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Introduction

This dissertation's research questions are:

1. Does the Anatolian hypothesis or the Steppe hypothesis better explain the spread of Indo-European languages into Europe?
2. To what extent can multi-disciplinary approaches aid archaeologists' understandings of the past?
3. What is the impact of multi-disciplinary approaches on theoretical archaeology?

Increasingly capable biomolecular, computational and linguistic methodologies have had a profound impact upon both archaeological thought and Indo-European studies (Kristiansen et al 2017; Kristiansen, 2014a), making now an apt time for this research.

To answer the first research question; a primer on Indo-European studies is given in Chapter I; whilst Chapters III and IV tackle the Anatolian and Steppe hypotheses respectively. Special attention is given to the origins of the Celtic subfamily, this is because the debate between the Anatolian and Steppe hypotheses is considered one of the biggest disagreements in scholarly understandings of Celtic origins (Cunliffe, 2013a).

To answer the second and third research questions, the Anatolian and Steppe hypotheses are considered from a multi-disciplinary perspective. Furthermore, Chapters II and V deal with theoretical archaeology; Chapter II outlining the theoretical context of this dissertation; and Chapter V making theoretical considerations for the academic discipline of archaeology as a whole.

Chapter I – An Introduction to Indo-European Studies

The term 'Indo-European' primarily refers to the Indo-European language family (Campanile, 1998: 1; Anthony, 2007: 5) (see appendix I for a list of Indo-European languages). Similarities between the Indo-European languages are usually attributed to there having been an earlier, preliterate, shared, progenitor language which is referred to as Proto-Indo-European (Beekes, 2011: 4; Renfrew, 1989: 35; cf Trubetzkoy, 1939; cf Robb, 1991, 1993; cf Demoule, 2016) (see figure 1). Proto-Indo-European would have been spoken in a much smaller area than the Indo-European languages are spoken in today or were spoken in immediately prior to the age of European conquest (Mallory, 1996: 22-23).

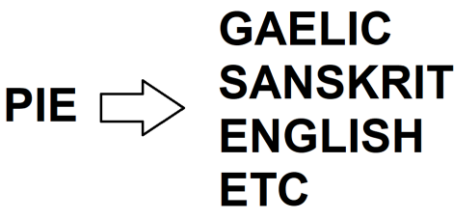

Figure 1 – All Indo-European languages stem from Proto-Indo-European.

For centuries, scholars have attempted to explain and understand the processes through which Indo-European languages became so widespread (Clackson, 2011: 15-16; Anthony, 2007: 6-11). The matter has been treated as an archaeological one, with definitions of 'Indo-European' and 'Proto-Indo-European' being expanded to refer to culture and institutions with origins in the period whence Proto-Indo-European was spoken (Anthony, 2007: 6-11; Kristiansen, 2005: 694). This is because those cultures and institutions may be considered archaeological expressions of the Indo-European-speaking communities (Anthony, 2007: 306-307). The use of such an expanded definition is controversial due to connotations with Third Reich propaganda, itself the culmination of many decades of often sinister, race-related research (Okholm Skaarup, 2017). There is however a need for objectivity; connotations do not 'make a theory right or wrong' (Nielsen Whitehead, 2017: 6).

The term 'Indo-European studies' refers to an academic discipline which is concerned with a wide variety of matters relevant to Indo-European languages and its speakers in (pre)historical times (Scott Littleton, 1973: 117-118). Indo-European studies is an inherently multi-disciplinary field, containing for example linguistic, philological and archaeological approaches (Jones-Bley, 2009: 9). Indo-European archaeology is largely concerned with the process by which Indo-European languages became so widespread (Mallory, 1996). Far from being an

academic anachronism, as some have implied (Olender, 2017: see in context of its preceding chapters), Indo-European studies is a vibrant field of research.

One domain of Indo-European studies involves reconstructing the Proto-Indo-European language. When a phonetical similarity between words from numerous Indo-European languages with the same meaning is found, it can be attributed to an earlier Proto-Indo-European progenitor word (Mallory & Adams, 2006: 39-45). Attempts are made to reconstruct Proto-Indo-European with phonetical accuracy, though disagreements occur here (ibid: 45-50). Despite a Proto-Indo-European revival movement, modern poetry written in, and translations into reconstructed Proto-Indo-European (ibid: 45; Quiles & López-Menchero, 2017: 9, appendix 1), reconstructed Proto-Indo-European is at most an approximation of what was actually spoken in prehistory (Mallory & Adams, 2006: 50-53). For the purposes of this dissertation, uncertainty surrounding the correct pronunciations of reconstructed Proto-Indo-European words is not an issue; awareness of the existence of Proto-Indo-European vocabulary lists is quite adequate. Proto-Indo-European vocabulary gives insight into Proto-Indo-European culture and helps to situate the Proto-Indo-European homeland (Mallory, 1996: 110-127, 151-156).

Many hypotheses explaining the spread of Indo-European languages have been proposed, and for several reasons, subsequently discarded (Klejn, 2017). At present there are two main competing hypotheses; the Anatolian hypothesis and the Steppe hypothesis (Mallory & Adams, 2006: 460-462; Klejn, 2017: 441-443) (see figure 2). The Anatolian hypothesis proposes that Proto-Indo-European originated in Anatolia and spread outwards from c.7000 BC, reaching Europe through accompaniment with the diffusion of agriculture (Renfrew, 1989: 145-177; Mallory, 1997: 109-111). The Steppe hypothesis proposes that Proto-Indo-European originated in the Pontic-Caspian steppe, an area of the more expansive Eurasian steppe, and that the language subsequently spread outwards from c.4500 BC (Mallory, 1997: 112-113).

Figure 2 – Current spread of Indo-European languages shown in green. Location of the two major hypothetical Indo-European homelands also marked (from Novembre 2015: figure 1).

Chapter II – Theoretical context

In so far that this dissertation is evidence-based and tests hypotheses, it may be considered as belonging to the Processual genre of archaeology (Johnson, 2010: 38-42). That said, no conscious effort was made to tailor this dissertation into the Processual school, and it is largely un-Processual. One reason for being un-Processual is that a highly eclectic and multi-disciplinary approach is favoured. Given the multi-disciplinary character of Indo-European studies (Scott Littleton, 1973: 117-118), such an approach is necessary. The eclectic, multi-disciplinary approach of this dissertation allows for liberal inclusion of linguistic and biomolecular research, though at the core, an archaeological sensibility is firmly held.

This eclectic approach was inspired by Manuel Fernández-Götz' (2014: 3) stance of 'pluralism of ideas, open, honest debate' and anti-dogmatic, anti-sectarian criticism. Fernández-Götz' stance was in turn inspired by John Collis' belief that 'there should be no politically correct approach' (Collis, 1997: 300, cited by Fernández-Götz, 2014: 3). Ironically, Collis holds something of a disdain for Indo-European and Celtic archaeology (Collis, 2009; Jones-Bley, 2009). This reveals that Collis considers certain approaches, which are legitimate to many other scholars, as politically incorrect, or at least academically problematic. Whilst this dissertation opposes Collis' condemnation of Indo-European and Celtic studies, it respects his right to formulate and hold such beliefs. Such respect stems from a spirit of pluralism and relativism (Johnson, 2010: 212-215, 231-233). The evidence-based approach held by this dissertation does however prevent such relativism from being absolute (ibid: 212-215, 231-233; Trigger, 2006: 529-531).

As stated in Chapter I, Indo-European studies has an unfortunate history of nationalistic manipulation (Okholm Skaarup, 2017). On the other end of the political spectrum, it has been argued that archaeologists should use genetics to promote modern-day diversity and multiculturalism (Müller, 2013). All forms of politicisation of the past are here rejected. This dissertation is non-political and politically indifferent. This non-political stance is aided by the evidence-based approach. It should be noted that the spread of Indo-European languages into Asia are not addressed here. This Eurocentric approach stems from a practical decision to limit the scope of research.

This dissertation draws liberally upon the culture-historical school of archaeological thought. The culture-historical approach offers methods in addressing spatio-temporal similarities and interconnections in material culture (Roberts & Vander Linden, 2011: 3). Despite widespread criticism, it continues to be widely used and has merits if used carefully (ibid: 2). The flawed nature of the culture-historical school of thought is not only acknowledged here, but is elaborated in more detail in Chapter IV, in which geneticists' use of the culture-historical

approach is examined. Kossinna's style (1911: 3) of culture-history rigidly synonymised culture, ethnicity and language (Veit, 1989, cited in Roberts & Vander Linden 2011). Such an approach is here rejected, however rigid denial of any such correlations are considered 'equally perverse' (Mallory, 1996: 164) because such correlations may in some cases be true (Mallory, 1996: 164, 1997: 106; Jones-Bley, 2009: 8-9; Clarke, 1978: 302-5; Cavalli-Sforza, 2000: 150, 167; Kohl, 2007: 234). Extensive use of a framework which might be considered overly culture-historical, or Kossinna-esque, by certain thinkers, is here justified as a means of searching for archaeological contexts of verified, preliterate, linguistic processes.

Joint historical-linguistic/biomolecular research conducted on Caucasian and European languages/populations has found the connection between language and genetics to be stronger than the connection between geography and genetics (Balanovsky et al, 2011, 2013). This can be attributed to the fact that humans' potential mating partners are usually limited to those who one can easily communicate (Cavalli-Sforza, 2000: 167; Kohl, 2007: 234). These findings are interesting considered in light of Kristiansen's (2014b) proposal that during the bronze age, European ethnic identities became increasingly prevalent, due to cultural-linguistic differentiation and intensified societal hierarchy, tied to corresponding increases in resource- and knowledge-motivated travel. Renfrew (2008: 157-159) sees the 'the rise of ethnicity' as occurring even earlier; in the Neolithic. He proposes that European sedentism and monument building lead to the strengthening of group affiliations; 'the very emergence of ethnicities where previously there were only more localised affinities' (ibid: 158).

Chapter III – The Anatolian Hypothesis

Figure 3: The Anatolian peninsula is marked in red (after Google maps).

An Anatolian homeland for the Indo-European languages was proposed in 1927 by A. H. Sayce (1927), on the basis that artefacts from the Hittite empire revealed it to be the earliest literate Indo-European society. Though Hittite languages remain the earliest attested Indo-European languages (Renfrew, 2017: 436), Sayce's proposal of Anatolia as the Indo-European homeland did not have much other archaeological support and was linguistically flawed (Renfrew, 1989: 35, 48). Though once an advocate of the Steppe hypothesis (Childe, 1926: 183-284), Gordon Childe later came to suggest an Anatolian homeland, albeit somewhat hesitantly (Childe, 1950, cited by Renfrew, 1989: 16, 39, 292). Beyond a shared location, Renfrew's Anatolian hypothesis, which is the prevalent one, shares little with these earlier proposals.

Renfrew (1989: 264, 271-272), whilst acknowledging that archaeologists can only hypothesise about prehistoric language spread, proposed that languages frequently spread in correlation with processes which are archaeologically visible. Renfrew (1989: 120-144) has explained numerous such processes but favours the 'Wave of Advance' model in his explanation of the spread of Indo-European into Europe. 'Wave of Advance' refers to 'an explicit mathematical model, drawn from the statistics of genetics' (ibid: 129). The model was originally created by Ammermann and Cavalli-Sforza (1971) to explain the spread of agriculture into Europe from the Near East. Renfrew's Anatolian hypothesis holds that Indo-European languages accompanied this spread (Renfrew, 1989: 145-177; Mallory, 1997: 109-111). A 'Wave of Advance' is considered 'diffusion' rather than 'colonisation' because the former is slow, continuous, random in direction and need not be linked to any coherent group of people (Renfrew, 1989: 126). The model proposed that advances occurred at a rate of one kilometre

annually (ibid: 126-131). Renfrew (1989: 129), pointing out that humans need not conform to mathematical assumptions, viewed this rate as a helpful average. Renfrew's Anatolian hypothesis is paradigmatically pleasing to many, because it stems from the still-prevalent, 'immobilist' (and therefore parochial) theoretical context (Mallory, 1996: 166-167; Jones-Bley 2009: 12-13; Hakenbeck, 2008). It essentially 'kills two birds with one stone'; explaining maximal phenomena (agriculture and Indo-European languages) with minimal migration (a single process of diffusion).

The major strength of the Anatolian hypothesis is that the spread of agriculture from Anatolia into Europe is widely supported by evidence, and is even treated as fact (Scarre, 2013: 396). The directionless diffusion of the 'Wave of Advance' model is not supported; two main strands spreading through Europe are archaeologically demonstrable; a Mediterranean spread and a central European spread (ibid) (see figure 4). Farmers will have moved into areas on account of the land, rather than by chance (Thomas, 2015; Pereltsvaig & Lewis, 2015: 141). Rather than the consistent rate of the 'Wave of Advance' model, Neolithic advancement occurred in periods of flux and stasis (Thomas, 2015). This is probably because farmers would not have moved into areas of which they had no knowledge, hence interactions between farmers and foragers prior to areas being colonised and agriculturalized (ibid). Though it is unclear from which area of Anatolia these farmers came, their migration into Europe is perhaps most evident from biomolecular findings, which have clearly indicated that the spread was one of populations, rather than of culture alone (Whittle, 2015: 1052; Haak et al, 2010; Omrak et al, 2016). Despite cultural diversity in Neolithic Europe (see figure 4), the early European farmers were genetically largely homogenous, showing high levels of Near Eastern ancestry not present in Mesolithic populations of Europe (Haak et al, 2015; Anthony & Brown, 2017). The Anatolian hypothesis argues for linguistic homogeneity, except in small-pockets such as Etruria and the Basque country, whose non-Indo-European languages it considers Mesolithic remnants (Renfrew, 1989: 145, 151, 238). The Anatolian hypothesis argues that over time numerous Indo-European speaking populations became isolated, leading to linguistic divergences from Proto-Indo-European to subfamilies such as Celtic and Germanic (ibid: 99-119).

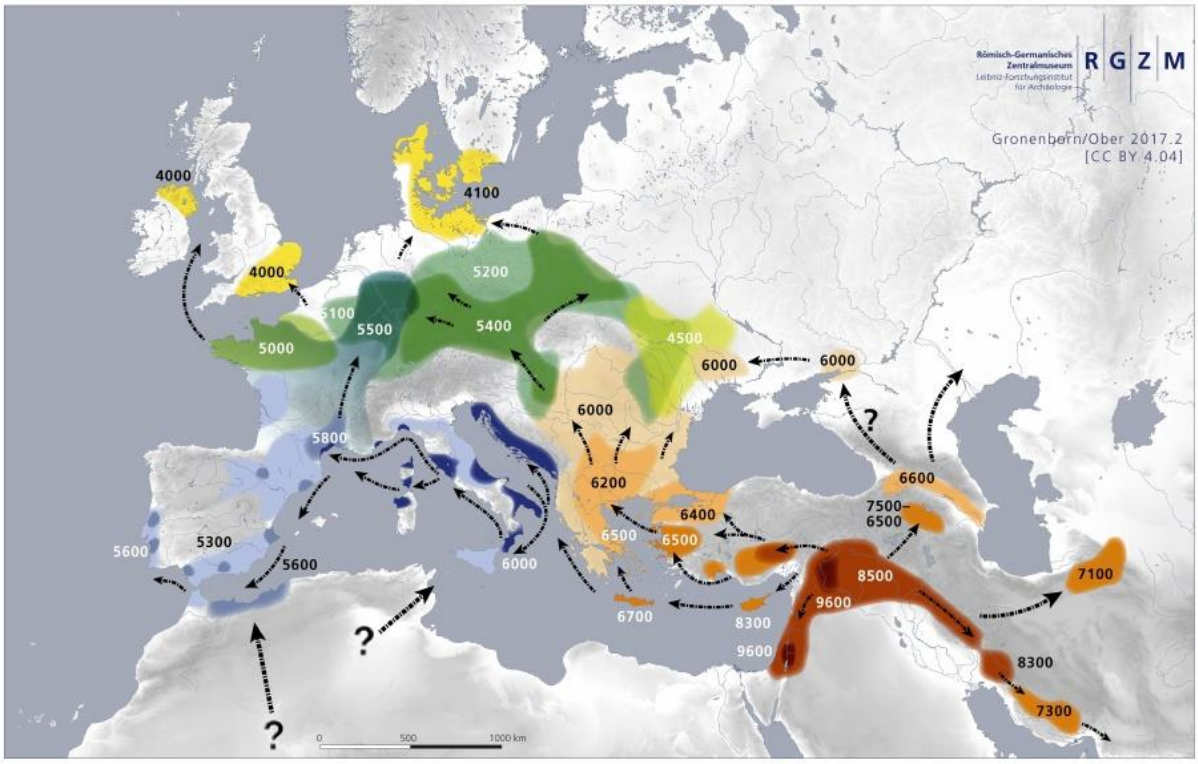

Figure 4 – ‘Expansion of farming in Western Eurasia, 9600-4000 BC’ (from Gronenborn & Ober, 2017: figure 1). Colours indicate regional variations in material culture.

For hundreds of years, scholars have linked the Proto-Celtic language with the central European Hallstatt and La Tène archaeological cultures, which originated c.700 and c.500 BC respectively (Karl, 2010: 39-41; Renfrew, 1989: 212-213, 234-235) (see figure 5). Renfrew (1989: 212-213) sees the linkage between the Celtic language and the Hallstatt culture as being driven by the almost dogmatical, migrationist theoretical framework. He acknowledges that the Hallstatt and La Tène cultures were situated in the centre of what is often held to be the Celtic-speaking world of antiquity but does not see this as relevant to determining the location of Celtic origins (ibid: 232). He argues that the case for Celtic languages having been common east of the Rhine is largely limited to La Tène art finds and place-names which have been tentatively associated with Celtic (ibid: 232). There are far fewer possibly-Celtic ancient place-names east of the Rhine than there are to the west (Cunliffe, 2010: 16-17; Oppenheimer, 2010: 124-125). Classical accounts of the aftermath of the death of Alexander the Great in 323 BC detail an influx of ‘Celts’ into the Hellenic world as a factor in post-Alexander power struggles, and state these ‘Celts’ to have later settled in Galatia, Anatolia (Renfrew, 1989: 223-233). These ‘Celts’ may or may not have been Celtic speakers. Even if they were, the 4rd century BC timing of these events rules out any eastern significance in the origin of Celtic (ibid: 233).

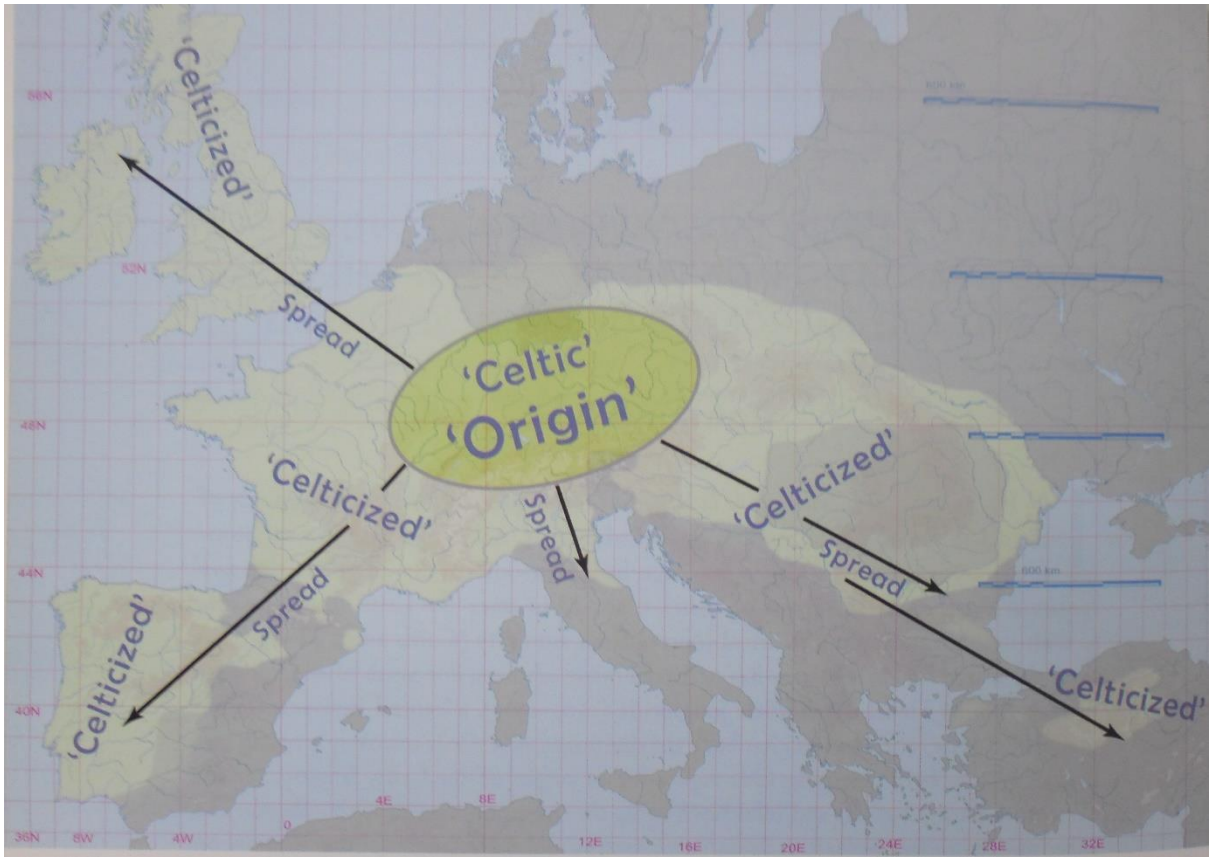

Figure 5 – The origins of Celtic as per the Hallstatt hypothesis (from Karl, 2010: figure 2.1, 40).

Renfrew (1989: 249; 2013) argues that the Celtic languages originated in the same area in which they are historically attested, namely the Atlantic façade. Sharing Christopher Hawkes' (1973) view of 'cumulative Celticity', Renfrew (1989: 246-248) does not favour any specific part of the Atlantic façade as the Proto-Celtic homeland, but rather sees Celtic's linguistic development as having occurred throughout that entire region. Renfrew (1989: 216, 249) argues that Proto-Celtic diverged from the Late-Proto-Indo-European language of the early Neolithic farmers in that area, and has tentatively linked Celtic with the Bell Beaker phenomenon of the late Neolithic, which is detailed in chapter IV. From a purely material perspective, continuity between Europe's first farmers and the Proto-Celts is somewhat tempting, given the similarities between some Neolithic decorative patterns and some later artwork supposed to have been produced by Celtic-speaking people (see appendix II).

During the Neolithic, c.4200 BC, the megalithic Passage Grave tradition originated (Cunliffe, 2013b: 156). The Passage Grave type monuments are defined as 'consisting of a circular tumulus containing a central chamber and an access passage whose walls, built with large stones, are the support of carved art' (Robin, 2009: 325). Structural and artistic similarities are evident between the Passage Graves of Britain, Ireland and the Morbihan region of Brittany

(Cunliffe, 2013b: 160; Sheridan, 2003, 2010: 92-95). Use of colours in Passage Grave art is recognised in Brittany and Orkney (Hensey & Robin, 2012), whilst the carved motifs of the Passage Graves of Ireland and Brittany bear similarities (Cunliffe, 2013b: 160; cf Robin, 2009: 325). Similarities are also evident in Passage Grave-associated artefacts from throughout the Atlantic façade, such as the Breton type pottery found at Achnacreebeag, Argyll, which is the earliest pottery in Britain or Ireland (Sheridan, 2010: 92-95), and carved stone mace-heads, carved bone pins and bone pendants from Ireland and Iberia (Cunliffe, 2013b: 160). Sheridan (2003, 2010: 92-95) considers the Passage Grave tradition of Ireland and Britain as an archaeological manifestation of a distinct, migrationary strand of Neolithisation, originating in Brittany (see figure 6). Cunliffe (2013b: 158-160) states that the same values and belief systems are embodied within Passage Grave structures throughout the Atlantic façade, implying continuous or episodic contact and mobility between geographically disparate communities. Furthermore, Cunliffe (2013b: 246-249) has suggested that Celtic may have developed as a *lingua franca* facilitating these contacts, and that if this was the case, a subsequent period of mobility associated with the Bell Beaker phenomenon, c.2700-c.2400 BC, may have triggered the differentiation of Continental Celtic and Insular Celtic (see figure 7).

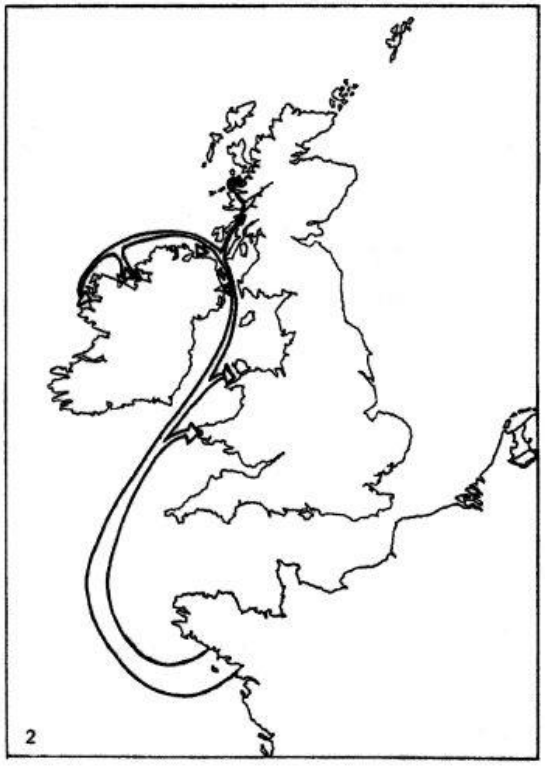

Figure 6 – Sheridan's view of the spread of the Passage Grave tradition (detail from Sheridan, 2010: figure 9.1, 93).

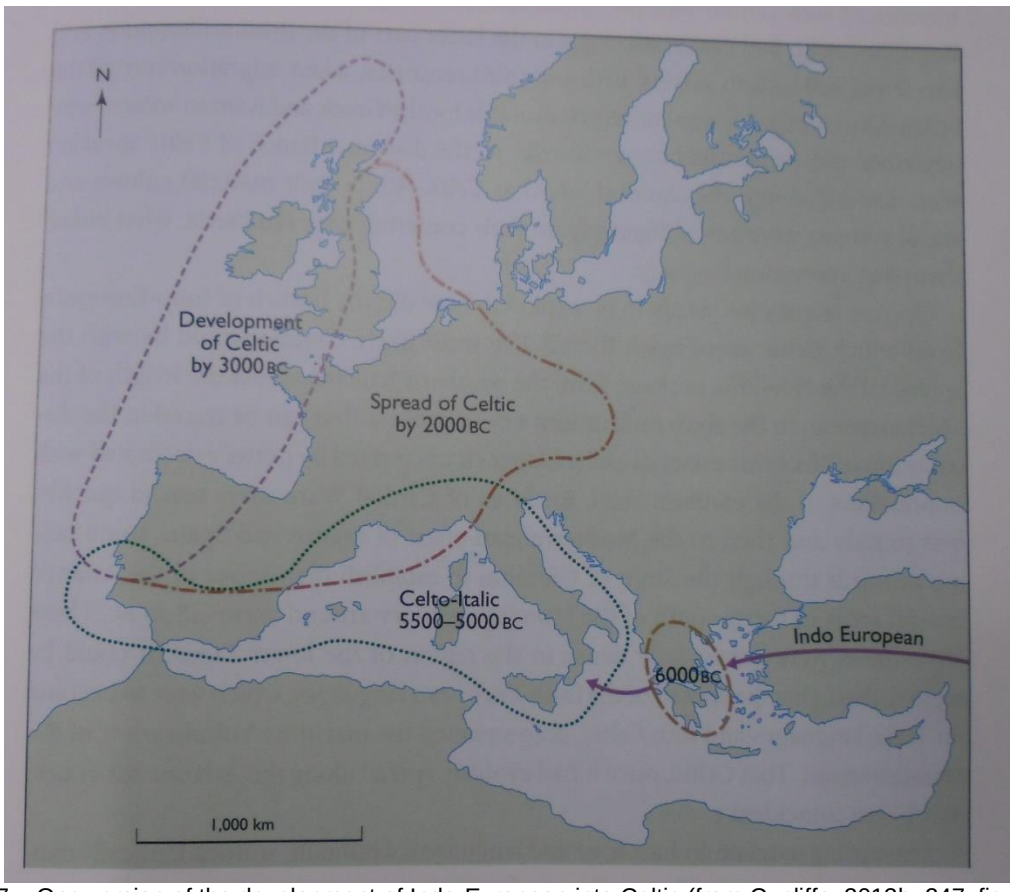

Figure 7 – One version of the development of Indo-European into Celtic (from Cunliffe, 2013b: 247, figure 7.5).

Over the past decade, consensus has moved away from the Hallstatt hypothesis, and Renfrew's idea of Celtic having originated in the Atlantic façade has gained considerable support (Cunliffe & Koch, editors, 2010, 2013, 2016). This is in large part due to the decipherment of the Tartessian language, and its classification as Celtic (Koch, 2013b: 5-6; 2010). Tartessian is known from over 95 inscriptions found in southwest Iberia dating c.800-c.400 BC, many of which are demonstrably 'Indo-European and specifically Celtic' (Koch, 2010: 185, 195; 2013a: 5-6). A contemporary of the Hallstatt culture, Tartessian is the earliest known Celtic language (Koch, 2013b: 5-6; Renfrew, 1989: 212-213). There is a marked absence of Hallstatt material culture in Iberia, which dissuades from views of Celtic originating with the Hallstatt culture (Koch, 2013b: 5-6; Renfrew, 1989: 212-213, 234-235). This change in scholarly consensus does not imply increased support for the view of continuity between Europe's earliest farmers and the earliest Celtic-speakers. As mentioned in this dissertation's introduction, the debate between the Anatolian and Steppe hypotheses is considered one of the biggest disagreements in scholarly understandings of Celtic origins (Cunliffe, 2013a). As will now be shown, there is substantial discrediting research against the Anatolian hypothesis.

Biomolecular studies have not only confirmed the migration of farmers into Europe during the early Neolithic but have also revealed another major European demographic shift, associated with late Neolithic population movements from the Eurasian Steppe, resulting in a view of European prehistory as that shown in figure 8 (Haak et al, 2015; Allentoft et al, 2015). Biomolecular research on living populations has revealed these shifts to be the final major development in the shaping of the modern European genome (Anthony & Brown, 2017: 40). The modern European genome is therefore made up of three genetical groups, representing the Mesolithic Europeans, the early Neolithic incomers and the later Neolithic incomers, though the genetic proportion of these three groups varies in different European populations (Lazaridus et al, 2014; Haak et al 2015) (see figure 9). Though genes need not correlate with language, multi-disciplinary perspectives hold that disciplines differ but ultimately deal with the same 'underlying reality' (Renfrew, 1997: 88). If early Neolithic Europe was Indo-European-speaking, as the Anatolian hypothesis purports, then it is amazing that the Indo-European language withstood these major demographic shifts, unless of course the later incomers were Indo-European speakers also. There are several linguistic reasons to disregard this notion of early Neolithic Europe being Indo-European-speaking.

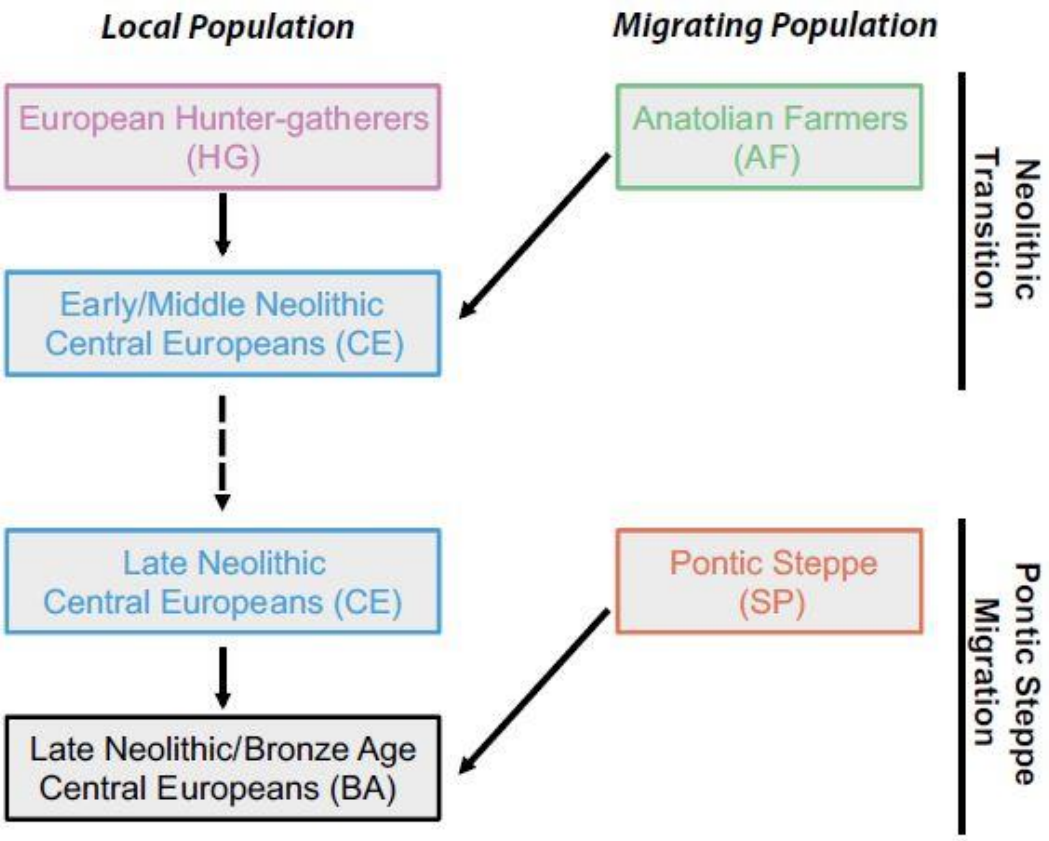

Figure 8 – European population history (from Goldberg et al 2017: 2658, figure 1).

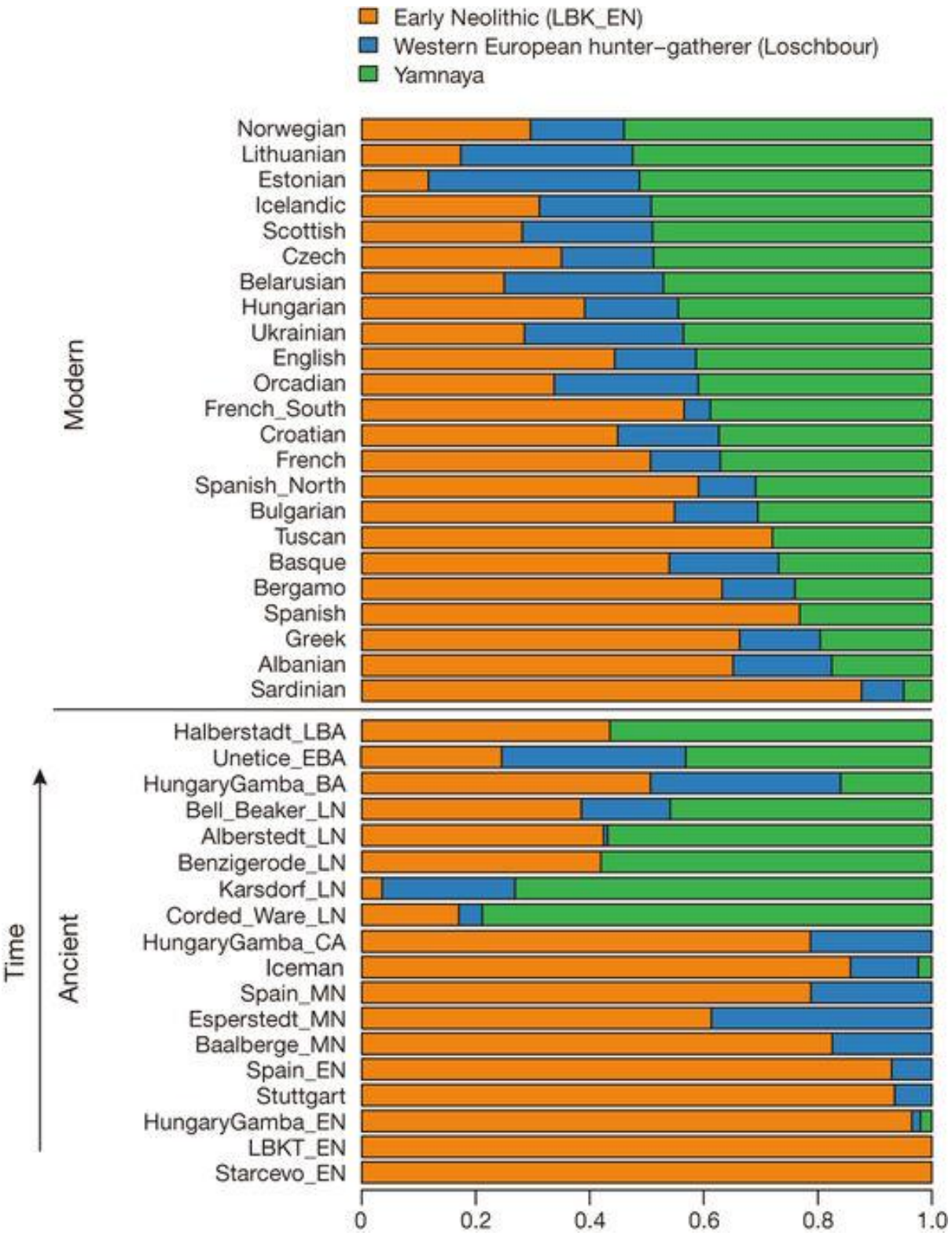

Figure 9 – Levels of admixture in modern national genetic libraries (top) and in ancient DNA samples (bottom) (from Haak et al 2015: 210, figure 3). Note: Yamnaya is an archaeological culture associated with the Steppe.

Just as Proto-Indo-European can be linguistically reconstructed, so can its now-extinct derivative proto-languages. Reconstructed Proto-Germanic, whilst mostly Indo-European, also holds some non-Indo-European linguistic influence (Kroonen, 2012; Iverson & Kroonen, 2017). The overrepresentation of agricultural terminology in this non-Indo-European linguistic substrate denies the idea of the Proto-Indo-Europeans having been deeply agricultural people (Kroonen, 2012; Iverson & Kroonen, 2017). It suggests that Indo-European speakers did not have full knowledge of agricultural crops, and that they learned much about agriculture inside Europe, from pre-existing populations. Agricultural terms cannot have come from hunter-gatherers; therefore, this non-Indo-European substrate is viewed as demonstrating that (at least some of) Europe's first farmers did not speak Indo-European languages.

Terms relating to wagons are contained within reconstructed Proto-Indo-European (Anthony, 2007: 75-82) (see figure 10). Renfrew (1989) dates Proto-Indo-European to c.7000 BC, though wagons are not found in Europe until c.3500 BC (Anthony, 2007: 75-82). If Proto-Indo-European was in existence at 7000 BC, it would be expected that the numerous Indo-European sub-families such as Germanic and Celtic, would have diverged by c.3500 BC (ibid: 75-82). This leaves the linguistic 'wagon' scenario unexplained. Homogenously protracted rates of dialectal change throughout Europe, c.7000-c.3500 BC, are linguistically unrealistic demands, which gain further incredulity when considered against the context of Neolithic Europe's diversity in material culture (ibid: 75-82) (see figure 4). Whilst a Post-Processualist stance would hold that there are no universal laws of culture (Julian, 2015: 1288), ethnography has shown that in undisturbed tribal societies linguistic diversity tends to be greater than material diversity (Anthony, 2017: 75-82). Furthermore, without a high degree of inter-regional verbal interconnectivity, the European continent is simply too large an area for a single language not to change (ibid: 75-82), yet the Indo-European-speaking area extended beyond Europe. In times when land transportation was limited to walking, such interconnectivity would not have been forthcoming. A counter-argument to this is that the words for nouns may be derived from verbs (ibid: 78). To give a modern example of this, there was a term for 'boiling' before the invention of the boiler. The noun 'wheel' (PIE: *kʷékʷlos*) may be derived from the verb 'turn' (PIE: *kʷel*) (ibid: 78). This counter-argument is flawed because there are no fewer than four terms for the verb 'turn' in Proto-Indo-European, and it seems unlikely that each Indo-European branch would derive the term 'wheel' from the same verb for 'turning', when there were also terms which might be translated as 'rotating' or 'revolving' (ibid: 78). Similar arguments can be made about other reconstructed Proto-Indo-European terms (ibid: 59); though the wagon argument is the strongest.

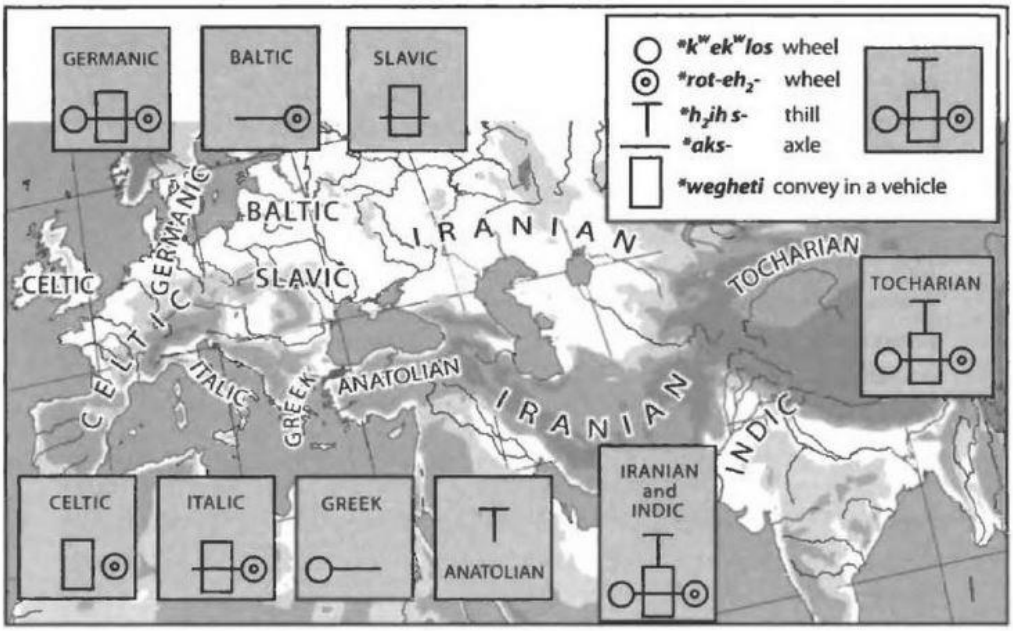

Figure 10 – 'Distribution of PIE terms referring to wheeled vehicles' (from Anthony, 2007: figure 4.2, 64).

Renfrew (1989: 1999; 2001; 2003) acknowledges that his dating of the Proto-Indo-European language, to the 7th millennium BC, is widely considered too early by linguists and archaeologists. He considers such linguists 'too conservative' in their treatment of historical linguistic time scales (Renfrew, 1997: 88), and sees the cooperation of archaeology and linguistics as leading to an unreliable 'circulatory of reasoning' (Renfrew, 1989: 165). He argues that Proto-Indo-European is 'stratified' rather than 'flat', and that the Proto-Indo-European language of Anatolia, c.7000 BC, would have differed greatly from the Proto-Indo-European language of central Europe, c.2000 BC (Renfrew, 1999; 2001). As an example of this, he implies that the dating of a phenotypically European mummified corpse found in the Tarim Basin of China to c.2000 BC provoked the pushing back of the dating of the Tocharian language, which is Indo-European, and first attested c.800 AD (Renfrew, 2003: 331). Renfrew (2001) acknowledges the linguistic wagon scenario explained in the previous paragraph but argues that the wagon-related terms date back no earlier than to a late stage of Proto-Indo-European.

Much to Renfrew's (2017) delight, computational phylogenetic linguistic studies have lent support to the Anatolian hypothesis (Gray & Atkinson, 2003; Bouckaert et al, 2012). These studies have not only dated Proto-Indo-European to a time-scale suitable for the Anatolian hypothesis (Gray & Atkinson, 2003; Bouckaert et al, 2012) but have also geographically placed Proto-Indo-European in Anatolia (Bouckaert et al, 2012). The methodologies of these studies

are however heavily flawed (Pereltsvaig & Lewis, 2015). Pereltsvaig & Lewis's (2015) book primarily responds to the 2012 article by Bouckaert and colleagues. Pereltsvaig and Lewis (2015: 7-8, 55-57) took this focus in order to address fundamental flaws held by certain historical-linguistic paradigm, which the 2012 article is seen as embodying.

Bouckaert's (2012) study compiled a list of words with corresponding translations in 103 Indo-European languages. Several extinct languages were included, but many other extinct languages including Scythian, which has been connected with the Steppe (Giacalone Ramat & Ramat, 1998: 127; Anthony, 2007: 321), were not included (Bouckaert et al, 2012: supplementary materials). A preservation bias therefore skews the results (Pereltsvaig & Lewis, 2015: 124-126). Bouckaert and colleagues (2012) tested for similarities between words from different languages with the same meanings. These kinds of similarities were taken to be the primary signifier for shared origins between languages. Not only does this ignore grammar and phonology, thereby reducing language to merely vocabulary (Pereltsvaig & Lewis, 2015: 69-80), it also fails to distinguish between innovations and retentions, and between similarities caused by shared linguistic ancestry and similarities resultant of borrowing between languages (ibid: 64-69, 80-88). Retentions and borrowings are not relevant when considering the origins of language, and their inclusion further skews the results.

The computational model of Bouackaert and colleague's (2012) study was biased towards movement of language in the form of diffusion; movement which is random in direction and consistent in rate. This bias causes the study to overlook advection; movement in deliberate directions (Pereltsvaig & Lewis, 2015: 139-142). Advection has been shown to be quicker than diffusion, thus its exclusion in Bouckaert's model will have favoured an outcome with exaggerated time depth (Davison et al, 2006; Pereltsvaig & Lewis, 2015: 139-142). Although Bouckaert and colleagues claimed that their geographical model was 'feature-rich' (2012: supplementary materials, 11) to call it geographically simplistic would be to put it lightly. Slope and altitude are not considered by the model (Bouckaert et al, 2012; Pereltsvaig & Lewis, 2015: 140-141). The sole geographical feature of the model is a distinction between land and water, the latter being viewed as an inherent obstacle to transportation (Bouckaert et al, 2012; Pereltsvaig & Lewis, 2015: 140). Water can often aid transportation (Pereltsvaig & Lewis, 2015: 140), and rivers are considered by some archaeologists to have been the 'highways' of the Neolithic and of prehistory (Davison et al, 2006). The flaws listed here are just a sample of the errors which Pereltsvaig & Lewis (2015) expose in the computational phylogenetic 'support' for the Anatolian hypothesis.

Chapter IV – The Steppe Hypothesis

The Steppe hypothesis holds that Proto-Indo-European originated in and spread outwards from 'the grasslands north of the Black and Caspian Seas in what is today Ukraine and southern Russia, also known as the Pontic-Caspian steppes' (Anthony, 2007: 83; Mallory, 1997: 112-113) (see figure 11). This area is enclosed by the Carpathian Mountains to the west, the forest steppe to the north, the Black Sea, Caspian Sea and Caucasian Mountains and to the south, and the Ural Mountains to the east (Cunliffe, 2015: 59). The Steppe hypothesis holds that the spread outwards occurred between the 5th and 3rd millennia BC and links it to equestrian and agro-pastoral societal developments (Mallory, 1997: 112-113). Traditional versions of the Steppe hypothesis consider the spread warlike and male-dominated (Gimbutas, 1997).

Figure 11 – Pontic-Caspian steppe (dark green), contemporary Indo-European-speaking areas in Eurasia (light green) (https://en.wikipedia.org/wiki/Proto-Indo-European_homeland#/media/File:Indo-European_steppe_homeland_map.svg).

Linguistic similarities are demonstrable between Proto-Indo-European, and the Uralic, Semitic, and Caucasian language families (Mallory & Adams, 2006: 81-83). It is uncertain

whether these linguistic similarities were caused by an earlier shared progenitor language or by loanwords (ibid: 81-83). Furthermore, it is uncertain to which stage of the various languages these loanwords may stem (ibid: 81-83). Nonetheless, Proto-Uralic seems to be the closest language group to Proto-Indo-European (ibid: 81-83). As with Proto-Indo-European, the placement of the homelands of these other language families are contentious issues (Anthony, 2007: 93-98). However, given these linguistic similarities, a Proto-Indo-European homeland somewhere between the Caucasus region and the Urals is supported (ibid: 93-98).

As mentioned in Chapter I, reconstructed Proto-Indo-European vocabulary has helped to trace the homeland. Though the cultural vocabulary of Proto-Indo-European does not clearly specify a homeland, the vocabulary does make some geographical areas less likely, and it does offer cultural knowledge which can be checked against the archaeological record of any region suggested (Mallory & Adams, 2006: 449; Mallory, 1996: 183). Reconstructed Proto-Indo-European has fewer terms relating to cold weather than reconstructed Proto-Uralic has, suggesting a comparably more temperate climate (Mallory & Adams, 2006: 130-131). Faunal terms in these two reconstructed languages are suggestive of different kinds of economies. Reconstructed Proto-Uralic has more terms for fish, birds and insects, but fewer for mammals (ibid: 151-152). It is therefore interpreted as the language of hunter-gatherer-fishers (ibid: 151-152). Reconstructed Proto-Indo-European contains terms for domesticated animals including cattle, goat, sheep and possibly horse, suggesting a Neolithic economy (ibid: 151-152). A Neolithic economy is further supported by Proto-Indo-European terms for domesticated plants such as wheat and barley, along with verbs relating to planting, harvesting and processing (ibid: 170-171). The Pontic-Caspian Steppe meets all demands which the vocabulary of reconstructed Proto-Indo-European places upon suggested homelands, and it does so prior to 4000 BC (Mallory, 1996: 183).

It is necessary to point out the impossibility of absolute archaeological evidence for the spread of Proto-Indo-European. Plausible trajectories can however be recognised in the archaeological record (Mallory, 1996: 232; Renfrew, 1989: 264) and such a trajectory follows.

From the early 6th millennium BC, Neolithic peoples from Europe, who had, generations earlier, spread out of Anatolia, spread eastwards, through the Carpathian Mountains (Cunliffe, 2015: 59) (see figure 12). By c.5800 BC, these Neolithic populations had settled in at least 30 sites in the Forest Steppe and had introduced ‘the full range of cultivated plants’, as well as cattle and pigs to the area (Cunliffe, 2015: 59; Anthony, 2007: 143) (see figure 13). The fullness of the Neolithic package, and the rapidity of its appearance, have been taken to indicate population movement rather than cultural diffusion (Cunliffe, 2015: 59). Over the following millennium, Neolithic peoples continued to arrive and to expand further east through

the Forest Steppe (Cunliffe, 2015: 61; Korvin-Piotrovskiy, 2012) (see figure 13). Unlike in the Forest Steppe and in Europe, the Pontic-Caspian Steppe failed to fully absorb the Neolithic economy (Cunliffe, 2015: 61), perhaps due to its more arid climate (Dolukhanov, 2002: 18; cf Bunyatyan, 2003: 269). Grain cultivation did not become common in the Pontic-Caspian Steppe (Cunliffe, 2015: 455), but domestic animals were enthusiastically received. From c.5200, herding was practiced by indigenous non-farmers in the Dniester valley (see figure 13); a practice which spread eastwards reaching the Volga-Ural region c.4700 BC (ibid: 61). The Anatolian hypothesis would see these western Neolithic groups as Indo-European speakers. Due to issues of timing and placement, the Steppe hypothesis does not share that stance (Anthony, 2007: 138, 146-147). Some scholars deem the Proto-Indo-European word for bull, *tawro-s*, to have originated in the Afro-Asiatic language family, and to have entered Proto-Indo-European vocabulary through these contacts with farmer migrants from the west (ibid: 147).

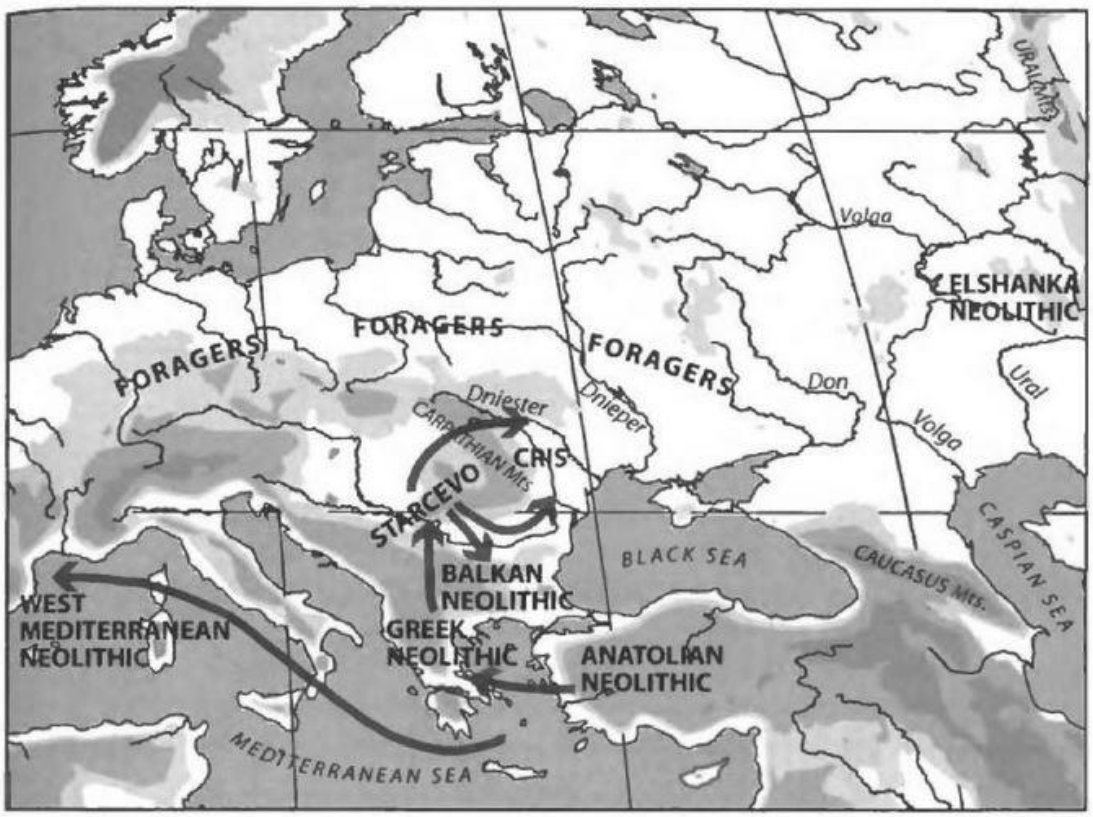

Figure 12 – Early Neolithic population movement into Europe (from Anthony, 2007: figure 8.1, 139).

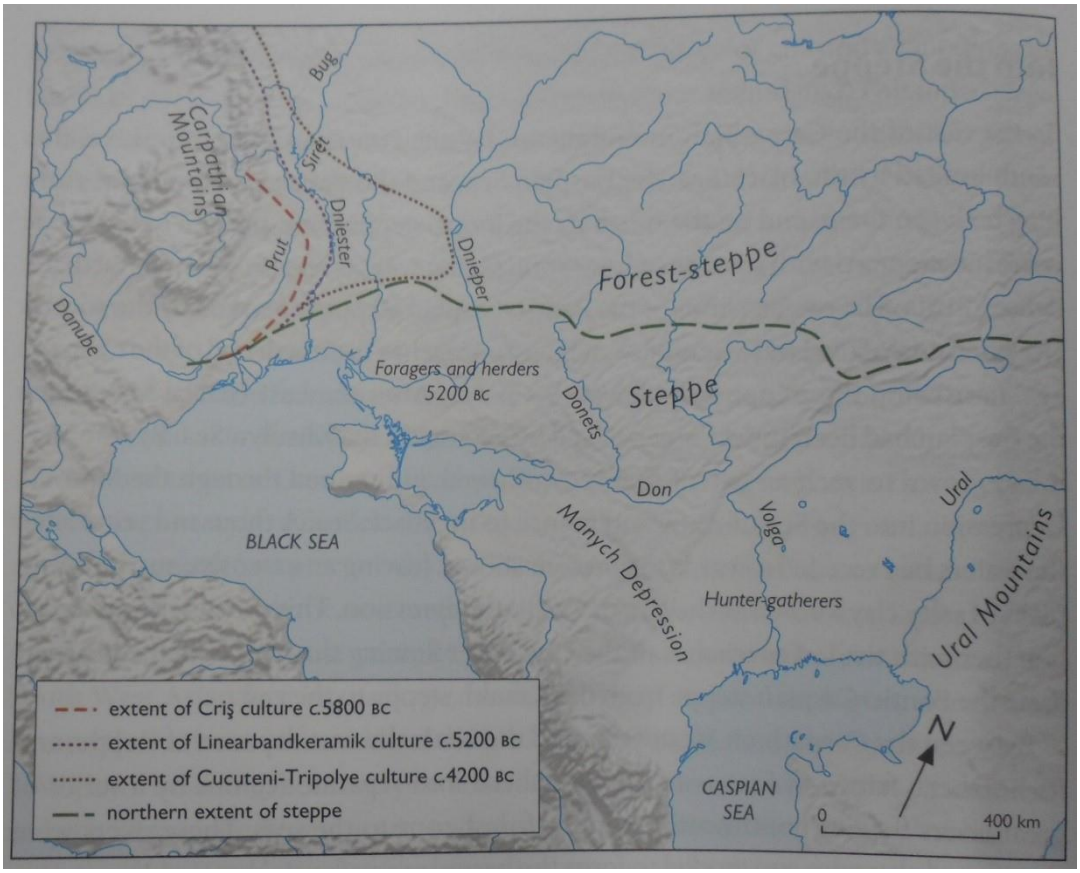

Figure 13 – Early Neolithic population movement into the Steppe (from Cunliffe, 2015: figure 2.13; 60).

Perhaps the most profound impact of the adoption of domesticated animals in the Pontic-Caspian Steppe, was the changing relationship between humans and horses (Cunliffe, 2015: 75-77). Before the native Steppe populations had adopted domesticated animals into their economy, wild horse had featured prominently in their diet (ibid: 75-77). Unlike the domesticated animals, horses coped well in snow and did not need to be fed by humans (ibid: 75-77). Cunliffe (2015: 75-77) considers these factors the motivations for the domestication of the horse in the Pontic-Caspian steppe.

A key site for demonstrating the domestication and subsequent riding of horses is the settlement site of Botai, in the eastern Steppe (Dudd et al, 2003; Anthony & Brown, 2003: Olsen, 2003) (see figure 14). Excavations at the site, which was in use c.3700-c.3000 BC, uncovered ten tons of animal remains (Cunliffe, 2015: 78; Anthony, 2007: 216-220). 99.9% of this were equestrian (Anthony, 2007: 216-220). Several full horse carcasses were found, and these were interpreted as having been domesticated horses kept on site, as wild horses would likely have been butchered where they were killed, to lighten the burden during the journey home (Cunliffe, 2015: 78; Olsen, 2003: 86-87). Some scholars suggest that domesticated horses were being ridden to hunt wild horses (Cunliffe, 2015: 80; Anthony & Brown, 2003: 63).

Tooth wear analysis was conducted on the teeth excavated from Botai. Twenty-six percent of the teeth showed abrasion of the sort caused by bridle bits, attachments used by horse riders (see figure 15), which indicates that around a quarter of the Botai horses were being ridden (Cunliffe, 2015: 79). Archaeological experiments have involved horses being ridden with Chalcolithic style organic bridle bits, and this caused similar dental wear as observed at Botai (Anthony & Brown, 2003: 62-63). The Botai horses are equally sexed and are of varied ages which is suggestive that entire flocks 'were being swept up together for the kill'; something which Cunliffe (2015: 79) deems only possible from horseback. Levine's study of forty-one equestrian thoracic vertebrae from Botai found no signs of riding-related pathologies, however only three vertebrae (T13, T14 & T15) per horse would be prone to such injuries, and the publication did not specify which vertebrae were analysed (Levine, 1999, cited in Anthony & Brown, 2003: 64). Further evidence for horse domestication comes from traces of milk noticed through chemical analysis of residue on pottery (Cunliffe, 2015: 78; cf Dudd et al, 2003).

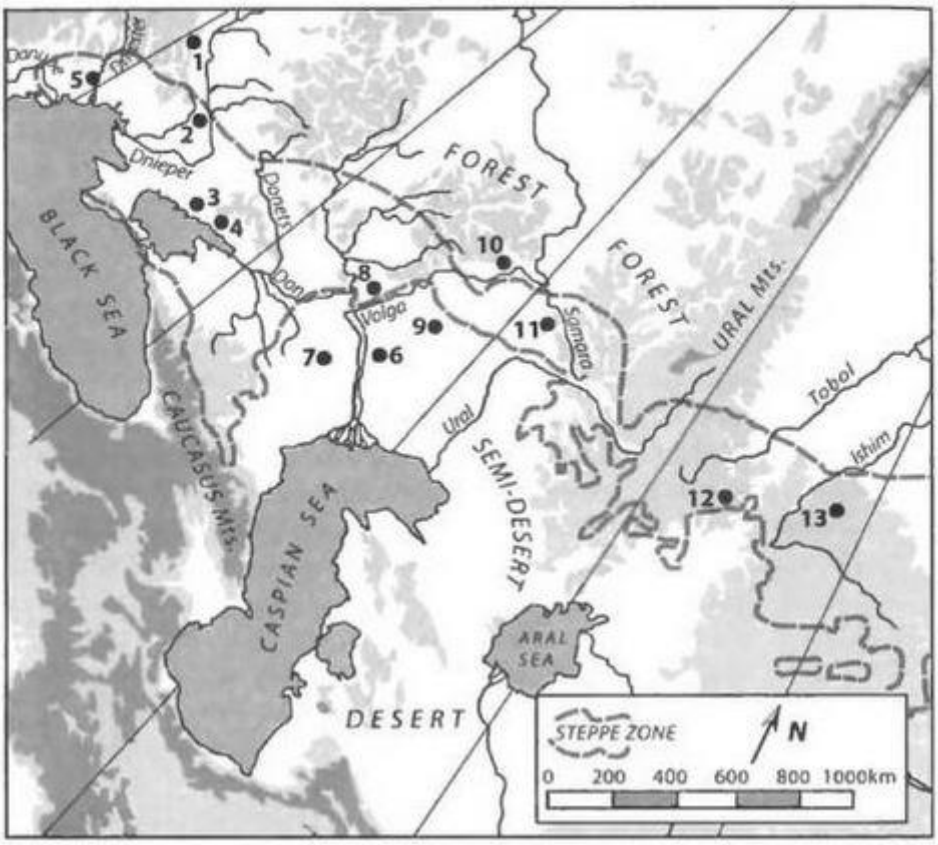

Figure 14 – Prehistoric sites with horse related finds (from Anthony, 2007: figure 10.9, 216). Note increased density in the western Steppe. Botai is site 13.

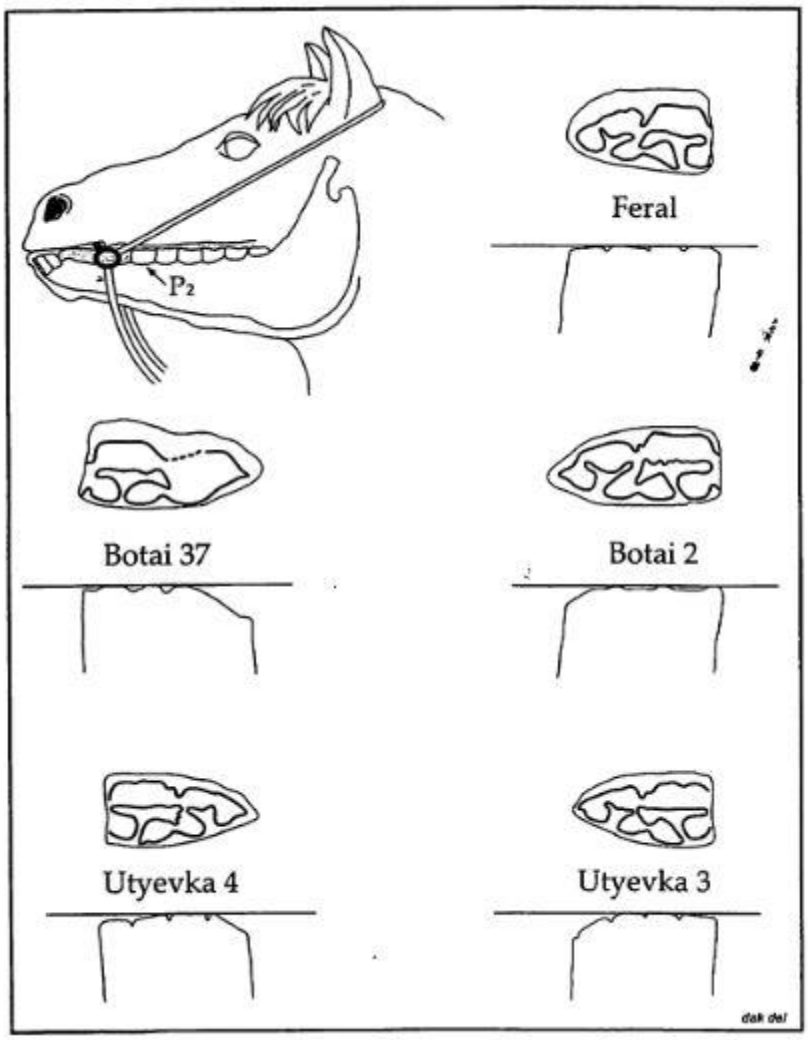

Figure 15 – Dental wear on horse teeth from sites Botai and Utyevka. Lack of wear on the tooth of a feral horse, never bitted (from Anthony & Brown, 2003: figure 5.5, 64).

Whilst Botai demonstrates horse domestication well, it is not always considered the site of the earliest domestication. To the west of Botai, in the Pontic-Caspian steppe, animal domestication occurred earlier, a wider variety of animals were domesticated, and there are more horse-related sites (see figure 14) (Cunliffe, 2015: 79-80; Anthony & Brown, 2003: 65). For these reasons, horse domestication is believed to occurred in the Pontic-Caspian Steppe before it did in the eastern Steppe (Cunliffe, 2015: 79-80; Anthony & Brown, 2003: 65). Domestication of horses would likely have encouraged the innovation of horse-riding as a means of herd management, 'indeed, domestication and riding may have developed concurrently' (Cunliffe, 2015: 79-80). This is however just speculation (Benecke & von den Driesch, 2003), and others have argued that domestication does not indicate riding *per se*, and that there must have been a period of 'cohabitation of horses and humans' prior to riding

(Dietz, 2003: 190-191). Either way, the ability of horse riders to travel and transport goods much more quickly than previously possible would have had profound societal, political and economic implications (ibid).

The attractiveness of the self-sustainable domesticated horse would only have increased with the Piora Oscillation, a mini ice age which occurred c.4200-3760 (Cunliffe, 2015: 83). This period's cold climate would have caused agricultural problems such as crop failure, floods and lower life expectancy of animals (Anthony, 2007: 227; Cunliffe, 2015: 72, 83-84). These problems may have increased the attractiveness and ubiquity of nomadic pastoralism in the Steppe, but probably also encouraged migration from the Steppe to the more temperate Danube valley (Cunliffe, 2015: 83-84). Anthony (2007: 236) and Mallory (1996: 236) consider contacts between the Pontic-Caspian Steppe and southeast Europe during the mid-4th and the 3rd millennia BC as a largely asymmetrical process of westward spreading acculturation. Cunliffe (2015: 80) and Vander Linden (2004), emphasise the earlier spread of farmers into the Steppe, and consider the contact more symmetrical. Horse riding probably facilitated these contacts; however, no military advantage was gained from horses until millennia later (Sherratt, 2003: 242, 247; Renfrew, 1998: 268; Kohl, 2007: 237).

Some migration from the Steppe to west prior to the Piora Oscillation has been genetically demonstrated. Steppe-derived genetic components have been found in two skeletons from southeast Europe dating to 4711-4550 BC and 4550-4450 BC respectively; the earliest known traces of these genetic components outside of the Steppe (Mathieson, 2018). What appears to be Steppe-derived material culture has also been found in southeast Europe during the Piora Oscillation. Southeast Europe's shell-tempered pottery ware has utilitarian quantities interpreted by some as markers of indigeneity (Anthony, 2007: 230-234), and so the cultural source of this pottery remains debated (Dergachev, 2002: 94). The high quantity of these pots suggests that at least some will have been locally produced, however the earlier occurrence of the same pottery type in the Steppe is certainly significant (Anthony, 2007: 230-234). Status symbols, namely horse-headed sceptres and polished stone maces also indicate interaction (ibid: 234; Mallory, 1996: 234-236). These items are considered Steppe-derived due to the equestrian link, and because there are earlier such artefacts in the Steppe (Anthony, 2007: 234; Mallory, 1996: 234-236; Dergachev, 2002: 108; Heyd, 2017: 351; cf Levine, 2004: 117; cf Kohl, 2007: 134-135).

Circa 4200 BC, the Suvorovo-Novodanilovka horizon emerged around the north Danube (Cunliffe, 2015: 83-84; Anthony, 2007: 249). Suvorovo-Novodanilovka material culture is clearly Steppe-derived, and Steppe-type kurgan (barrow) cemeteries expose migration rather than just trade (Anthony, 2007: 249-254; Frînculeasa et al, 2015: 84). The arrival of the

Suvorovo-Novodanilovka horizon is concurrent with a native culture's relocation, possibly indicating forceful eviction (Anthony, 2007: 251). Circa 4200-c.3900 BC, six-hundred tells were burned and destroyed (ibid: 227; Mallory, 1996: 238), possibly by force, though natural causes, or ritualistic closure by previous inhabitants cannot be ruled out (Kohl, 2007: 51-52). Moves to villages are recognised, however some of these were burned also (Anthony, 2007: 227; Mallory, 1996: 238). During this period there were sharp increases in the quantity of projectile points found, however there is no correlating increase in finds of animal remains (Anthony, 2007: 230). Native sites became increasingly fortified, c.4300-c.4000 (ibid: 230; Mallory, 1996: 236; Dergachev, 2002). Circa 3700-c.3400 BC, some native southeast European sites known as Tripolye super-towns were the largest settlements in the world (Cunliffe, 2015: 80-84; Anthony, 2007: 279-282). These super-towns are considered wartime measures, possibly places of refuge (Anthony, 2007: 279-282; Kruts, 2012: 76). Osteoarchaeological evidence of warfare comes from the Ukrainian site of Verterba Cave, in use by native farmers c.3950-2573 cal BC (Madden et al, 2018) (see figure 16). Eleven out of twenty-five of the preserved skulls had cranial trauma; in nine cases this could be classified as perimortem trauma (ibid). More than half of the fractures were on the cranial posterior, which indicates that these individuals were struck from behind, perhaps in surprise attacks (ibid). These eleven injured skulls belonged to males and females of varied ages (ibid). The remains of females and youths dissuade interpretation of slave-taking (ibid). Verteba is interpreted as the site of a deadly raid, rather than a battle site (ibid). That said, there are some osteoarchaeological signs of face-to-face fighting (ibid).

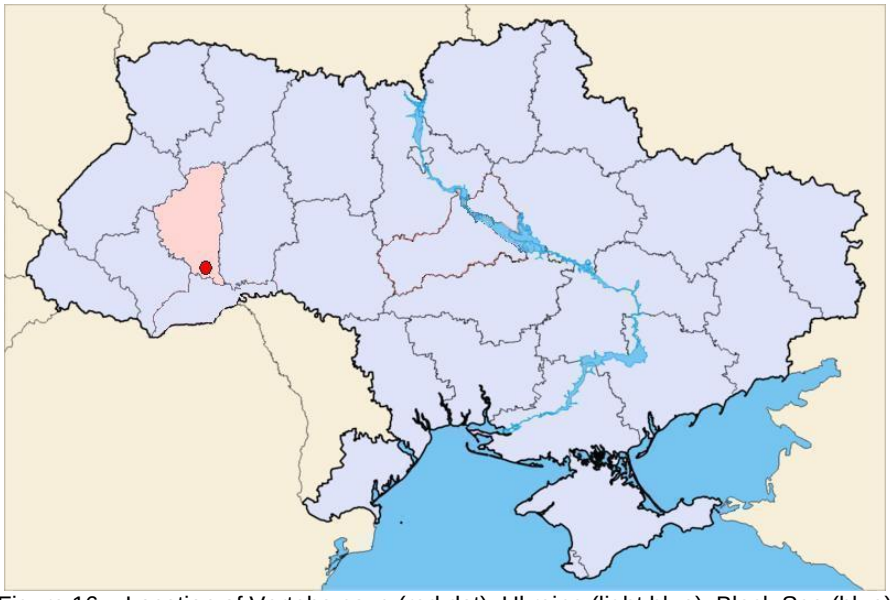

Figure 16 – Location of Verteba cave (red dot), Ukraine (light blue), Black Sea (blue) (https://en.wikipedia.org/wiki/Bilche_Zolote#/media/File:Bilche_Zolote_map.JPG).

Archaeological signs of societal strife became much less common in the following periods. From c.3800 BC, settlement density and fortification declined (Anthony, 2007: 236). The Tripolye super towns were all abandoned by c.3300 BC (ibid: 279-285). Declines in archaeological signs of societal strife may signify an era of integration, or rather of successful colonisation and acculturation. Human remains from the Suvorovo-Novodanilovka horizon were morphologically different from their Steppe counterparts, the Suvorovo (ibid: 253). This is considered by some to have been resultant of inter-mating between Suvorovo-Novodanilovka incomers and the natives of southeast Europe (ibid: 253). Further signs of integration come from the rise of seemingly hybrid cultures (ibid: 277; Mallory, 1996: 237-239). The emergence of the Usatovo culture, c.3300-3200, is an example of this, with its combination of Steppe-type kurgan graves with imported pottery, and poorer flat cemeteries with native pottery (Anthony, 2007: 349-360; Mallory, 1996: 237-239). Circa 3800-c.3300, there is a marked absence of permanent settlement sites from certain parts of southeast Europe, however marginal areas such as caves display signs of occupation (Anthony, 2007: 229). This is taken to indicate that pastoral nomadism was the norm in those regions. The climate warmed c.3760, which would have been favourable to agriculture, yet the Steppe-derived nomadic pastoralist lifestyle seems to have become dominant (ibid: 227), which can be attributed to the climate or the Steppe migrations (Kohl, 2007: 50-51). Anthony (2017: 263) has proposed that after the Piora Oscillation, c.3800-c.3300, the people of the Pontic-Caspian Steppe 'turned their attention away from the Danube valley' and towards elsewhere.

The climate, c.3500-c.3000, was dry and cool, which would have increased travel distances for nomadic pastoralists who needed to feed and water animals (Cunliffe, 2015: 72; Anthony, 2007: 300). The invention of the wagon, c.3300, in the Steppe (Dietz, 2003: 215), would therefore been a very welcome development. Wheeled vehicles are considered prerequisites for fully nomadic pastoralism (Cunliffe, 2015: 455; Anthony, 2007: 300). Fully nomadic pastoralism involves much more mobility than would have occurred prior to wagons, with the horse-drawn vehicles providing shelter, significantly reducing the need for camps (Anthony, 2007: 300-302). Whilst some agriculture occurred within the Yamnaya, the Yamnaya culture is noted for having embodied the economic and technological developments of fully nomadic pastoralism (Anthony, 2007: 300-302; Mallory, 1996: 212-213; Dietz, 2003: 214-216). After the Yamnaya culture's formation, c.3300 BC, the culture quickly spread all over the Pontic-Caspian Steppe, unifying the region to an extent never seen before (Anthony, 2007: 304-305; Cunliffe, 2015: 95). There was however, regional variability within the Yamnaya horizon (Mallory, 1996: 210-211), perhaps most significantly an East/West distinction (Anthony, 2007: 304-305). Anthony's (2007: 304-305) version of the Steppe hypothesis considers the western Yamnaya responsible for the spread of Indo-European into Europe, and the eastern Yamnaya

responsible for the spread of Indo-European into Asia. Significant Yamnaya emigration occurred, from the Steppe, through Usatovo territory and into the lower Danube valley, c.3100-c.2800 BC (ibid: 361-365; Cunliffe, 2015: 98) (see figure 17). During these three centuries there was, according to Anthony (2007: 361-365), a continual stream of people targeted at no fewer than five specific lower Danube regions.

Figure 17 – Yamnaya migrations, c.3100-c.2600 BC (from Anthony, 2007: figure 14.1, 345).

According to the Steppe hypothesis, after the Steppe-derived culture and peoples had spread into southeast Europe, advances into central, western and northern Europe occurred (Mallory, 1996: 243-257; Anthony, 2007). These later advancements have been widely misbelieved by archaeologists on account of insufficient evidence and the migrationist theoretical context (Novembre, 2015: 165; Kristiansen et al, 2017: 122). Even Mallory (1996: 243, 256-257), a proponent of the Steppe hypothesis, admitted this spread to be more equivocal than the spread into southeast Europe. These doubted advancements from the Steppe into central, western and northern Europe have however been genetically proven (Haak et al, 2015; Allentoft et al, 2015; Cassidy et al, 2016). Allentoft and colleagues (2015) conducted whole

genome analysis on ancient DNA samples from 101 prehistoric individuals found throughout Eurasia. This research revealed that genes traceable to the Pontic-Caspian Steppe largely replaced the genome of early European farmers. This occurred by 3000 BC in eastern Europe, and by 2800 BC in temperate Europe (ibid). Genome wide data of 69 ancient Europeans allowed Haak and colleagues (2015: 207) to propose a 'massive migration from the steppe' into Europe during the third millennium BC. The Steppe genetic component has been found in British and Irish samples dating from c.2500 BC onwards (Olalde et al, 2018; Cassidy et al, 2016). Some of these archaeogenetic articles explicitly state the significance of their findings to the Steppe hypothesis (Allentoft et al, 2015; Haak et al, 2015; Cassidy et al, 2016). Cassidy and colleagues (2016) also tentatively connect their findings with the Celtic subfamily. Genetic analysis of 36 samples showed the early Neolithic migration from Anatolia to Europe to be sexually unbiased, but the later migration from the Steppe to be male-biased, with at least five times, and perhaps as much as fourteen times more males than females (Goldberg et al, 2017). Poznik et al (2015) studied 1244 Y-chromosomal sequences chosen at random from around the world, several cases of rapid increases of males in populations, one being dated to c.3500-c.2800 BC. Findings of the bacteria *Yersinia pestis*, the plague, dating c.3000-c.800 have been made throughout Eurasia (Rasmuusen et al, 2015). Outbreaks of the plague may have been a factor in these demographic shifts, both as motivating migration and in causing the supposed downfall of early European farmers.

Some scholars deem the sample quantities of the genetic studies cited above too low for such profound conclusions, which are considered simplistic understandings of the past (Heyd, 2017; Vander Linden, 2016; Callaway, 2018). Flohr Sørensen (2017: 105) has termed this 'everything from almost nothing'. Some of this criticism may be due to incomprehension of biomolecular methodologies. Until c.2012, mitochondrial and Y-chromosomal DNA analysis were the most rigorous kinds of analysis which could successfully be conducted on ancient DNA samples (Anthony & Brown, 2017: 25; Anthony, 2017: 51-59; Røyvrik, 2010). These methods only reveal data of individuals' ancestries as pertaining to single lineages; the paternal and maternal lineages respectively, in what are termed haplogroups or haplotypes (Anthony, 2017: 51-59; Jones, 2001; 208-11; Zhang & Hewitt, 2013). Mitochondrial and Y-chromosomal DNA analysis therefore fail to analyse the vast majority of the ancestry of sampled individuals (see figure 17). Use of one of these methods on one individual would detail information on one of two parents, one of four grandparents, etc; the amount of unanalysed ancestry growing exponentially with time-depth (see figure 18).

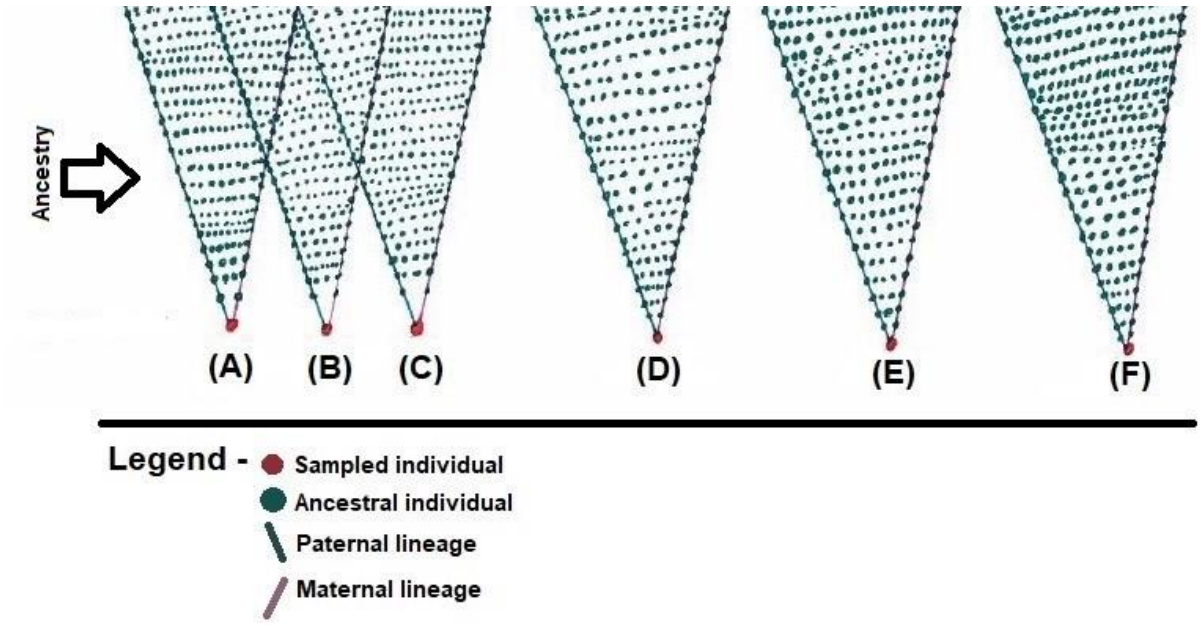

Figure 18 – Diagram of ancestry-based DNA analysis (after Catriona Pickard, 2017: personal communications; further acknowledgment to Tom Booth for explaining these issues in conversation, 2017).

Autosomal DNA analysis, a methodology of the genetic studies cited in the previous paragraph, can provide information of sampled individuals' entire ancestry (Anthony, 2017: 51-59); thereby studying the full triangle in figure 18 rather than merely the side-lines. The main concern with whole genome or autosomal ancient DNA studies should probably not be with quantities of samples. To demonstrate this, the loss of sample B in figure 18 would perhaps be no great loss given its overlap with samples A and C. A more legitimate concern is whether genetic datasets are representative of the population in question (Røyvrik, 2010: 85); i.e. if the dataset in the figure 18 contained only samples A-C, this would result in a lack of information for the genetic diversity of the full group (A-F). Admittedly there is currently no infallible way of knowing when suitable representation of genetic samples in a dataset has been achieved. As ancient DNA preserves much better in certain climates and areas than in others, preservation bias is an issue (Brandt et al, 2015). It is reasonable to state that as the quantity of autosomally analysed ancient DNA samples grows, if a pattern emerges, i.e. if new studies show similar results to older studies, then confidence in the findings will grow also. Further research could clarify or tweak recent biomolecular findings, but a framework seems to have been set (Kristiansen et al, 2017).

Another repeated criticism (Heyd, 2017; Vander Linden, 2016; Klejn, 2017; Furholt, 2017) of recent biomolecular studies is their culture-historical character. Samples underrepresent

ancient individuals from certain areas, eras and cultures, and therefore biomolecular results overemphasise the importance of certain archaeological groups in understanding the past. To demonstrate this, population movement from the Steppe into Europe occurred prior to the formation of the Yamnaya culture (Anthony, 2007; Mallory, 1996). Despite this fact, due to a lack of samples from pre-Yamnaya Steppe individuals, the genetic Steppe component has been labelled 'Yamnaya' (Klejn et al, 2018; Haak et al, 2015) (see figure 9). Regarding the spread of the Steppe component into central, western and northern Europe, the exaggeration seems to be on the role of the Corded Ware culture (Heyd, 2017; Vander Linden, 2016; Furholt, 2017) (see figure 19 for distribution map). Addressing these issues, Heyd (2017) has argued that the Globular Amphora culture was associated with the Steppe before the Corded Ware culture was. Mallory has also suggested that the Globular Amphora culture may have played a part in the Indo-Europeanisation of central, northern and western Europe (Mallory, 1996: 243-244, 254-256). Since these archaeologists' proposals, skeletons associated with the Globular Amphora culture have been autosomally analysed, testing negative for the Steppe component (Mathieson, 2018). Whilst this does not rule out the possibility of Steppe ancestry in unsampled Globular Amphora individuals, it weakens the relevance of the Globular Amphora culture to this narrative.

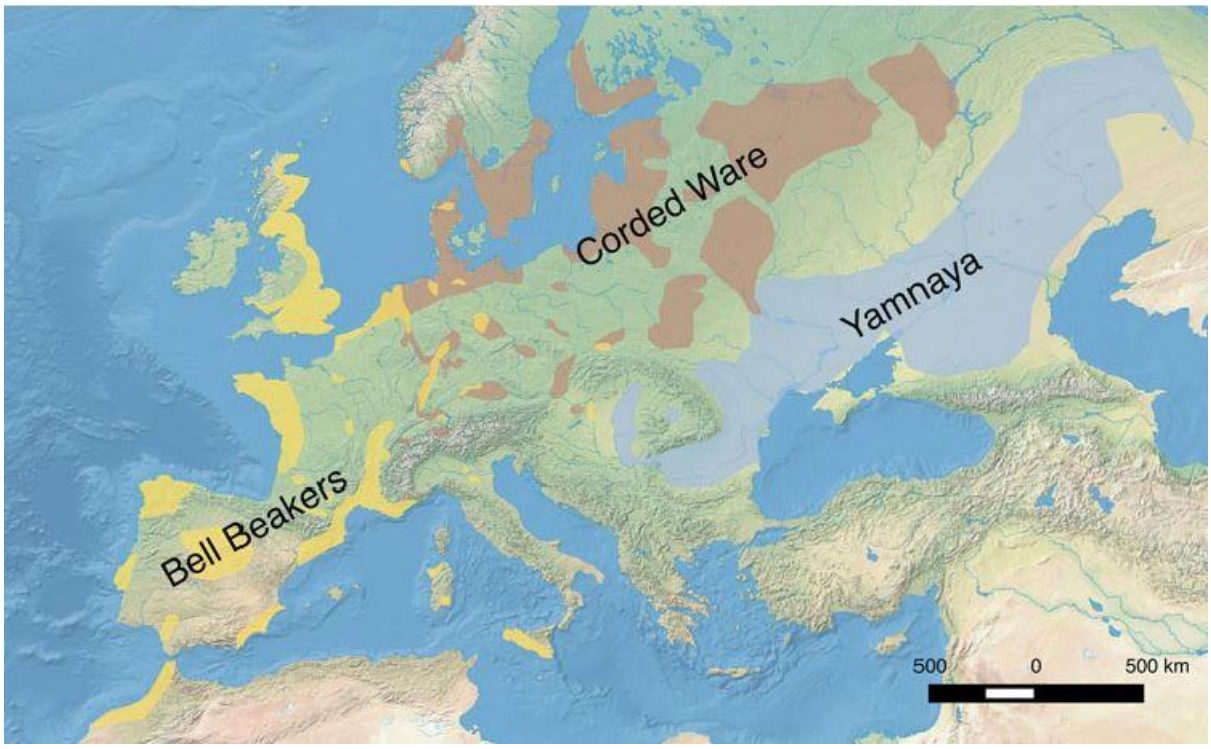

Figure 19 – Furholt's view on the distribution of the Yamnaya (blue), Corded Ware (red), and Bell Beaker (yellow) horizons (from Furholt, 2017: figure 1). Contrast with Figure 20 which shows a more substantial distribution of the Bell Beaker horizon.

To a certain extent, the archaeology of the Corded Ware complex resembles that of the Yamnaya. In both, funerary practices comprise supine-flexed corpses, deposited inside barrow monuments, with graves good such as animals, weapons and cord-ornamented pottery (Mallory, 1996: 246). Mallory (1996: 245-247) calls these similarities 'generic' and notes a range of material differences between the two cultures, such the increased sexual dimorphism in the burial practices of the Corded Ware, manifest in body orientations and grave goods. The archaeology of the Corded Ware horizon is similar to numerous other contemporary cultures around Eurasia (Mallory, 1996: 249; Furholt, 2017), which undermines the case for Yamnaya origins of the Corded Ware horizon. Anthony (2007: 367-368) considers Corded Ware material culture as 'mostly native' to its territory (see figure 19), but sees the 'underlying behaviours', chiefly nomadic herding, as Yamnaya-derived. He proposes these behaviors to have reached the Corded Ware through intermediary carriers; the Usatovo and Bell Beaker cultural communities (ibid: 367). Usatovo sites in southeast Europe are deemed to have exchanged pottery with Bell Beaker sites in southeast Poland, c.3000-c.2800 BC (ibid: 368). These pottery exchanges are interpreted as signs of migration of Steppe-descended groups from southeast Europe into central Europe (ibid: 368). Despite Anthony's emphasis on the Usatovo and Bell Beaker complexes, there was some later direct contact between the Yamnaya and Corded Ware horizons, c.2700-c.2600 BC (Szmyt, 2010: 178-188; Anthony, 2007: 367-368).

There is a high degree of regional variability in the Bell Beaker complex, but the standard package is made up of several components, including Bell shaped pottery and archery paraphernalia (Fitzpatrick, 2013; Heyd et al, 2018) (see figure 20 for artefacts and figure 21 for distribution map). The earliest Bell Beaker radiocarbon dates are from Portugal, c.2750 BC, though Dutch (Heyd et al, 2018) and even North African (Turek, 2015) origins are preferred by some archaeologists. Both the Portugal and the Dutch hypotheses claim continuity between Bell Beakers and earlier pottery traditions (Fitzpatrick, 2013). In most areas, the Bell Beaker package dates to c.2500-c.2000 (Heyd et al, 2018). Traditionally, the Bell Beaker horizon was considered as derivative of the Corded Ware, but the two are now considered contemporaneous (Bradley, 2010: 142-143). The first Bell Beaker/Corded Ware contact is deemed to have occurred through the trade network of the metal-like flint of Grand Pressigny (Bradley, 2010: 143). It is this Bell Beaker/Corded Ware interaction which Cunliffe (2013b: 246-249) proposed as having caused the split between the Insular Celtic and Continental Celtic branches, mentioned in the previous chapter. Bradley (2010: 143) states that eventually these 'two traditions lost their separate identities'.

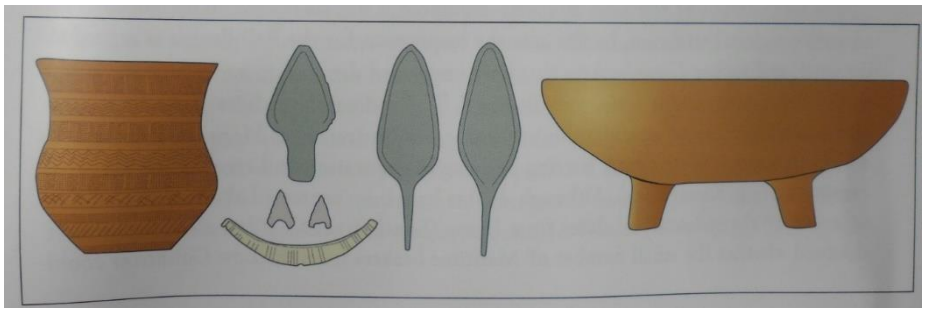

Figure 20 – The Bell Beaker package; 'left to right – Bell Beaker, copper knife, flint arrowheads and bow-shaped pendant, copper spearheads (Pamela Points); accompanying pottery' (from Fitzpatrick, 2013: figure 2.2, 43; drawing by Liz James, acknowledgment to Christian Strahm).

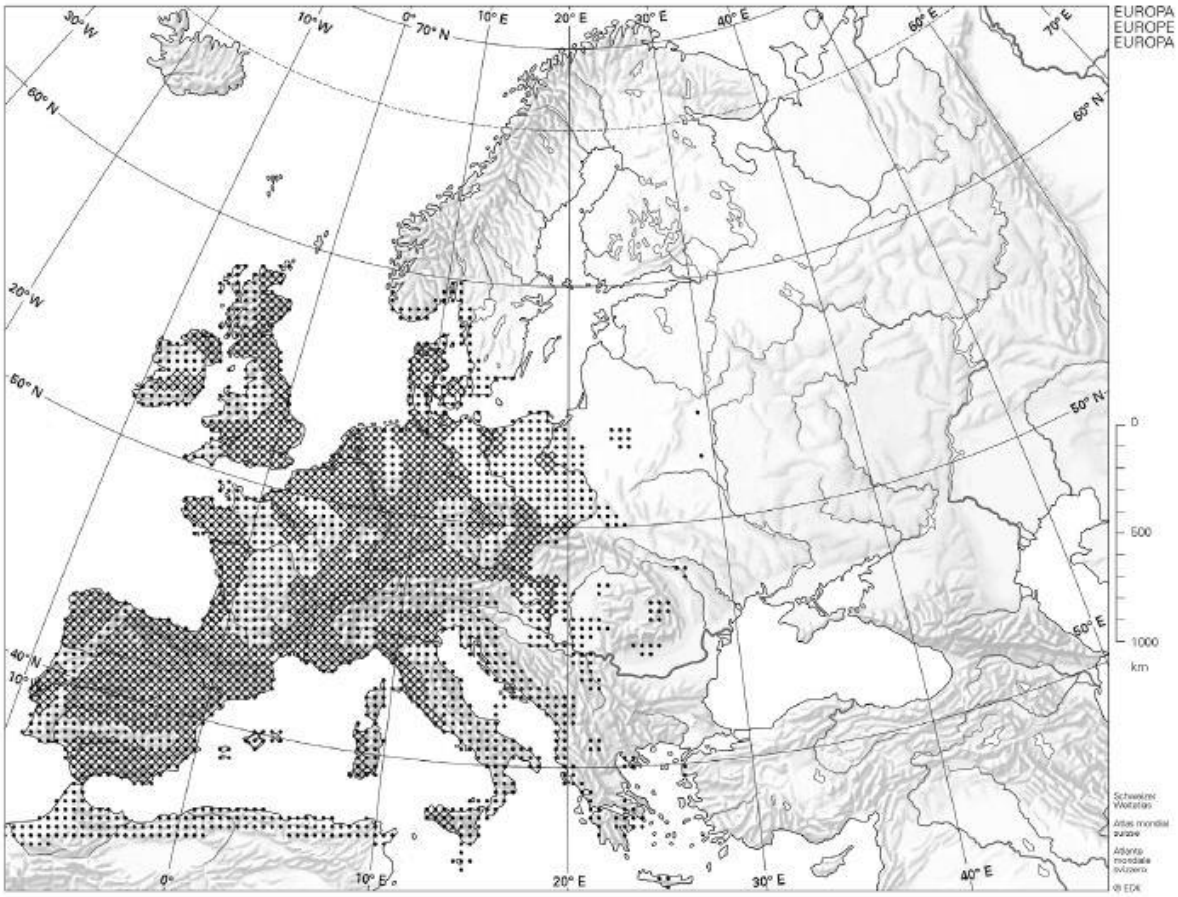

Figure 21 - 'schematic Beaker distribution in Europe' (from Heyd, 2013: 50, figure 28).

Geneticists have found that Bell Beaker associated individuals from Iberia hold much less Steppe-derived ancestry than elsewhere in Europe (see figure 22). Genetical analysis of 226 individuals buried in association with the Bell Beaker complex has revealed that inside Iberia, these individuals possessed the same Y-chromosomal haplogroups held by early Neolithic

populations, whereas in other parts of Europe the Steppe-derived haplogroup, R1B, was common (Olalde et al, 2018). Whole genome analysis of 13 individuals dating to between c.5500-c.1500 BC has revealed that most of the Steppe associated genes only reached Iberia after the Bell Beaker complex had formed (Valdiosera et al, 2018). Analysis of 14 ancient individuals excavated in Portugal show that the Steppe component became increasingly prevalent between the Middle Neolithic and the Middle Bronze Age (Martiniano et al, 2017). The increase is not excessive, which in light of Iberia's linguistic diversity, is interesting (ibid; Renfrew, 1989: 231-232). Modern Mediterranean populations share far greater genetic affinity with Europe's first farmers than modern populations in other areas of Europe do (Haak et al, 2015; Valdiosera et al, 2018) (see figure 9). Valdiosera et al's (2018) study found no affinities between ancient Iberians and modern Africans; there was no data for ancient African genomes. Historical linguist Guus Kroonen (2018), has stated that the continuation of early European farmer ancestry in Iberia during the Bell Beaker period may indicate that Indo-Europeanisation was, at that stage, incomplete.

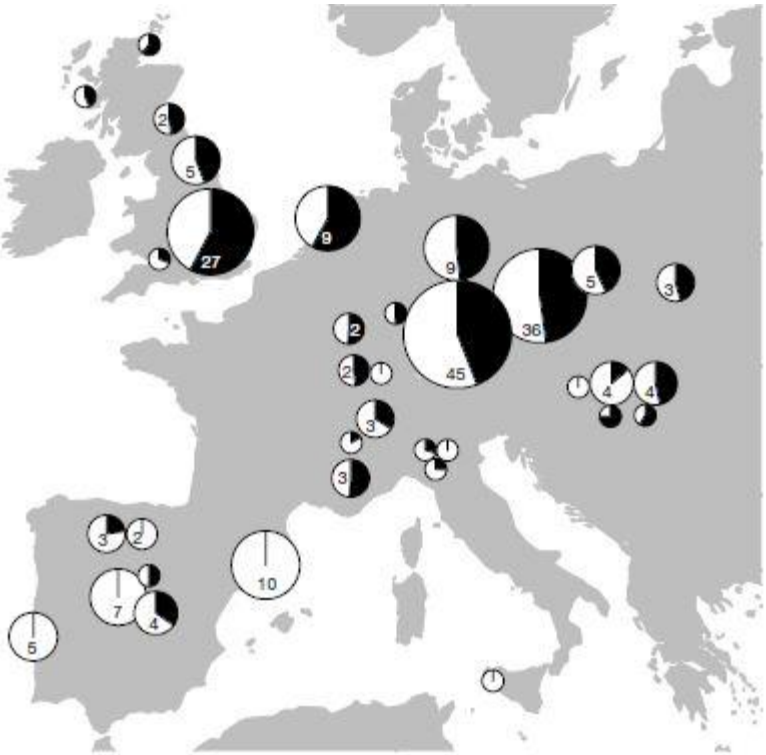

Figure 22 - 'Proportion of steppe-related ancestry (in black) in Beaker-complex-associated groups. The size of the pie chart is proportional to the number of individuals (number shown if more than one)'. (Detail from Olalde et al, 2018: figure 2).

Unlike in studies of the Yamnaya, and to a lesser degree Corded Ware, with the Bell Beaker complex there is not a strong correlation between genetical ethnicity and archaeological material culture (Olalde et al, 2018). However, were the samples from Iberia and Sicily

excluded there would be (ibid). The Bell Beaker complex can be considered as a cultural transmission out of Iberia, and then demic spread throughout Europe (ibid). The demic spread seems particularly strong in Britain and Ireland; over a few hundred years, Steppe-derived components became very common in the gene pool of these islands (ibid; Cassidy et al, 2016) (see figure 22). Material culture shifts were contemporary with these genetic shifts, as profound cultural changes associated with the Bell Beaker complex occurred, c.2500-2000 BC (Cummings, 2017: 234-235).

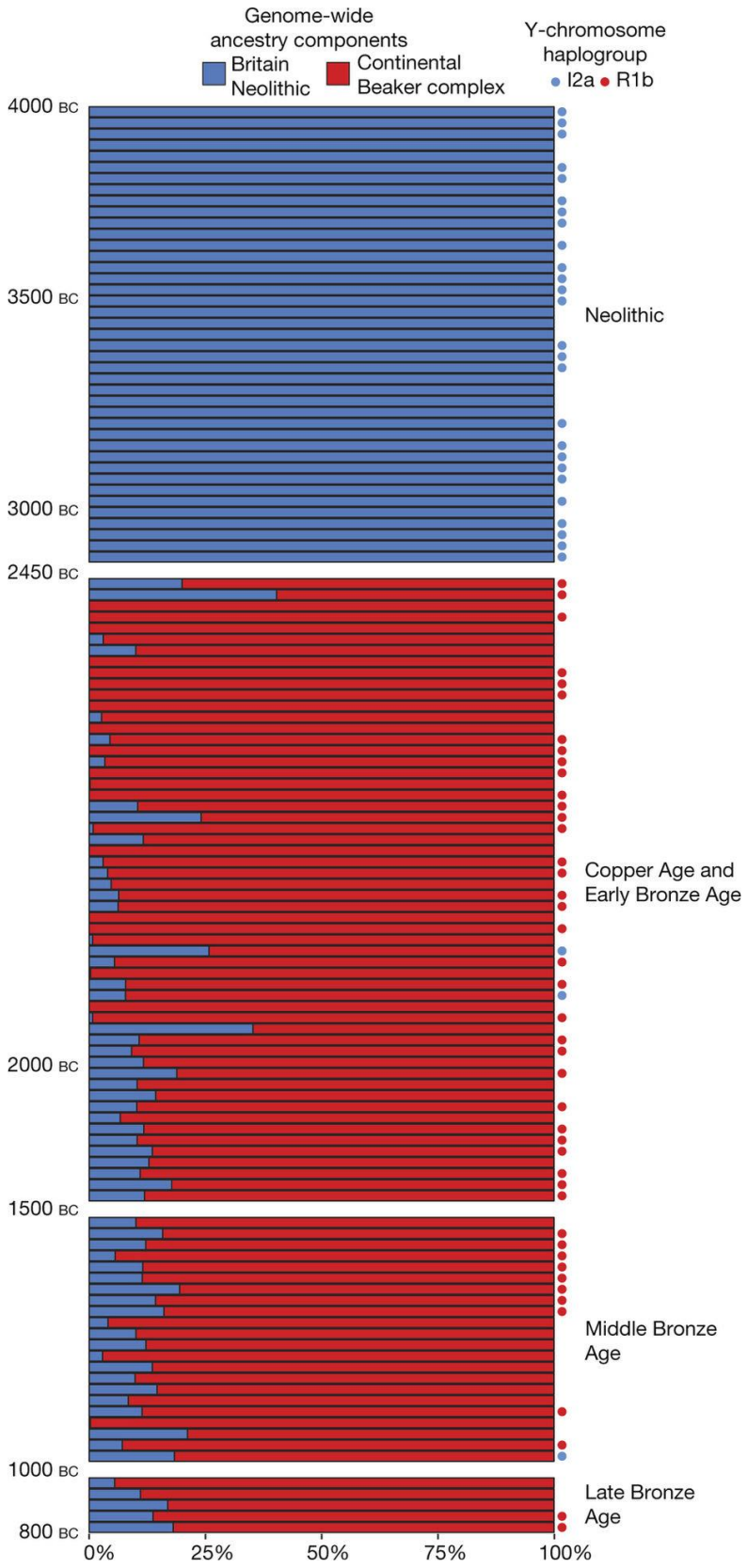

Figure 23 – Genetic bar chart, each bar represents one sampled individual (from Olalde et al, 2018: figure 3).

In Ireland and some parts of Scotland, Bell Beakers were deposited in pre-Beaker, earlier Neolithic monuments (Bradley, 2010: 150; 2000: 221-224). These actions, probably committed by Steppe-derived populations, can be interpreted as cultural appropriation, colonisation, or perhaps as recognition of their early European farmer ancestry. Many of the re-used monuments were ‘closed’ by Bell Beaker peoples (ibid: 152). Sometimes this was physical; entrances to chambered cairns were blocked with stones (ibid: 152). In these cases, there were no other signs of Beaker modification to the monuments, but there were some signs of imitation at original Bell Beaker constructions (ibid: 152; Jones et al, 2015). Sometimes these ‘closures’ were symbolic, such as the addition of ring ditches to the perimeters of stone circles (Bradley, 2010: 152). These actions can be interpreted as symbolic gestures of Indo-Europeans triumphing over early European farmers.

One of the most notable Bell Beaker sites in Europe is the Ross Island copper mine in County Kerry; the earliest known occurrence of metallurgy in Ireland or Britain (Fitzpatrick, 2013: 55). The metal sourced there was a chemically distinctive type of arsenic copper, which was widely exported to Britain and Europe (ibid: 55-56). The relative technological advancement of the Ross Island metallurgy suggests a spread from the European continent; perhaps Iberia, on account of other cultural links embodied in megaliths, gold artefacts, and artistic depictions of boats (ibid: 55-58; Gibson, 2013). Further weight for the view of Iberian influence upon the establishment of metallurgy at Ross Island comes from differences in the Bell Beaker archaeology of Britain and Ireland; Britain being stylistically closer to France and the Netherlands, than to Ireland and the rest of the Atlantic façade (Bradley, 2010: 147-150). The use of the Ross Island mine started, c.2400, declined a few centuries later, and completely stopped, c.1900 BC (ibid: 146-147; Bray & Pollard, 2012). With the declines of copper at Ross Island, other copper mines were opened, however their copper was not arsenic, and would therefore have been softer (Cunliffe, 2013b: 201-208). Experimentation with alloys began; the mixing of tin and copper led to the start of the full bronze age, c.2200-c.2000 BC, which soon reached Armorica, but took at least another two centuries to expand further into Europe (Cunliffe, 2013b: 201-208; Koch, 2013a: 110) (see figure 23).

Figure 24 – Adoption of standardised tin-bronze (from Koch, 2013a: figure 4.4, 110, map by Crampin & Koch, data from Pare, 2000).

Koch (2013a) has proposed that the emergence the full bronze age in Ireland and Britain was stimulus for the differentiation of Proto-Celtic language. This is not to say that he considers Britain or Ireland the 'Celtic homeland'; he does not, he stresses the heterogeneity of proto-languages, in this case variants of Celtic throughout the Atlantic façade (ibid: 103-109). Koch can therefore be considered an advocate of 'cumulative Celticity' (Hawkes, 1973). Koch's (2013a) proposal is less culture-historical focused than it is technological. To demonstrate, the Bell Beaker culture is also deemed to have been instrumental in the Indo-Europeanisation of Scandinavia (Prescott, 2017, 2012: 41), an area which was not Celtic-speaking. Koch (2013a: 109) sees trading networks as having generated societal bilingualism and a *lingua franca*. On account of the linguistic complexity of Celtic, and the typical simplicity of trading languages, Mallory (2013a: 273-274; 2016) refuses to accept that Proto-Celtic was a trading language. It would be simplistic to view the widespread metallurgical trading networks as merely trade;

they will have incorporated the entire process of industry (Fitzpatrick, 2013: 62-64). Isotopic analysis of human remains and artefacts have shown high levels of mobility in the Beaker period (ibid). Often mobility occurred in childhood, perhaps for apprenticeships, fosterages or cultural exchanges; all of which would have strongly encouraged language shifts of the sort proposed by Koch (2013a; Fitzpatrick, 2013: 62-64).

Koch (2013a: 109-115) emphasises the occurrence of other long-distance strands and mobility networks, such as the spread of a chariot package from the eastern steppe, and the spread of advanced seafaring through the Mediterranean. The Atlantic façade is considered to have been somewhat isolated from these strands, with independent seafaring developments in Britain (ibid). The Mediterranean Sea network is seen to end at the straits of Gibraltar (ibid: 117). Iberia is thought to have been split between a Celtic-speaking west, and a non-Celtic, sometimes non-Indo-European east (ibid: 121-123; Mallory, 2013b: figure 1.5). On account of the spread of the full bronze-age, chemical characterisation of metals and literary fragments from the Classical poem *Ora Maritima*, which was based on earlier historical texts, Koch (2013a; 2010: 193-194) argues for maritime connectivity in the Atlantic façade. The combination of these factors (interaction in the Atlantic façade, and isolation from the east) is considered the context for the development of Celtic (Koch, 2013a).

Mallory (2013b: 36) states that if the Atlantic façade is to be considered the Proto-Celtic homeland, a north Alpine spread of Indo-European is to be favoured over a Mediterranean spread. This is due to similarities between the Celtic and Italic language families, and the frequency of non-Indo-European languages along the Mediterranean (ibid: 24-26). Mallory (2013a: 279-280; 2013b: 27-30) sees the mobility of the Bell Beaker period, outlined above, and indeed the spread of agriculture, as possible language shift ‘windows’, but he considers them as too early for the divergence of Celtic from Indo-European. Citing reconstructed Proto-Celtic vocabulary for lead and iron, metals which are visible in the archaeological record from c.1500 BC and c.1000 BC respectively, Mallory (2013a: 258-261) argues that Celtic cannot have emerged much earlier than those dates. The emergence of hillforts, c.1000 BC, and of iron metallurgy, c.600 BC, as well as the spread of La Tène artefacts, c.300-c.100 AD, and of refugees from Roman Britain, c.1-100 AD, are all considered by Mallory (2013a: 278-280), as possible factors in the spread of Celtic.

Chapter V - Discussion

There is supporting and discrediting research for both of the main two hypotheses of how Indo-European languages reached Europe. The Anatolian hypothesis has been considerably more discredited than the Steppe hypothesis has. The Steppe hypothesis has increased in plausibility, particularly due to biomolecular findings. Renfrew (2017: 436) has reacted to these findings, claiming that no correlation between populations and language can be made prior to literacy. He thereby discredits not only the Steppe hypothesis, but also his own Anatolian hypothesis. The lack of Anatolian ancient DNA can, to a certain extent, be considered mitigation against the Anatolian hypothesis' diminished status. Whilst new evidence may suggest that Indo-European languages were spoken in the Steppe, c.3000 BC, they may have been spoken somewhere else earlier (ibid). Some scholars (Parpola, 2012; Kohl, 2007: 236) have viewed the farmers who expanded into the Steppe during the 5th millennium BC, though ultimately of Anatolian stock, as Proto-Indo-Europeans. This sort of 'secondary homeland' hypothesis is not new (De Benoist, 2016: 101-102, 123).

Whilst population movement from the Steppe into Europe has been proven, the view that this brought Indo-European languages has not; it remains speculative and hypothetical. Whilst there are undoubtedly some parallels between the linguistic, archaeological and biomolecular data, it is unclear if these parallels are truly meaningful. It may be the case that the datasets do not perfectly match up, and that views of synthesis are overoptimistic (Vander Linden, 2016: 720). For example, Iberian ancient DNA samples largely lacked the Steppe-derived genetic component (Olalde et al, 2018; Martiniano et al, 2017; Valdiosera et al, 2018), which has been treated as a proxy for Indo-European languages (Haak et al, 2015; Allentoft et al, 2015), but Iberian metallurgy has been supposed by some to have transmitted to Ireland (Fitzpatrick, 2013; Gibson, 2013), leading to processes which are deemed to have caused the development of Celtic (Koch, 2013a). Mallory's (1997: 115) statement 'that the Steppe hypothesis is not the best but is just the least bad', remains a legitimate point-of-view. In future, the Anatolian and Steppe hypotheses could potentially be reconciled as non-exclusive and mutually complementary.

Acceptance of the Steppe hypothesis on the basis of the evidence presented in Chapter IV requires acceptance of multi-disciplinary approaches. The use of genetics as a proxy for language can be justified by the fact that humans' choice of mating partners are usually restricted to individuals they can understand (Kohl, 2007: 234; Cavalli-Sforza, 2000: 150, 167). However, 'language is culturally learned, not physically inherited' (Kohl, 2007: 234). The use of genetics as a proxy for language may ignore interesting aspects of the past, such as cases of polyglottal people, or people who have linguistically deviated from their ancestors.

Genetics/language proxies are only of tentative legitimacy. If this shortcoming is understood and disclosed, there should be no problems with drawing hypothetical connections between genetics and languages.

Biomolecular studies cannot, at least directly, provide socio-linguistic information (Pala et al, 2016: 374). Socio-linguistic impressions can, however, be gleaned from societal impressions based upon the archaeological material, such as from the knowledge of numerous competing social groups, and of the co-existence of different economies, such as hunting-and-gathering, arable farming and nomadic pastoralism (Mallory, 2016). These circumstances may have led individuals and families (either European hunter-gatherers or early European farmers) to become attracted to cultures other than their own, perhaps for higher chances of survival and social mobility (Anthony, 2007: 340). In this scenario, if the various cultural groups were linguistically demarcated, societal bilingualism would occur, which may in turn have led to language death, though the term language suicide may also be applicable (Mallory, 2016). 'The adoption of a dominant-culture language (even to the exclusion of their own) by members of a subordinate or peripheral culture… provides linguistic access to the dominant culture, with all the attendant possibilities of incorporation into that culture' (Dorian, 1981: 40-41).

This process of language death has been ethnographically observed amongst the east Sutherland *Maraichean* (fisher-folk), whose Gaelic dialect became obsolescent during the 20th century (Anthony, 2007: 340-341). The *Maraichean* were refugees from the *Teamhair an Iomruagadh* (Highland Clearances), c.1808-c.1833 (Dorian, 1981: 54, 2010: 41-42; Richards, 2007: 23). To the *Maraichean*, the English language was associated with middle classes and the non-native aristocratic elite of the House of Sutherland (Dorian, 2010: 36, 41, 49), which has been one of the richest patrician families in Britain since c.1850 (Tindley, 2010; Brinded, 2017). Increased mobility into Sutherland during the 19th century caused greater consciousness amongst the *Maraichean* of the social prestige associated with English (Dorian, 1981: 49). The *Maraichean* held low social standing, were socially isolated, and religiously segregated (Dorian, 2010: 48, 52, 62-63). Their earnings were unpredictable and often meagre (Dorian, 1981: 51, 2010: 48). From around the time of the Great War, 1914-1918, declines in the fishing trade were concurrent with increases in employment opportunities in more stable English-speaking settings (Dorian, 1981: 46-48). The language and culture of the *Maraichean* people, and the people themselves, were stigmatised (Dorian, 2010: 52-53, 62-63). These factors all contributed to the beginnings of *Maraichean* exogamy, c.1918, (Dorian, 2010: 52) and to the language death of *Maraichean* Gaelic (Dorian, 1981).

This socio-linguistic scenario of inter-group competition, leading to societal bilingualism, then monolingualism seems a likely occurrence in the spread of Indo-European into Europe

(Anthony, 2007: 340-341). Other possible stimulus for language shifts include trade, technological developments, social relations, intermarriage, technological developments, and militaristic domination (Mallory, 2016). No single one of these socio-linguistic explanations is preferred 'the right one'; it is entirely plausible that multiple of these factors, and indeed others, will have occurred (cf. Labov, 1994: 23, cited in Dorian, 2010: 3-4).

This archaeological dissertation drew heavily upon the disciplines of genetics and linguistics, though findings from more-accepted multi-disciplinary methods, such as radiocarbon dating and chemical source characterisation of finds, were also conveyed. At the time of its introduction, archaeological chemistry caused serious interpretive problems for archaeology, but these were overcome (Kristiansen, 2017). It is here predicted that over time biomolecular and linguistic approaches will gain increased acceptance and integration within the discipline of archaeology, as archaeological chemistry has done. This prediction is confidently made because given the empirical status of biomolecular results, if archaeology fails as a discipline to adequately come to terms with genetics, then archaeology will lose both its academic worth and its status as a cardinal system to understand the human past (Kristiansen, 2014a: 26). However, the integration of genetics into a more holistic study of the past requires humanistic interpretation and should not take the form of blind acceptance.

Archaeologists ought to take care when doing tasks familiar to them, but ought to take extra care when analysing information from other disciplines. Appreciation for other disciplines should not take the form of methodological laxity. Prudence was exercised in this dissertation via its evidence-based approach. Though Renfrew (2017) has openly celebrated computational linguistic phylogenetic support for the Anatolian hypothesis, this dissertation rejected that research. Similarly, caution was taken over the use of culture-historical archaeological thought, itself controversial (Trigger, 2006), within biomolecular approaches. The so-called 'everything from almost nothing' attitude (Flohr Sørenson, 2017: 105) with which some scholars regard biomolecular findings was also considered. This kind of scrutiny of non-archaeological methods allows for multi-disciplinary approaches to enrich archaeologists' understandings of the past, whereas blind acceptance of non-archaeological methods would impair understandings.

Due to the increased ubiquity of multi-disciplinary approaches, Kristiansen (2014a) anticipates a 'return to grand narratives'. Given that this dissertation dealt with the spread of the world's largest language family (in terms of number of languages and speakers) (Gamkrelidze & Ivanov, 1990: 110), it was destined to be something of a grand narrative. The inclusion of biomolecular research may also have contributed to this dissertation's large-scale approach; some of the ancient DNA studies cited were constructed from analyses of hundreds of

individuals found over a wide geographical area (i.e. Mathieson et al, 2018; Olalde et al, 2018). However, biomolecular archaeology does not inherently favour grand narratives over small-scale studies. To demonstrate, skeletal isotopic analysis, though not featured prominently in this dissertation, can reveal information about migration and diet on an individual level (Frei et al, 2017). Grand narratives essentially comprise numerous smaller sets of information, which are inevitably compressed and stripped of detail. However, a 'return of grand narratives' need not indicate the demise of small-scale studies. Even if grand narrative archaeology becomes the dominant style, some of its readers will care to explore certain avenues in more detail, and its producers will have to. It would be wrong to consider the purpose of small-scale studies as feeding grand narratives. The relationship between small-scale archaeology and grand narrative archaeology ought to be considered mutually beneficial; when dealing with small-scale archaeology, one benefits from possessing knowledge of its wider significance and context.

Some archaeologists view the increasing ubiquity of multi-disciplinary approaches as causing ongoing archaeological paradigm shifts (Kristiansen, 2014a; Heyd, 2017: 357; Flohr Sørensen, 2017). Multidisciplinary archaeological approaches are not limited to collaboration with 'hard' science; to demonstrate, in North America, archaeology and social anthropology are not considered different disciplines (Barnard, 2018). Despite this, the ongoing paradigm shifts are considered resultant of 'hard' science (Kristiansen, 2014a; Heyd, 2017: 357; Flohr Sørensen, 2017). If archaeologists are to consider other disciplines as tools which can be used to understand the past, the emerging, eclectic, new paradigm may be termed the 'toolbox approach'. Whilst such an approach is not new, certain hard scientific 'tools' have been 'sharpened'. The toolbox approach allows archaeologists to choose a suitable scale of research, be it site-specific, grand narrative, or anywhere in between. The toolbox approach also allows for single phenomena to be studied in multiple ways. When this is done, optimal insight into the past can be attained, and a degree of neutrality may be possible.

Because the contents of different archaeologists' toolboxes vary (González-Ruibal, 2014), this emerging paradigm will encourage excellent debate. When scholarly consensus is unattainable, it is debate rather than polarisation, which ought to be the aim (Flohr Sørensen, 2017). Frustrating as it may be, some debates will end in impasse. However, in a spirit of relativism and pluralism (Johnson, 2010: 212-215, 231-233), archaeologists ought to engage with different ways of thinking about and engaging with the past (Flohr Sørensen, 107: 111). To use a metaphor, archaeologists should build not walls, but bridges between disciplines and opinions. Some scholars will not cross the disciplinary bridges (González-Ruibal, 2014; Huvila, 2014; Líden, 2017); purely 'humanistic' archaeology will continue, and similarly much biomolecular writing will remain stylistically dry, either overconfident in or lacking in

archaeological interpretation (Flohr Sørensen, 2017). Archaeologists willing to embrace this new paradigm, should consider such writings means rather than ends (Fossheim, 2017). This is to say that ‘hard’ scientific findings should be critically analysed, just as more humanistic archaeologies usually are (Prescott, 2013: 40). There will probably always be disagreements in the study of the human past, and numerous ways of understanding the human past. A relativist, eclectic and evidence-based toolbox approach offers archaeologists a method of navigating the diversity of styles, opinions and methods.

Conclusion

This dissertation aimed to answer three research questions;

1. Does the Anatolian hypothesis or the Steppe hypothesis better explain the spread of Indo-European languages into Europe?
2. To what extent can multi-disciplinary approaches aid archaeologists' understandings of the past?
3. What is the impact of multi-disciplinary approaches on theoretical archaeology?

Though both of the main hypotheses for the spread of Indo-European languages into Europe remain possible, multi-disciplinary analysis has assessed the plausibility of both, and has therefore advanced in understandings of Indo-European origins. From a strictly archaeological, that is, non-multi-disciplinary perspective, the Anatolian hypothesis could be considered quite feasible, given the spread of agriculture into Europe from Anatolia. However, multi-disciplinary analysis found the Anatolian hypothesis to be considerably flawed. Prior to recent genetical findings, migrations from the Steppe into Europe were widely misbelieved by archaeologists (Kristiansen et al, 2017: 335), but multi-disciplinary research has shown the Steppe hypothesis to better explain the spread of Indo-European languages into Europe.

Neither the Steppe hypothesis or the Anatolian hypothesis hold a single explanation for the origins of the Celtic language family. Both hypotheses are compatible with numerous explanations on timing, nature and placement. What both hypotheses share however, is a willingness to accept the Celtic from the West hypothesis, and to reject the Hallstatt hypothesis of Celtic origins.

The multi-disciplinary approach of this dissertation allowed for thorough hypothesis testing and good results. Multi-disciplinary approaches can greatly aid archaeologists' understandings of the past, as has been demonstrated. The impact of multi-disciplinary approaches on theoretical archaeology is profound, with a new 'toolbox' paradigm emerging (Kristiansen, 2014a).

The field of Indo-European studies would benefit from future multi-disciplinary research focused either on Asia and the Indo-European languages of Asia, or on Eurasia and the entire Indo-European language family. Ultimately, it is only through study of the entire Indo-European language family that the nature and timings of its origins, and subsequent spreads, will become apparent. Therefore, archaeological study on a much wider platform is encouraged. Whilst further genetic sampling of European skeletons would be beneficial, if the biomolecular successes of Europe were to be replicated in Asia, that would be an even better development.

Appendix I – List of Indo-European languages

(Diamonds represent subfamilies; arrows represent language groups within those subfamilies; squares represent individual languages).

- Anatolian
  - Hittite (extinct)

- Indo-Iranian
  - Indo-Aryan
    - Vedic Sanskrit (archaic)
    - Hindi
    - Bengali
    - Sinhalese
    - Romany
  - Iranian
    - Avestan (archaic)
    - Old Persian (archaic)
    - Persian
    - Pashto
    - Kurdish
    - Ossetic

- Greek

- Italic
    - Latin
  - Romance
    - Romanian
    - Spanish
    - Portuguese
    - French

- Germanic
    - Gothic (archaic)
    - English

- German
- Dutch
- Danish
- Swedish
- Norwegian
- Icelandic

- Armenian

- Tocharian
  - Tocharian A/East Tocharian/Turfanian
  - Tocharian B/West Tocharian/Kuchean

- Balto-Slavic
  - Baltic
    - Lithuanian
    - Latvian
  - Slavic
    - Polish
    - Russian
    - Ukrainian
    - Albanian

- Celtic
  - Continental Celtic
    - Gaulish
    - Galatian
  - Insular Celtic
      - Brythonic (sub-division within Insular Celtic)
    - Welsh
    - Manx
    - Breton
      - Goidelic (sub-division within Insular Celtic)
    - Irish
    - Scots Gaelic
    - Manx

(Data from: Cowgill & Jasanoff, 2017; Greene, 2017).

Note: this list does not contain all of the Indo-European languages. One reason for this is that many Indo-European languages will have died out completely during prehistory, just as many have died during historical times (Mallory, 1996: 261).

Contrast the phylogenetic approach presented here with the historical linguistic wave approach, which recognises that languages may hold influence from language families which they are not strictly part of; for example, English is Germanic, but has been strongly influenced by French, an Italic, Romance language (Mallory, 1996: 18-21).

Appendix II -

Image captions (clockwise from bottom left):

1 - Carpet page from the Book of Durrow, produced c.600-c.700 AD (http://www.codex99.com/typography/33.html);

2 - Crescentic plaque from a lunula found in the Llyn Cerrig Bach lake deposit, considered part of the Bell Beaker package (c.200 BC – 100 AD), National Museum of Wales, detail of a lunula (https://museum.wales/articles/2007-05-03/Celtic-Art-in-Iron-Age-Wales/);

3,4 - Engraved stones from Newgrange, a Passage Grave monument, re-used in the Bell Beaker period (http://www.worldheritageireland.ie/bru-na-boinne/built-heritage/art/);

5 - 'Gold lunula from Ross, Co. Meath' c.2000 BC (http://irisharchaeology.ie/2014/11/bronze-age-gold-treasures-from-the-national-museum-of-ireland/);

6 - Engraved stone from Newgrange (http://www.worldheritageireland.ie/bru-na-boinne/built-heritage/art/).

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