been found carved out of amber, implying that representing the form was perhaps more important than the material.

- Two red deer from the Danish Bell Beaker period were found with arrows embedded in the bone.¹⁴
- The example from the tomb of the ‘widow’ (Italy) where one of the burial items (associated with the male) was a quiver made from stag antler (a sign of symbolic or ritual hunting?).
- The site of Leceia (Portugal) showed evidence for deer and boar hunting as well as the presence of wild horses (Cardoso 2008).

To some of these points, cave paintings support both hunting and warfare theories for archery, however it is important to remember that the dates are not confirmed. Some of these paintings could date to the Mesolithic or Early Neolithic, and hunting was obviously important to hunter-gather societies. The point is that warfare also existed, and it existed throughout the Neolithic (this study is not saying that the Neolithic was the beginning of warfare), including the Bell Beaker period. Secondly, it is important to consider other, contemporary societies. This study is focused on the Bell Beaker period of Central Europe (the Eastern complex), however it is necessary to remember that contemporary and even preceding populations had hierarchies, specialization, and organized warfare (e.g. the Levantine Bronze Age, the Early Dynastic Period and Old Kingdom of Egypt, and evidence from the Varna cemetery). One interesting example from the Near East (Iraq) dates to the middle of the 3rd millennium BC. The Standard of Ur is a painted wooden box dating from about 2500 BC found in a tomb in modern day Iraq (Woolley 1934). The two sides of the box are known as the ‘peace side’ and the ‘war side’ based on their assumed themes (Figure 36). Both sides show a large person, seemingly a leader, and the war side clearly displays chariots pulled by horses and a phalanx of armed individuals. These depictions therefore indicate not only the presence of organized warfare, but also of a social hierarchy with a distinct leader in what is an already established society. It is therefore not unreasonable to assume that such facets of life also existed for the Bell Beaker societies of Central Europe.

While this study finds that warfare themes were more common than hunting, and therefore archery (practice and/or ideology) was most likely associated with warfare and the warrior, it is not correct to disregard completely the presence of hunting. Hunting has existed throughout human history, so there is no reason to say that it did not exist during the Bell Beaker period. What this study is saying, is that in the discussion of prominence and influence on daily life, warfare was likely more important. Therefore the majority of ‘archer’ burials, either as a practice or an ideology, are linked to warfare and the warrior. However, each site and burial should be evaluated according to its own features.

These ideas are also relevant as they relate to the concept of hierarchies. This study has proposed that: 1) grave context does not necessarily indicate an individual’s occupation, 2) stone wristguards are likely symbolic rather than practical, and 3) the ‘archer’ burials are more likely linked to warfare than hunting. The next step in this line of interpretation is to establish exactly what role these individuals might have had in Bell Beaker society and how they might have fit into a culture with some level of social stratification. The first step in responding to this question is establishing the likelihood that Neolithic societies, including

¹⁴This is obvious evidence for hunting, but it is exceptional.



Figure 36: The "war side" of the Standard of Ur, image available from the British Museum, www.britishmuseum.org, list number 121201

specifically Bell Beaker societies, had social hierarchies. Some of the main evidence can be outlined as follows:

- Tombs were not large enough for the entire population, therefore something had to be significant about those interred within them.
- The construction of structures such as tombs and fortifications indicates a level of organization most likely obtained through the presence of a leader.
- Stelae depicting a single person necessarily valorize that individual.
- The inconsistent distribution of grave goods (some people had multiple, rich items while some had nothing at all) demonstrates wealth inequality (e.g. Hulín 1 and 2).
- There are very few copper daggers present in German Bell Beaker cemeteries, often only one per cemetery (similar distributions are recorded for the stone wristguards).
- Female exogamy and patrilineal societies indicate the potential for a hierarchy at least partially based on sex¹⁵ (e.g. the findings at Koszyce, Poland).
- Cave art showing numerous individuals sometimes seems to depict leaders (e.g. Cingle de la Mola Remigia, Spain).
- The presence of specialization could indicate a distribution of labor.
- The presence of child burials could be a sign of familial power or inheritance. Child burials with 'warrior' items disappeared during the Bronze Age, perhaps exhibiting a change in emphasis to 'true and proven' warriors.
- There appears to be a link between 'richer' grave goods and better health (Bentley *et al.* 2012).
- Some domestic sites had a house in the center and obvious evidence of planning, including the construction of fortifications (e.g. Leceia¹⁶).
- There are confirmed hierarchies from the Early Bronze Age, therefore it is possible that they were present beforehand.

¹⁵ This needs to be considered with respect to the fact that prestigious female burials exist.

¹⁶ This example dates to the Bell Beaker period, but to the Western complex.

- Example from this study's trauma data: Ostopovice 19 was a female non-suspected archer with a poorly healed, complete fracture of the femur. Could a poorly healed femur be a sign of a lower social-standing within a community? '...A healed femur shows that someone cared for the injured person, did their hunting and gathering, stayed with them, and offered physical protection and human companionship until the injury could mend. Mead explained that where the law of the jungle – the survival of the fittest – rules, no healed femurs are found. The first sign of civilization is compassion, seen in a healed femur' (from Ira Byock in the book, 'The Best Care Possible: A Physician's Quest to Transform Care Through the End of Life').
- This anthropological study found that non-suspected archers, so those with non-archery (lesser?) grave goods, had more muscular development (a sign of manual labor) than the suspected archers, or those with archery (more prestigious?) grave goods.

As a last example, a study from Cassidy *et al.* (2020) analyzed the DNA of a male skeleton found in the Neolithic passage tomb of Newgrange (Ireland). Results concluded that the individual was a product of first degree incest (his parents were either siblings or parent and child). This individual's burial context in this great tomb marks him as some type of elite, leading to the theory that incest was practiced as a way to ensure a 'pure' bloodline. This practice has been well-documented throughout history, most notably in ancient Egypt – even the famous Cleopatra VII was married to her brother. Two other interesting findings from this study were that the people buried in tombs, such as at Newgrange, had a diet rich in meat, and that a genetic link between several individuals within and between tombs (some as far away as 150 km) indicates a non-random selection of partners. All of this, combined with the fact that tombs become increasingly more extravagant with time, provides strong evidence for a hierarchical society. Additionally, the individuals in this study are from the late 4th and early 3rd millennium BC, which predates the Bell Beaker period in Central Europe. This means that an organized, symbolic (because of the elaborate tombs) hierarchy existed before, as well as contemporary to, the period in question for this study.

The final aspect of this discussion seeks to consider all of this in perspective to Bell Beaker society. The findings of this study therefore indicate that 'archer' burials:

1. Contained both likely and unlikely specialized archers
2. Were prestigious within a community
3. Contained symbolic and sometimes specialized objects
4. Were most likely, and most commonly, linked to warfare
5. Existed during a time with social hierarchies

What can this contribute to the understanding of Bell Beaker society, and specifically the role archers and archery within it?

For both the likely and the unlikely specialized archers, their contexts all reflect his and her individual prominence or position within the given communities. When considered in terms of warfare and burial prestige, it becomes highly possible that these individuals maintained some level of elevated social role, such as a leadership position. The interpretation diagram therefore looks like this (Figure 37):



Figure 37: Diagram for interpreting the possible link between warfare and elevated social positions within a Bell Beaker community

Following the findings and interpretations of this study, the concept of warfare and warriors (archery and archers) is directly linked to an elevated social role. The implication is therefore that an individual's ties to battle, either practically as a warrior or symbolically, were desirable attributes in at least some Bell Beaker societies of the Eastern complex. If the 'archers' were practical, then they and their communities took pride in the occupation. If they were more symbolic archers, then they took pride in their links or commitment to warriorhood and warrior culture. Child burials and the wear¹⁷ on stone wristguards could then be a sign that these roles were inherited and passed throughout the community – a community that respected the position enough to provide such elaborate grave contexts as well as cenotaphs.

¹⁷ A reminder that the 'wear' on stone wristguards indicates that they were probably worn by an individual throughout his or her life (signs of use around the drill holes), and not that they show signs of archery activity (surfaces are fresh).

All of this puts into perspective what life might have been like living within a socially stratified Bell Beaker society. There was possibly a more working class, as witnessed in the greater EC development of the non-suspected archers (i.e. those with a non-archer burial context). Then there was likely a higher-ranking class or classes whose primary responsibilities remain unknown, but whose material goods denote a life dedicated to warfare and archery, either as a practice or as an ideal, and who received respect and commitment from their communities.

A note on sex and sexism in archaeology

One of the reasons that identifying specialized archery in Bell Beaker burials is so significant to Neolithic archaeology is because archaeological interpretations often require additional analyses from outside fields. Many areas of research, archaeology and anthropology included, often like to create classifications for each culture and society that can sometimes leave little room for exceptions and outside interpretations. In terms of this study, that is a huge problem when considering questions of warfare, occupation, and sex. Bell Beaker sites are classified according to pottery – if a site does not have this pottery, then it is not Bell Beaker. Likewise, warriors must have a particular grave context, otherwise he or she was not a warrior. Much work from archaeology, anthropology, and ethnology has argued that 1) women would not have been warriors, and 2) ‘archer’ burials were warriors; but then this all becomes problematic when excavations uncover female ‘archer’ burials. So which is it? Are females not warriors or are ‘archer’ burials something else? And why does it have to be one or the other, with no room for nuance? This is problematic because trends are not rules, and each site and individual needs to be analyzed according to its own attributes in order to avoid sweeping generalizations, particularly those that fail to distinguish between sex and gender. Just as this study found that an archery context does not always imply archer, ‘masculine’ objects do not always imply male. In fact, in her PhD dissertation, Belard (2014) concluded that people were more often interred based on their social standing than on their sex or gender.

For these reasons, collaboration between fields, specifically anthropology and archaeology, remains vital to interpreting these contexts. Just as differentiating between sex and gender has entered modern conversation, it should also be at the forefront of modern research interpretations of past populations. For research archaeology projects dealing with human remains, osteological analyses are necessary for determining biological sex, rather than relying solely on archaeological context and preconceived notions of male and female burial identity. As anthropological research continues to develop, and as this study has shown, it can also help provide assessments of occupation and specialization, and such analyses can contribute to archaeological interpretations of social position and community identity. The essence of this argument is that the research needs to continue moving beyond the paradigms – dagger presence does not equal man just like archery equipment does not equal archer. This also acts as another example for the value of individual analyses in addition to population analyses because they allow for specific identifications rather than sexist generalizations based on what women ‘would likely’ have been doing. Some ethnoarchaeological findings, comparisons with societies throughout history and the modern era, and even several examples cited in this dissertation suggest that a majority of warriors and leaders are men. However, just like everything else, this is not a black-and-white rule and treating it as such does a disservice to the women, past and present, who have helped shape the modern world. Here are a few examples from this study alone proving that the situation is not so simple:

- Ethnoarchaeological findings from the Americas showing that women were not only warriors, but also sometimes war chiefs (Holliman 2001; Koehler 1997; Thorpe 2003)
- 18% of female Bell Beaker burials had a copper dagger and 10% had a stone wristguard (Müller 2001)
- The LBK site from Halberstadt (Germany) with the likely burial of a small band of warriors, one of whom was female (Meyer *et al.* 2018)
- Sites of likely massacres, such as at Schöneck-Kilianstädten (Germany) and El Trocs (Spain), have young children and adults over the age of 30 but no teens or younger adults. This includes males and females. One theory¹⁸ for this is because they were warriors away from the settlement
- The cave painting of El Cingle de la Mola Remigia, which clearly depicts a battle scene, and possibly a female warrior¹⁹
- With regard to conceptions of leadership, the presence of prestigious female burials (e.g. Hulín 1 grave 86 and Tišice 77/99) demonstrates that even this was not exclusive to men
- A female burial from Durankulak, the Bulgarian Copper Age, contained a flint ‘super-blade’ (sword?) likely measuring more than 30 cm, which was also the largest in the cemetery (Gurova 2013; Stratton 2016)

The point of all of this is not to say that women were just as likely as men to be warriors, because that is obviously not true. Much more evidence exists for mostly male warriors as well as for a patriarchy. The point is to say that modern research would do well to make habitual distinctions between sex and gender a regular part of each interpretation. Specifically, over-simplified black-and-white classifications can sometimes be detrimental to the understanding of past populations. While there is a need to define societies and cultures at the population level, thus necessitating some level of generalization, this should not be done at the expense of the individual. Individuals as well as cultures deserve thorough examinations based on their own unique attributes. This is why one important finding from this research is that analyses at the individual level are just as crucial as those at the population level.

Closing remarks

This project gathered archaeological evidence for Neolithic warfare in general and the Bell Beaker period in particular in order to contextualize it with prehistoric concepts of specialization, social stratification, and recent anthropological analyses. Overall, this archaeological perspective situates the anthropological findings for suspected archers into a broader population with a complex social structure. The results and interpretations drawn from Parts 1 and 2 have a direct impact on understanding the placement of ‘archer’ burials in a socially stratified society. Delving into the temporal and physical context of the collections allowed for a detailed look at warfare and archery as well as social hierarchies and specialization. This permitted the contextualization of the anthropological results as they apply to the global understanding of Bell Beaker populations.

¹⁸ Part 1 discusses other theories.

¹⁹ The vast majority of cave paintings appear to depict men only, however this does not make it permissible to dismiss those of women.

The anthropological study yielded both differences and similarities between the suspected and non-suspected archers indicating that they were indeed part of the same population, but there was also a likely labor differentiation between the two groups. This therefore draws a direct parallel between grave context and labor. Additionally, evaluations at the individual level assessed the likelihood of a person having been a specialized archer. This was primarily possible based on the reorganization of observations according to the biomechanics profile. Secondary hypothesis tests provided support for the final results, concluding that some suspected archers were likely specialized archers, and some were not. This is important because it indicates that there is no link between a Bell Beaker archery occupation and the burial context, a point that is further emphasized by the consistently diverse skeletal morphology profiles for the non-suspected archers.

Considering the anthropological findings alongside the archaeological contexts, the two perspectives work together to contribute five primary conclusions concerning 'archer' burials and Bell Beaker life. Firstly, stone wristguards tended to have a social or symbolic function rather than a practical function. This is in agreement with several other studies cited throughout this work. Secondly, hierarchies existed both within Bell Beaker society as well as in contemporary societies, and other studies have also proven this social construct in preceding cultures. Thirdly, archery was important to the groups that exhibit it in their material cultures, and this remains true despite whether or not the 'archer' burials were practical or symbolic. Fourthly, warfare was a more prominent part of daily life than hunting, meaning that the majority of archery contexts were in reference to warriors and warfare. And lastly, the 'archer' burials, especially those with stone wristguards and daggers, were prestigious – signifying that they represent higher-ranking individuals, either economically, socially, or both, within their given societies. These findings then contribute to the broader archaeological implication of this study, which is that many high positions in Bell Beaker hierarchies have a relationship with archery, and by extension warfare and warriorhood. This result is important because it implies a direct association between the socially prominent, perhaps leaders, of many communities and warfare. However, because Ryan-Despraz (2021) found no direct link between context and occupation, it is essential to emphasize the necessity of studying each site and individual according to its own attributes and to avoid sweeping generalizations. It is true that these Bell Beaker individuals exist within a greater cultural population worthy of examination and contextualization, but these people were also unique individuals whose daily lives are deserving of recognition. These results help to acknowledge both of these respects.

The combination of these perspectives helps address questions concerning the potential of anthropological analyses and social identity during the Neolithic period. It is the hope that this work will serve as a reference and means of comparison for future studies seeking to enhance the understanding of prehistoric warfare and Bell Beaker society.

Acknowledgements

This book is the result of a PhD research project, therefore the author would like to thank the Swiss National Science Foundation, grant [Doc.CH](#) number P0GEP1_175169/1, and the University of Geneva's Laboratory of prehistoric archaeology and anthropology for funding this research, with an additional thanks to project supervisors Prof. Marie Besse, Dr. Jocelyne Desideri, and Dr. Sébastien Villotte. The anthropological analyses were made possible through the kind collaboration of colleagues Dr. Karin Wiltschke-Schrotta and the Natural History Museum of Vienna (Austria), Dr. Petr Velemínský and the Prague National Museum, Dr. Zdeněk Tvrdý and the Anthropos Institute of the Moravian Museum, and Dr. Mike Schweissing, Dr. George McGlynn, and the Bavarian State Collection of Anthropology and Palaeoanatomy. Last but certainly not least, the author is grateful to Lisa Ryan for providing the cover art.

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Practice and Prestige: An Exploration of Neolithic Warfare, Bell Beaker Archery, and Social Stratification from an Anthropological Perspective investigates the appearance of the 'archer's package' in select Bell Beaker burials raising questions of daily life, warfare, and social stratification during the Neolithic period. It draws on a recent study by the author that applied an anthropological methodology to assess the bone morphology of these skeletons for signs of specialised archery activity. These analyses revealed results at both a population as well as an individual level. In order to contextualise these osteological findings, the book explores the evidence for warfare and archery throughout the Neolithic period in general and the Bell Beaker period in particular. This perspective considers warfare to be a primary function of archery, thereby associating 'archer' burials with concepts of warfare and the warrior. A second perspective delves into prehistoric concepts of specialisation and social hierarchy in order to situate archers, archery, and warfare within potentially stratified populations. These two perspectives allow for the contextualisation of the anthropological results within a broad archaeological framework in which archers and archery were prominent parts of a complex Bell Beaker society.

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ISBN 978-1-80327-052-4



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