ANTHROPOLOGIE • LXI/3 • pp. 229–246 • 2023

VÁCLAV HRNČÍŘ, PETR KVĚTINA

APPLICATION OF COMPARATIVE ETHNOLOGY IN ARCHAEOLOGY: RECENT DECADES

ABSTRACT: The use of ethnographic and ethnohistoric data to inform reconstructions of past human societies has a long tradition. While simple ethnographic analogies have been used since the beginning of archaeological research, since the 1950s there have been several efforts to rationalize and systematize their use. This led to the development of several new methods, including direct historic analogy, ethnoarchaeology, and comparative ethnology. The latter is now experiencing a resurgence, stimulated by the digitization of large ethnographic databases and the development of new analytical methods. As part of a broader cross-cultural research approach, comparative ethnology explicitly aims to answer questions about the incidence, distribution, and causes of cultural variation. Based on the statistical evaluation of theories and large samples of cultures, this approach not only illustrates variation in cultural practices, but also provides supporting arguments for archaeological hypotheses. Specifically, it can (1) reveal archaeological indicators of human behavior, (2) test causal and non-causal associations between diverse cultural and ecological variables, and (3) reconstruct the evolutionary paths of specific cultural traits. Despite significant development in this field over recent decades, the application of comparative ethnology to the study of the human past is still relatively rare in the archaeological community. Our aim is to (re)introduce this method and demonstrate its potential to address archaeological questions through several recent case studies from two thematic research areas: hunter-gatherers and kinship systems. This paper demonstrates the breadth and variation of topics that can be studied using comparative ethnology.

KEY WORDS: Comparative ethnology – Cross-cultural research – Hunter-gatherers – Kinship systems

INTRODUCTION

The use of ethnographic and ethnohistoric data to inform reconstructions of past human societies has a long though not truly straightforward tradition (Peregrine 1996, Wylie 1985). Based on the assumption that apparent similarities between contemporary non-industrial societies and prehistoric ones imply a profound link for interpretations, simple analogies (single-culture analogies) have been used since the

Received 27 January 2023; Received in revised form 15 May 2023; Accepted 15 May 2023. Available online 30 August 2023.

DOI: https://doi.org.10.26720/anthro.23.06.27.1

beginning of archaeological research (Charlton 1981, Orme 1981). However, the arbitrary use of ethnographic parallels can be misleading because similarities between cultures can have many causes. It can be also selective, because scholars tend to use only those ethnographic cases that are consistent with their theories and ignore those that are not. Thus, since the 1950s, there have been several efforts to rationalize and systematize the use of analogies. For example, under the influence of neo-evolutionism, J. G. D. Clark (1953) suggested that archaeological cultures should be compared primarily with ethnographic societies that have similar subsistence and live under similar environmental conditions. Another method called "direct historic analogy" or "folk culture approach" emphasized that analogies should be drawn only from ethnographic cases that could be directly linked to the archaeological material (i.e. ancient society) being interpreted (Ascher 1961). However, the most popular approach to analogy has been ethnoarchaeology, also known as "living archaeology", which uses ethnographic methods to identify the links between the material aspects of living cultures and the non-existent cultures of the past (David, Kramer 2001).

Although all these approaches have their own unique limitations (Gosselain 2016, Hayter 1994, Perreault 2019: 15–17), they share one in common: their conclusions are based on only a small number of cases, which makes them virtually ungeneralizable. To address this shortcoming, comparative ethnology was designed. This method, based on "the statistical evaluation of theories or hypotheses using [ethnographic] data from large (often worldwide) and clearly defined samples of cultures" (Peregrine 2004: 286, cf. Ember, Ember 1995) is a part of the broader field of cross-cultural research (Ember, Ember 2009). It explicitly aims to answer questions about the incidence, distribution, and causes of cultural variation. Despite significant advances in this field in recent decades, the application of comparative ethnology to the study of the human past is still relatively rare in the archaeological community. The aim of this article is to briefly (re)introduce this method and demonstrate its potential through several recent case studies.

Comparative ethnology – short overview

Despite the fact that every culture is unique, there are certain commonalities shared across some or many or even all human societies. Comparative ethnology assumes that these common patterns (resulting from living in similar environments or otherwise analogical cultural trajectories) can be identified through systematic comparison of cross-cultural data. Comparisons can be both synchronic and diachronic (Ember, Ember 1995, Peregrine 2004). Synchronic comparisons conducted with all cases taken from a single period (i.e. one "ethnographic present" for each sample case) are the most common, largely because the depth of the ethnographic record is usually insufficient for diachronic analysis.

"Ethnographic present" may vary considerably across the cases, as it usually reflects the period of the first ethnographic records (Ember, Ember 2009). For some societies, this means the eighteenth century or even earlier, while for others it is the twentieth century. Similarly, most cross-cultural studies are essentially comparisons of localities in different cultures, not comparisons of the cultures themselves, since ethnographers usually describe only one particular community, not the society as a whole. Neither of these, however, is a problem. Comparative ethnology does not look for the characteristics of all communities in each society but for relationships between cultural traits across different societies that should be valid regardless of the different time foci across the sample cases. Because cultures change over time (some traits emerge while others disappear), the only requirement is that all analyzed variables are measured synchronically for each culture, i.e., they come from the same time and place.

Comparative ethnology is thus the examination of a series of ethnographic "snapshots" (each capturing a culture at a particular time and locality), with the aim of finding strong associations between presumed causes and effects (Ember, Ember 1995). The importance of this approach is that if one can find such associations in a global sample of cultures then one can assume that they reflect general human behavior and not just the customs of a particular culture or historically related group of cultures. Moreover, although recent ethnographically documented societies are not relics of the past and differ in many ways from prehistoric ones (Ember, Ember 1995: 95–96, Kelly 2013: Chapter 10, Wobst 1978), there is no a priori reason for this generalization not to hold for past human societies as well. This is less of a problem especially if studies in their models control for "modern" external influences such as depopulation, pacification, or introduction of foreign goods.

For archaeologists, the most useful findings that comparative ethnology can provide are archaeological indicators of human behavior, also called "material correlates" (Ember, Ember 1995), or "proxy measures" (McNett 1979). Thanks to them, archaeologically invisible aspects of society can be inferred from material remains (or other cultural and environmental variables

that can be archaeologically estimated). The first and best-known of these findings was the correlation between household population and total living floor area (Naroll 1962). Replications by other researchers (Brown 1987, Porčić 2012) have shown that the relationship between these variables is very strong and can be roughly expressed by the formula *1 person = 6 m^2 of living floor area*, with the differences between sedentary (7 m^2 per person) and mobile societies (3.25 m^2 per person).

At the turn of the millennium, Peregrine (2004) provided a comprehensive summary of other results from comparative ethnology with implications for archaeological interpretation (see also Ember, Ember 1995, McNett 1979), as well as an overview of other cross-cultural comparative approaches in archaeology. There is no point in repeating them all here, and in this article we focus instead on how the field of comparative ethnology has developed since then.

Recent developments in comparative ethnology

The history of comparative ethnology has gone through several phases. Its beginning is associated with the cultural evolutionists of the nineteenth century, namely E. B. Tylor. His paper "On a Method of Investigating the Development of Institutions: Applied to Laws of Marriage and Descent" published in 1889 was probably the first cross-cultural study using statistical methods. The concept of cross-cultural comparison gradually developed during the twentieth century. Three main directions were established, each associated with a specific university (McNett 1979, Peregrine 1996). Led by A. L. Kroeber, the California School collected cross-cultural data with the goal of classifying cultures into related groups and identifying directions of cultural diffusion. The Indiana School founded by Kroeber's student H. Driver pursued a similar goal but used advanced statistical methods, including cluster and factor analysis. Finally, the Yale School took over the methodological emphasis on statistical analysis from the Indiana School, but newly focused on testing relational hypotheses about human cultural behavior. The key figure here was G. P. Murdock (1897–1985), who with colleagues set up a number of foundational data sets, including the *Human Relations Area Files* (HRAF; Murdock 1950), the *Ethnographic Atlas* (EA; Murdock 1967) and the *Standard Cross-Cultural Sample* (SCCS; Murdock, White 1969). The last phase began 25 years ago with the growing digitization of these large databases and the development of new analytical methods, including phylogenetic analysis and Bayesian statistics.

The first online version of the *eHRAF World Cultures* (https://ehrafworldcultures.yale.edu/) database (developed by HRAF and called *eHRAF Collection of Ethnography* at that time) was available in 1997. This on-line accessibility, together with the development of effective search tools (the database is not only full-text but also indexed at the paragraph level), has facilitated the work with primary ethnographic literature for a wide range of researchers from different parts of the world and different disciplines. As of 2023, the database contains ethnographic collections of more than 360 cultures and is continuously being updated.

In the mid-2010s, the *Database of Places, Language, Culture, and Environment* (*D-PLACE;* https://d-place.org) was launched (Kirby *et al.* 2016). This open-access database brought together a wealth of coded cultural data that had previously only been available in disparate and relatively inaccessible repositories, including the *Ethnographic Atlas* (Murdock 1967), the *Binford Hunter-Gatherer dataset* (Binford 2001), the *Standard Cross-Cultural Sample* (Murdock, White 1969) and *Western North American Indian database* (Jorgensen 1980), and made them available to the public. Moreover, D-PLACE links the information on human cultural traits to relevant linguistic, geographic, and environmental data that allows scholars to consider the relative influence of cultural ancestry, spatial proximity, and environment on diverse cultural practices. Overall, D-PLACE includes a wide range of data on more than 1,400 human cultural or ethnolinguistic groups.

In a similar vein, albeit regional and not global, *Pulotu* (https://pulotu.com/) – an open access database of Austronesian religious beliefs and practices – was created (Watts *et al.* 2015). It contains 86 variables on religion, history, society, and the natural environment for 137 cultures from the Moken of mainland Asia to the Māori of New Zealand. One of its unique features is that it has separate sections on the traditional state, the post-contact history, and the contemporary state for each culture.

Two databases based primarily on historical data, *Seshat: Global History Databank* (https://seshatdatabank.info/; Turchin *et al.* 2015) and the *Database of Religious History* (https://religiondatabase.org/; Slingerland, Sullivan 2017), are also worth mentioning, as is *Explaining Human Culture* (https://hraf.yale.edu/ehc; Ember 2016), an open access database of results of over 1,100 cross-cultural studies that makes it possible to search for specific hypotheses and variables. For a recent discussion of how cross-cultural databases are created and what their limits are, see Slingerland *et al.* (2020) and Watts *et al.* (2022b).

The availability of sufficient computing power and software has led to the development and popularity of sophisticated analytical methods (Gelman, Hill 2007, McElreath 2020). Compared to simple correlations, advanced statistical models allow for the examination of relationships among multiple variables and better handling of uncertainty. This makes it possible to assess the relative importance of different factors on the emergence and distribution of cultural traits, which in turn can lead to the better generalizability of the obtained cross-cultural results.

One of the main methodological advances in comparative ethnology was the introduction of phylogenetic approaches adopted from evolutionary biology (Mace, Holden 2005, Mace, Pagel 1994, Nunn 2011). Using linguistic and/or genetic relatedness of cultures as a proxy for their common ancestry, these methods help to control the possibility that some correlations may be simply due to the non-independence of cultures, long-term issue of cross-cultural research originally identified by F. Galton (Tylor 1889; but cf. Ember, Ember 2009: 107–110, for contrary view). Phylogenetic methods also provide new opportunities for the study of cultural evolution. In particular, they allow several types of evolutionary analysis, including ancestral state reconstruction (what was the earlier form of a cultural trait?); cultural transformation models (how do traits change form?); correlated evolution (do traits change together?); and analysis of the tempo of evolution (how and when do cultural traits diversify; Kirby *et al.* 2016).

In summary, comparative ethnology has been an important discipline, especially in American anthropology, in the second half of the 20th century. As *Figure 1* shows, it reached its peak of popularity in the 1970s and subsequently began to decline. However, with the digitization and accessibility of ethnographic data since the beginning of the 21st century, it is flourishing again.

Case studies

According to *Explaining Human Culture* (Ember 2016), more than 470 cross-cultural studies have been published between 2000 and 2022 (https://hraf.yale.edu/ehc/documents, calculated using search syntax *pub_year:[2000 TO 2022]*. Accessed 25 April 2023), and there are undoubtedly many others not included in the database. The purpose of this article is not to discuss all of them. In order to illustrate how comparative ethnology can be useful for archaeological research, we will focus on just two thematic areas that are close to our own research, namely hunter-gatherer and kinship studies.

Use of comparative ethnology for hunter-gatherer archaeology

The following section presents the results of more than twenty studies that have used ethnographic information about recent hunter-gatherers to help resolve archaeological questions. These range from cave use, clothing, fire use, weapons, childhood behavior, human-dog relations, to religion. These examples demonstrate the breadth and variation of topics that can be studied using comparative ethnology.

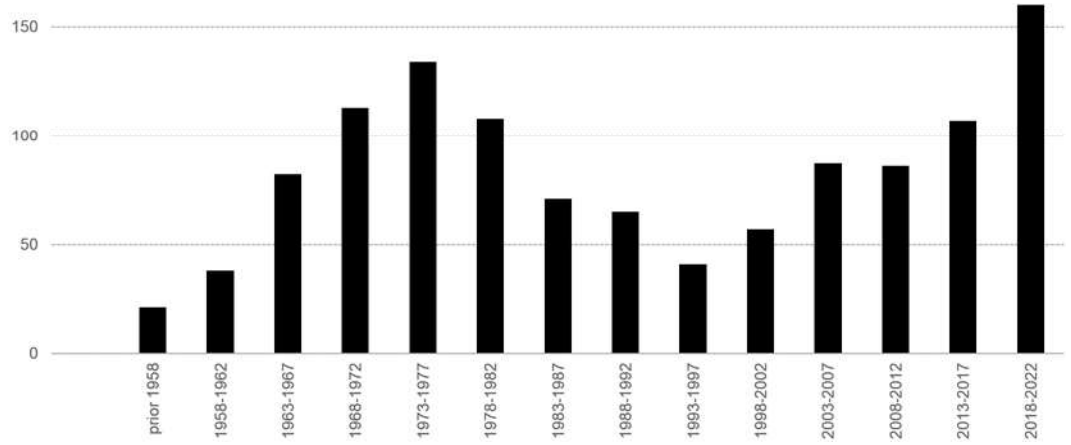

FIGURE 1: Popularity of cross-cultural research, based on the number of cross-cultural studies published at 5-year intervals, as compiled in the Explaining Human Culture database (Ember 2016). Calculated using search syntax pub_year:[]. Accessed 25 April 2023.

One of the largest cross-cultural studies on hunter-gatherers, including 478 societies, examined several relationships between social organization, habitat, and technology (Marlowe 2005). From an archaeological perspective, the most interesting findings are the links between human behavior and the natural environment, as the latter can be inferred to some extent from the archaeological record. Marlowe confirmed the previous finding that in higher latitude areas, with colder temperatures and fewer plants, gathering is less important, while hunting and fishing are more important. He also showed that population density increases with higher primary biomass, but it levels off once primary biomass reaches about 30 kg/m^2. Above this level, other factors become more important, such as the abundance of anadromous fish. Fishing is also associated with other traits such as lower mobility and a higher male contribution to diet.

Singh and Glowacki (2022) presented the case against the assumption that until 10,000 years ago humans lived predominantly in small, mobile, relatively egalitarian bands. Instead, they argue that Pleistocene societies were much more diverse. Using ethnographic and archaeological evidence from 34 world regions, they show that low-mobility, large-scale, non-egalitarian foragers are not anomalous and emerge in environments with dense, rich, reliable resources (see also Roscoe 2006, Smith, Codding 2021). Given that humans have occupied these environments for tens of thousands of years, it is likely that their exploitation led to the development of large, hierarchical, and semi-sedentary societies long before the emergence of agriculture (but cf. Marlowe 2005: 58). Although such societies would only exist in a limited area, due to their larger sizes and higher densities, they might represent a considerable proportion of the total human population.

Fry *et al.* (2020) examined lethal aggression across 30 forager societies. They found that only group-on-group type of lethality significantly correlates with complexity variables (specifically, population density, sedentism, size of local groups, social class, and slavery). On the other side, no other type of lethal aggression (including homicide and manslaughter) correlates with social complexity variables. Corresponding to worldwide archaeological findings, the results suggest that war is not typical for mobile forager band social organization. Instead, it supports the theory that war develops along with sociopolitical complexity, including increases in population density. However, other authors argue that the data on hunter-gatherer warfare tell a different story (e.g. Ember, Ember 1997, Glowacki 2023).

Although caves and rock shelters have been the most frequently excavated sites by paleoarchaeologists, systematic cross-cultural research on this topic is rare. One recent exception is Agnolin (2021), who analyzed the use of these kinds of sites among 113 hunter-gatherer groups from four continents. Only five societies in the sample do not use caves, often out of fear of supernatural entities. The others use them for a great variety of purposes, including residential, funeral, ritual, as a storage space, shelter in storms, logistical camp, refuge during war, resting place, stop during travels, or for resource extraction. Contrary to the widespread assumption that caves and rock shelters constitute efficient solutions under hard climatic conditions, Agnolin shows their use as residential camps is limited to tropical and temperate climates. At high latitudes, foragers prefer a solution in the form of transportable housing. Therefore, at least after the invention of complex means of transport such as boats and sleds, the residential occupation of caves in cold climates was probably rare and limited to scarce sites with exceptional ecological resources. Whether these conclusions can be applied to Neanderthals and other members of the genus *Homo* is open to question. In any case, the results suggest that caves cannot be considered as representative sites of the regional archaeological record.

Other scholars examining the use of caves and rock shelters through the method of comparative ethnology used relatively smaller samples. For example, Galanidou (2000) analyzed 35 sites occupied by 10 cultural groups from tropical and arid regions, including both mobile foragers and semisedentary horticulturists. The results suggest the size of caves does not affect whether they are occupied or for how long (but cf. Anderson 2007). Galanidou also found no evidence for any connection between the amount of energy invested in hearths and the length of occupation. Degree of mobility is a more important factor; sedentary groups are more likely to build hearths requiring a high-energy investment (e.g., stone-lined, log-lined, ovens). There is also no simple correlation between the number of hearths and site size. Instead, several variables influence the number of hearths, including group's attitude toward hearth reuse, social composition of the occupying group, and the character of on-site activities. The sample of sites examined also indicates there are no universals regarding patterns of refuse disposal, "since spatial perceptions and feelings about comfort and impurity are culturally specific" (Galanidou 2000: 253). Simply put, rock shelters of some groups are "tidier". Likewise, the author cautions against attempts to identify activity areas in

these types of sites, because "it is impossible to distinguish whether debris associated with an activity is in primary or secondary deposition" (ibid. 260). On the other hand, sites inhabited by members of the same culture tend to contain very similar site furniture (e.g. stone walls, windscreens, artificial sand ridges), which presents archaeologists with the opportunity to identify sites used by the same cultural group.

The use of ethnographic data contributed to the debate on clothing differences between Neanderthals and early modern humans (Collard *et al.* 2016). The researchers first identified mammalian families that recent small-scale societies from mid-to-high latitudes used to manufacture cold weather clothing. Then they compared the frequency of occurrence of these families between Mousterian and Aurignacian/Gravettian archaeological strata. Since mammalian families used for cold weather clothing occurred in both contexts, authors argue that both Neanderthals and early modern humans made clothing. However, the higher frequency of leporids, mustelids, and canids remains in Aurignacian/Gravettian strata suggests that early modern humans added fur trim to their clothing to make it more thermally effective. This supports the hypothesis that the Neanderthals employed only cape-like clothing while early modern humans used specialized cold weather clothing.

Thermoregulatory needs may not have been the only motivating factor behind the origins of clothing. Investigating ethnographic data on 10 recent hunter-gatherer populations, Buckner (2021) provided arguments for multiple other social and functional pathways to the emergence of clothing, especially in warm climates. Those include disguise (in contexts of hunting, interpersonal violence, or religious practices), modesty norms, protective needs in conflict situations, and concerns over status. While the author did not explore under what conditions these alternatives play a major role, the very range of possible causes helps to expand our imagination and inspire further study.

The ways in which early *Homo sapiens* (and hominins in general) used fire are still poorly understood, although remains of fire use are common in the archaeological record. Two recent studies have attempted to change this with comparative analyses of fire use by recent foragers. McCauley *et al.* (2020) focused on the use of fire in settlements. They analyzed a global sample of 93 hunter-gatherer societies and studied how these groups created and preserved fire, the ways in which they used it, and when and where they created it. Although many of the results were expected (e.g., all of the groups used fire to cook, the most common fuel was wood), the authors came up with some surprising findings. First, they found that several groups did not know how to make fire using traditional methods or had very few members who knew how to use such methods. This means that fire making, like any other technology, requires both theoretical knowledge and practical skills that can be lost over time. One should therefore not treat fire making as an on/off skill and not assume that fire has been used continuously since it was first discovered. That means that an absence of fire residues at Pleistocene sites may indicate the absence of fire making knowledge rather than simply the effects of formative processes. Another interesting finding was that many groups preferred to preserve fire than to create it anew, even to the point of carrying it between camps. The prevalence of the practice of preserving fire suggests that fire remains in Pleistocene contexts are not necessarily evidence of the ability to make fire. Instead, they can only reflect the ability to collect naturally occurring fire and maintain it for long periods. Last but not least, fires intended for a single use were relatively uncommon among surveyed groups; most fires were used for multiple functions. This can have implications for the number of anticipated fire structures at archaeological sites.

Scherjon *et al.* (2015), following a previous study by Mills (1986), explored a different type of fire usage, namely burning practices in the landscape. They collected more than 230 individual references to off-site fire use among recent foragers from all parts of the world. Their data demonstrates that people used fire for a wide range of purposes, including the direct procurement of food, communication, stimulating the growth of edible plants, clearing pathways, and entertainment. Interestingly, off-site burning was common in all types of environments, except tundra, where only use for signaling has been recorded. According to the authors, the ubiquitous usage of fire off-site in the ethnographic record (in contrast to sparse archaeological evidence) suggests that this activity may have been as old as the regular use of fire. They argue that burning the landscape could have been an important tool in the niche construction activities of Pleistocene hunter-gatherers, particularly in contexts where other technologies and subsistence aids, such as guns or dogs, were lacking.

From fire to cooking. Nelson's (2010) analysis of 152 cultural groups provided several implications for the study of prehistoric cooking. First, it shows that the use of stone boiling (i.e. the use of heated stones to

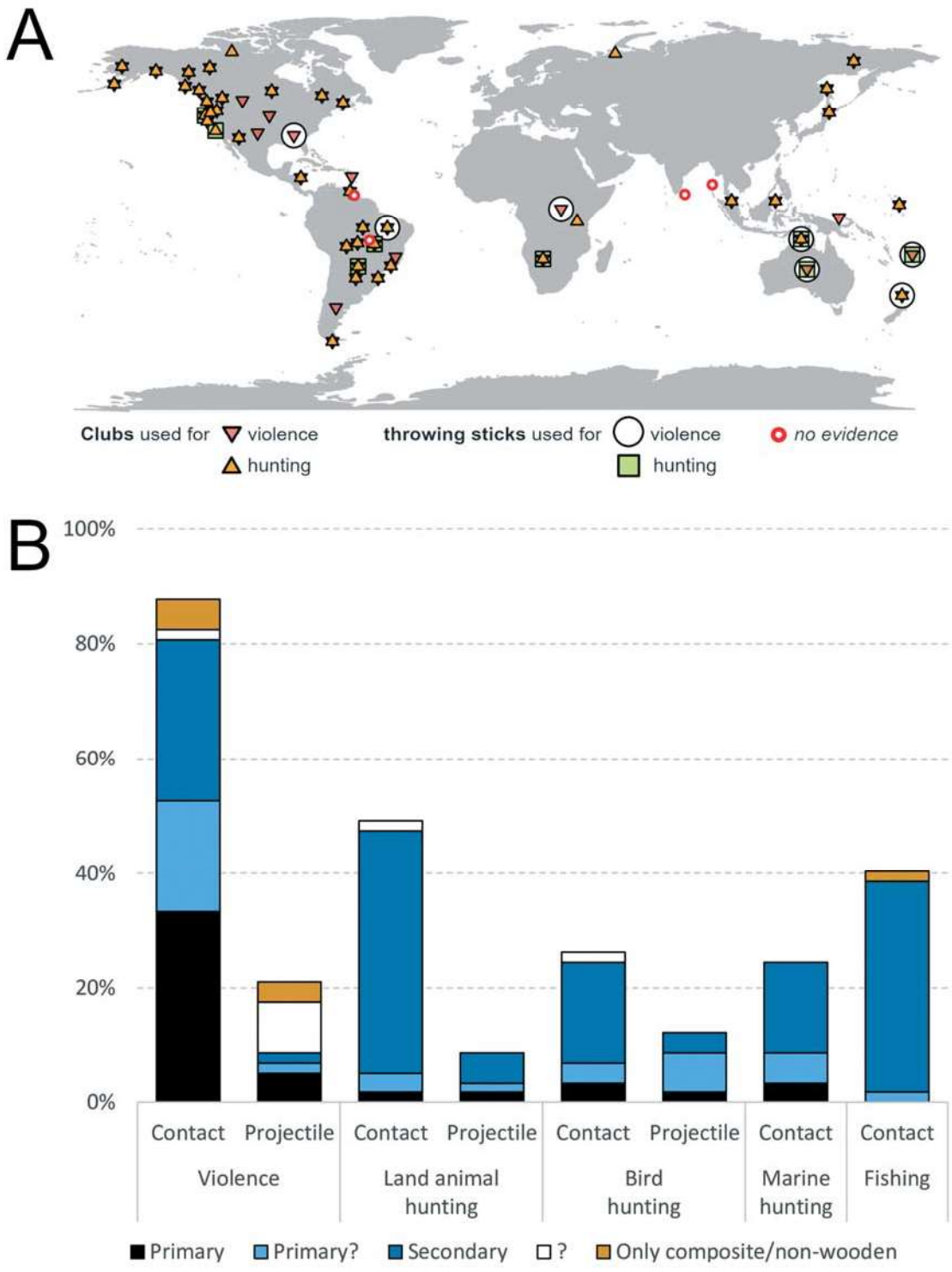

FIGURE 2: A. Global distribution of 57 foraging societies in the sample. Symbols indicate the documented use of clubs and throwing sticks (including non-wooden and composite weapons) for hunting and violence. B. Five main activities for which wooden clubs (contact) and throwing sticks (projectile) were reported to have been used as a primary or secondary weapon. Adapted from Hrnčíř (2023).

cook) is closely related to latitude (as a proxy for effective temperature) and rainfall; it is more likely in areas with effective temperatures above 10.3 °C and range in rainfall variability greater than 100 mm per year. The major factor for the presence of stone boiling is abundance of fuel resources (such as wood) and the intensity of labor required to collect these resources. Second, there is a relationship between the material of the vessels and the cooking method. Bark and basketry containers are primarily used for stone boiling, while pottery and stone containers are typical for direct fire boiling. In addition, the author notes that a single group often uses more than one cooking strategy and that many cooking vessels are made of materials that would not be represented in the archaeological record.

Not only containers made of organic materials are rare in the archaeological record. This is also the case of the earliest weapons, such as wooden spears and clubs. In addition to experimental archaeology (e.g., Dyer, Fibiger 2017, Milks *et al.* 2019), a systematic review of their functions and distribution amongst recent ethnographically documented populations can serve to explain their use in the past. Milks (2020) conducted one such study, focusing on the use of wooden spears for hunting and interpersonal violence. She collected 76 ethnographic records from North America, South America, Africa, and Oceania, including both foragers and farmers. Contrary to previous assumptions (e.g., Churchill 1993), she demonstrated that even untipped wooden spears "are not limited to either small or large game procurement, and are capable of killing a variety of animals of different size classes and with differing behaviors and ecologies" (Milks 2020, 11). Moreover, wooden spears were recorded as having been utilized with nearly all known hunting strategies and associated technologies. They can serve as contact thrusting weapons, as hand-thrown weapons, and/or as multifunctional implements, both in hunting and human violence. Overall, the study shows that wooden spears are much more powerful weapons than previously assumed.

In a similar way, Hrnčíř (2023) conducted a cross-cultural study on the use of wooden clubs and throwing sticks among 57 recent foraging societies. Ethnographic sources provided evidence for widespread use of clubs as contact weapons in more than 90% of societies (*Figure 2*). The results also showed that 33% of societies used clubs as one of their main fighting weapons, whereas in hunting the club usually served only as a secondary tool. The use of throwing sticks was less frequent and was documented in only 12 surveyed societies. Based on these results and other evidence, Hrnčíř argues that the use of contact wooden clubs by early humans was highly probable, despite the lack of direct archaeological evidence. However, this does not mean that all prehistoric human groups used clubs with equal intensity or that the club was some standardized piece of weaponry. On the contrary, it could take many forms, from a simple crude stick to a long stave or a curved and decorated heavy club with a strong symbolic meaning, which existed only in certain regions or periods.

Comparative ethnology has also helped to shed light on questions concerning the use of stone projectile tips. Ellis (1997) showed that stone-tipped weapons have several liabilities that may outweigh their greater general effectiveness. These include the need for suitable stone sources, excessive investment in time and energy to their production and maintenance, a shorter use-life, and lower reliability due to the brittleness of the stone. These limitations and the almost exclusive ethnographic association of stone points with large game (and to some extent with warfare) then led the author to the conclusion that "in prehistoric cases one can almost always assume that stone points were used in large animal hunting" (Ellis 1997: 63).

The following studies show how comparative ethnology can help interpret particular archaeological findings. For example, McCauley *et al.* (2018) tried to shed light on the phenomenon of hand images with missing phalanges that occur at a number of Upper Paleolithic rock art sites in France and Spain. Their review of the ethnographic literature identified 121 societies from Africa, Asia, the Americas, and Oceania that engaged in finger segment amputation. The cross-cultural prevalence of this practice suggests that at least some of the images actually involved hands with removed finger segments, in contrast to the theories that images represented hand signals or a counting system created with intact hands (but cf. Etxepare, Irurtzun 2021, Overmann 2014). McCauley and colleagues were able to distinguish 10 distinct amputation practices within their sample, including the removal of phalanges as a sacrifice to a deity, an expression of extreme grief, marking group membership, attempts to heal sickness, a signal of marital status, punishment, part of veneration, an offering, trophy, and talisman making. Considering the context of the known incomplete hand images, authors conclude that the most likely explanation is voluntary sacrifice to a deity or supernatural power. This would fit well with one of the major hypotheses, namely, that the caves with Upper Paleolithic rock art represent sanctuaries or shrines.

Other Upper Paleolithic images and engraved artefacts have been speculated to have possible astronomical significance. Hayden and Villeneuve (2011) therefore investigated the role of solar and astronomical observations within a global sample of 82 recent foragers. Their results show that almost all of them had some kind of astronomical system. However, the more elaborate types of observations, often associated with the keeping of calendars and the scheduling of major ceremonies, were common only among "complex" hunter-gatherers (i.e. those with relatively high population density, seasonal or full sedentism, social stratification, hierarchical organization etc.). Eighty percent of them exhibited some solstice observation and/or calendars (most often lunar). Interestingly, the winter solstice appeared to have played a more important role than summer solstice or the equinoxes. Based on these findings, the authors argue that some art-producing Upper Paleolithic societies may have had calendrical knowledge (at least at the level of detailed solstice monitoring) that primarily served them for establishing the dates of large feasts and important ritual ceremonies. Hayden and Villeneuve admit that the supposed "notational" counts on some artefacts might be used in monitoring solar and/or lunar movements. However, they also suggest that other notations may have been used as tallies for keeping track of debts usually associated with feasts. In the same paper, the authors also conducted a small accompanying survey of 26 cultures on star constellations. The results show that hunter-gatherers perceived star configurations differently than Westerners, indicating that Paleolithic cave images of animals or humans probably do not represent constellations in the modern sense of star patterns.

Related cross-cultural study by Overmann (2013) analyzed the association between cultural complexity, number systems, and timekeeping behavior. The results suggest that increases in material complexity, especially material possessions with a specific social value, precede increases in the highest number counted and the use of material devices for counting (see also Divale 1999). Moreover, "increased complexity in material culture and numeration systems was consistent with an increased use of material devices, solstices and quantification for timekeeping" (Overmann 2013: 35). Based on this ethnological perspective, the author proposes that Pleistocene societies who manufactured artefacts with possible numerical and calendrical notations (e.g., those from Abri Blanchard, Abri Cellier, and Grotte du Taï) had complex material cultures, developed numeration systems and quantitatively structured concepts of time.

Several recent studies have shown that cross-cultural ethnographic research can provide many insights into understanding past childhood behavior, which can help us create a more complete and dynamic image of past societies. For example, Ember and Cunnar's (2015) study on children's play and work suggest that children between six and ten most probably were doing at least some subsistence work in agricultural and pastoral societies. On the contrary, children's economic contributions amongst hunter-gatherers were more variable – ranging from rare to substantial – therefore not allowing any inference about children's work patterns in this type of subsistence. A possible explanation for minimal children's contribution in some forager societies may be the dangerous environment, but this hypothesis requires further testing. Regarding children's play objects, Ember and Cunnar show that most of them were made of organic materials (wood, fiber, plants, leaves etc.), which are rarely preserved archaeologically. Moreover, stones and pebbles used for play were often unmodified manuports (depending on children's imagination or used as missiles to play hunting). Thus, archaeologist can uncover only a minimum of children's toys (e.g. ceramic objects). For a similar conclusion about the toy weapons, see Kamp and Whittaker (2020). Scholars also agree that it may be difficult for archaeologists to infer that a particular object was for the sole use of children. Unfortunately, comparative ethnology has not provided much help in this respect so far. Nevertheless, cross-cultural trends suggest that most of the objects that hunter-gatherer children interact with are full-sized or miniature versions of adult tools and that children often engage in play with risky objects such as knives, canoes, or stilts (Lew-Levy *et al.* 2022).

Langley and Litster (2018) focused on the common archaeological practice of applying the adage "it's ritual" to any artefact or feature that cannot be explained by economic or technological activities. Using a comprehensive review of the ethnographic literature on recent hunter-gatherer children, the authors demonstrate that significant overlap exists between objects associated with children's play and those used in adult rituals (such as figurines/dolls, musical instruments, miniature weapons and tools, ornamentation, collectibles, etc.). Given the fact that children were a significant part of past societies, it is likely that many of the previously identified "ritual items" were misinterpreted. Although the authors do not

provide a simple solution to distinguishing the material remains of childhood activity from adult ritual behavior, the very awareness of this problem encourages the search for alternative explanations of prehistoric art and unusual objects.

Comparative ethnology can also shed light on the early relationship between humans and dogs. Ethnographic records of 85 hunter-gatherer groups shows that the use of dogs in hauling and/or hunting is supported and constrained by different ecological and economic circumstances (Lupo 2019). The use of dogs in hauling activities is common in cold biomes, where foragers are usually highly mobile and dependent on widely dispersed, seasonally variable meat and aquatic resources. On the contrary, habitual haulage is not found among groups occupying biomes with extremely high temperatures (e.g. tropical forest or subtropical desert) that are heavily dependent on gathered resources; instead, dogs were used largely for hunting in these biomes. Lupo's study further highlights the importance of provisioning in establishing and supporting dog populations. The author argues that hauling and hunting dogs, especially in cold biomes, could not feed strictly on anthropogenic food waste, but they required intentional provisioning by their human companions. For this reason, dietary differences between wild and domesticated canid populations should be theoretically detectable in the zooarchaeological record.

The role of ecological constraints on dog-human coevolution was also suggested by Chambers *et al.* (2020). In their study of 144 non-industrial societies, they showed that dog-human mutual utility and dog-personhood (i.e. the perception that dogs have their own identities) negatively correlate with temperature; both are higher in colder climates. Results also suggest a non-linear relationship with pathogen stress; more pathogen stress predicts more mutual utility and dog-personhood up to moderate-high level and then the relationship becomes negative at higher levels. This indicates that zoonotic disease may be an acceptable risk of dog-human interaction only up to a certain point. However, dog-human coevolution was not only about ecology. The authors found several other factors predicting close dog-human interactions, including hunting, low population density, and intergroup violence.

Recently, Chira *et al.* (2023) showed that the dog-human relationship is closer in societies where dogs fulfil multiple purposes, such as hunting, guarding, or herding. However, not all of a dog's functions affected treatment equally. For example, hunting was particularly associated with increase in dog-personhood, while guarding with decrease in negative treatment. Positive caregiving was then associated especially with herding (and to a lesser extent, guarding of herds and carry functions). These findings suggest that the relationship between people and dogs strengthened over time as dogs got more functions beyond the ancestral roles of guarding and hunting.

Finally, let us mention two studies that used a phylogenetic approach, both investigating the early evolution of religion. In the first study, Peoples *et al.* (2016) reconstructed ancestral states for seven characters of religiosity in a global sample of 33 hunter-gatherer societies. Their results suggest that the oldest trait of religion was animism, followed in turn by a belief in an afterlife, and then shamanism and ancestor worship. Whether these three characteristics were present in the last common ancestor of present-day hunter-gatherers cannot be determined. On the contrary, belief in either ancestral spirits or creator deities who are active in human affairs was most likely absent in early humans. In the second study, Watts *et al.* (2022a) identified several factors associated with the emergence of professional religious specialists, including environmental predictability, environmental richness, pathogen load, the presence of widely recognized community leaders and food storage systems. However, only the latter variable was robustly and directly related to the presence of religious specialists, and the causal model suggested that it was food storage that facilitated professional religious specialization, not the other way around. This suggests that the emergence of healers, mediums, shamans, and sorcerers was the outcome rather than driver of increased socio-economic complexity.

Now, let us look at the second thematic area where comparative ethnology provides interesting insights, namely matrilineal descent.

Comparative ethnology and matrilineal descent

Kinship systems are the unifying element of all human cultures, since every society is primarily structured according to kinship ties. However, this is where the overall similarity ends because the particular norms are extremely culture specific. At the same time, ethnology itself is almost "obsessed" with kinship systems and devotes a lot of space to this topic (Fox 1983).

There are two main types of descent systems: cognatic and unilineal (Sanderson 2014). In cognatic groups, descent is counted along both the mother's and

the father's line. Unilineal descent is descent through a single parental line, either that of the father (known as patrilineality) or that of the mother (matrilineality). Cross-cultural comparisons bring a basic overview of the proportions of these systems across human societies. According to the *Ethnographic Atlas* (Murdock 1967), only about 29% out of 1,267 preindustrial societies are cognatic. Most human cultures are thus unilineal, with 52% patrilineal and 14% matrilineal. There is a long anthropological debate about whether patriliny or matriliny is evolutionarily older. Based on a comparison of humans and primates, it seems that matriliny is older, but the issue is still not settled (e.g. Chapais 2017, Knight 2008).

To be clear, matrilineal kinship organization emphasizes interactions between individuals related through the mother (*Figure 3*), while patrilineal group membership is obtained through the father. However, these systems are not simple opposites. While the line of authority and the line of descent both run through males in the patrilineal descent groups, in matrilineal societies the group affiliation runs through the female line but the line of authority still runs through men (Schneider 1961, 7). Matrilineal descent also means that inheritance of titles and property rights run through the maternal line. This leads to a situation in which males inherit from their maternal uncles (their mother's brothers) rather than from their fathers (Mace, Holden 1999).

Several articles have recently studied the cultural correlates that would explain the low frequency of matrilineality. Why? Because matrilineality is associated with an evolutionary paradox known as the "matrilineal puzzle". This refers to the potential tension in this social system arising from the conflict between the interests and responsibilities of men in their roles as brothers/uncles versus husbands/fathers (Fortunato 2012). In the matrilineal system, every male is a member of his own mother's kin group, while his children are members of his wife's (their mother's) kin group. Therefore, in matrilineal systems, men are expected to invest resources in their sister's children instead of their own, "which appears to violate the evolutionary predictions of inclusive fitness that individuals will prefer to invest resources in their closest kin" (Surowiec *et al.* 2019: 1). This puzzle was explained by the so-called "paternity uncertainty" caused by the fact that marriage and marital fidelity in matrilineal societies appeared relatively weak (Flinn 1981). When paternity uncertainty is high, men tend to invest in their biological matrilineal kins (for example offspring of their sisters). However, Hartung (1985) has suggested that matrilineality may be also a direct female strategy in some cases. Although political power rests at the male level, it is the female gene line that benefits most from inherited resources. Other authors agreed with Hartung and proposed that a matrilineal social structure can arise from daughter-biased wealth inheritance and other forms of altruism by parents and/or grandparents (Holden *et al.* 2003).

It has been known since the 1960s that matrilineal systems are more common in horticultural societies, rather than those using the plough and raising large livestock. Aberle literally stated that "the cow is the enemy of matriliny and the friend of patriliny" (Aberle 1961: 680). Matrilineality in this sense is a strategy that favors the female line that control resources. If horticulture is more compatible with matrilineality it

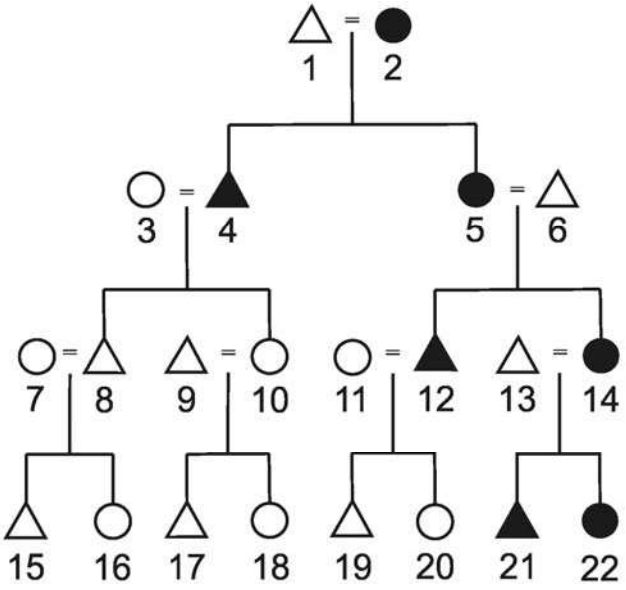

FIGURE 3: Matrilineal descent. Individuals 4 (male) and 5 (female), who are the children of 1 and 2, affiliate with their mother's kin group (black color). In the next generation, individuals 12 and 14 also belong to the matrilineal kin group, since they take their descent from their mother (female 5), who is a member of that group. However, the children of male 4 do not belong to this matrilineal group, since they take their descent from their mother (female 3), who is a member of a different group. Their father, although a member of the matrilineal group, cannot pass his affiliation on to them under the rule of matrilineal descent. In the fourth generation, only individuals 21 and 22 belong to the matrilineal group, since their mother (female 14) is the only female member of the preceding generation who belongs to the group. Modified after Pasternak *et al.* (1997).

means the fields are generally owned by women and they are inherited through the female line. It is not advantageous for men to invest work and social energy into property (fields, gardens) which they are not able to control and inherit. In this situation, men tend to be more fluid in the sense of mating and marriage. But if ownership is oriented more towards movable property such as cattle, the males take control of them, and the society will instead be patrilineal (Mace, Holden 1999). The authors further test their hypothesis, and they reveal a significant negative relationship between matriliny and cattle in past Bantu-speaking cultures. They also suggest that Bantu-speaking cultures in east and southern Africa were matrilineal before they acquired cattle, and then become patrilineal (Holden, Mace 2003).

On the example of Sub-Saharan Africa, Mace and Holden (1999) show that matrilineal societies tend to be spatially connected with other matrilineal groups. They also suggest that there may be functional reasons in the adaptive sense because the location of the matrilineal cluster is strongly correlated with the tsetse-infested areas of Africa where it was not possible to keep cattle. However, Divale's (1974) work on matrilocal (not necessary matrilineal) societies suggests the opposite: matrilocal societies tend to have languages that are in different language families, supporting his theory that matrilocality arises in societies that have recently migrated.

Other researchers have also attempted to search for predictive cultural and environmental relations of matrilineality. Benyishay *et al.* (2017), for example, used 79 small-scale horticultural fishing communities in Melanesia, as well as two worldwide samples, to study how the proximity of a marine environment shapes social institutions. As a proxy for the quality of marine environment, they took a reef density and revealed that it positively predicts the prevalence of female land inheritance in the Solomon Islands and across the world. The sexual division of labor can explain this relationship: in areas rich in marine resources, men specialize more in fishing, while women in horticulture. Because fishing encourages prolonged male absence (and thus lowers paternity certainty) and at the same time reduces the incentives to transmit land to sons, transferring wealth to daughters may be more beneficial for parents in terms of reproductive fitness.

Recently, Surowiec *et al.* (2019) tested the majority of already established hypotheses that relate matrilineality with specific subsistence and with other culture traits. They found that matrilineal descent was primarily positively associated with other female-based aspects of the kinship system (matrilineal inheritance of real and movable property, matrilocal residence, and female-biased hereditary political succession) and negatively associated with their male-based counterparts. On the other hand, matriliny was negatively associated with several subsistence-related traits, such as intensive agriculture, plough cultivation, milking and specialized metal working. In contrast to Murdock's (1949) prediction, their evolutionary analysis indicates that it might not be uncommon for matriliny to develop first, prompting a transition to matrilocality.

The aim of another paper was to estimate the cross-cultural and comparative frequency of transitions away from and to matrilineal descent, as well as to explore potential causes underlying these patterns (Shenk *et al.* 2019). The researchers found that transitions away from matriliny were significantly more common than "reverse transitions" to matriliny. They also confirmed earlier hypotheses about strong relationships between transitions to pastoralism, intensive agriculture and market economies with respect to social complexity and the importance of ecological factors (Gough 1961). The question is how much of this process was influenced by external and mostly recent socio-political constraints. We should probably see missionaries, bureaucrats, and the increased mobility that emerged in the colonial world and continues in the modern globalized era as the enemies of matriliny.

How are these findings relevant to archaeology? Quite significantly, because they show that kinship systems of past societies can be hypothetically inferred from cultural and environmental correlates that are associated with patrilineal or matrilineal systems. From a cross-cultural perspective, matrilineal descent is positively associated with horticulture and fishing, but it is rare in societies with intensive plough cultivation and large domesticated animals (Aberle 1961, Benyishay *et al.* 2017, Surowiec *et al.* 2019). Similar inferences can be made regarding the post-marital residence, which is not identical to the descent but is highly correlated with it (Divale *et al.* 1976: Table 1). For example, a link was found between post-marital residence and dwelling size: societies with large houses (with floor area over ca. 65 m^2) tend to be matrilocal, while smaller dwellings are more likely found among patrilocal societies (Brown 1987, Divale 1977, Ember 1973, Hrnčíř *et al.* 2020a, Porčić 2010).

In addition to the search for cultural correlates, several recent studies have attempted to reconstruct past kinship systems through phylogenetic comparative methods. Using language trees as a proxy for historical

relationships between populations, the evolution of post-marital residence rules has been reconstructed for several language families. The results suggest that early Austronesians were matrilocal and matrilineal (Fortunato, Jordan 2010, Jordan *et al.* 2009), the first Bantu were patrilocal and patrilineal (Opie *et al.* 2014), early Indo-Europeans practiced patrilocality and/or neolocality (Fortunato, Jordan 2010), and Tupi ancestors were matrilocal (Walker *et al.* 2012). The researchers also found that in Austronesian societies, changes in post-marital residence preceded changes in descent systems (Jordan 2007), whereas in Bantu societies, a change in the descent system was always followed by a shift away from the ancestral post-marital residence state (Opie *et al.* 2014). Using a worldwide sample of societies, Surowiec *et al.* (2019) then demonstrated that matrilineal descent emerges first, followed by a shift towards matrilocality, more often than vice versa.

It is very likely that archaeology will increasingly turn to cross-cultural studies to determine past kinship systems, as the third scientific revolution in archaeology (Kristiansen 2014) has opened up new possibilities for inferring origin, kinship and collective identity. As archaeological and especially bioarchaeological data accumulate, there will be extensive need for testing of anthropological models. However, it must be remembered that archaeologically and bioarchaologically inferred materialization of cultural norms is not necessarily compatible with existing anthropological evidence (Ensor 2021). For example, in her seminal paper (1950), Richards showed the diversity of matrilineal kinship settlement and economic units among Central African Bantu populations living in the geographical area of the so-called "Matrilineal Belt". The matrilineal descent of local groups differs in specific cultural expressions, so in reality the rules of post-marital residence, family composition, property ownership and inheritance may not correspond to the definitional set of matriliny. In addition, there is another issue in the study of kinship system of past societies. Deriving aspects of the matriliny or patriliny based on bioarchaeological indicators (mobility isotopes, aDNA) runs into the problem that it is practically impossible to read from ethnological data how kinship rules are reflected in the funeral rite. Finally, we face the problem of distinguishing different social spaces that do not necessarily overlap geographically (Furholt 2018). For example, although strontium data can reveal mobility (and thus indicate post-marital residence) at the level of regions, it is unable to discern it at the level of individual houses or indicate mobility between different non-localized social spaces such, as clans or moieties (Hrnčíř *et al.* 2020b).

CONCLUSION

Ethnoarchaeology, to which this *Special Issue* is dedicated, is currently in a phase of redefining itself. Some researchers directly consider it an unpromising and intellectually outdated field (Gosselain 2016). Other authors see the potential of ethnoarchaeology as a form of "slow science" that counterbalance "fast science/big science" approaches in archaeology (Cunningham, MacEachern 2016). The latter is oriented towards large multidisciplinary teams in which research managers play a leading role. It is also strongly competitive, data-oriented, methodically technocratic, and often detached from the cultural (social) background of the subject it studies. In their quest for grand narratives and high-impact-factor syntheses, however, "fast/big science" sometimes tends to dismiss the importance of on-the-ground complexities and confuse correlation with causation. In contrast, a "slow science" approach is primarily concerned with data quality, rigorous thinking during research, ethical standards and intellectual responsibilities.

From this perspective, comparative ethnology often tends towards a "fast science" approach. The use of statistical methods and a comparative approach necessarily leads to generalizations and simplifications. The risk of misinterpretation is then all the greater if researchers work only with already processed secondary data, now readily available through databases such as D-PLACE (Kirby *et al.* 2016), as opposed to complex information from ethnographic literature or even primary data collected in the field. (One of the current examples of cross-cultural research focused on the collection and analysis of primary data is the ENDOW project, bringing together researchers from over 40 field sites, see https://endowproject.github.io/.) On the other hand, each method has its trade-offs in terms of accuracy, generalizability, time and financial costs, etc. Therefore, dismissing one for the other makes little sense. Only by combining different approaches together can we get a detailed picture of the past.

In general, we believe that ethnographic data and its comparisons is a great source of information that can help us shed light on our past. It illustrates variation in cultural practices and can provide

supporting arguments for archaeological hypotheses. However, it is important to keep in mind that ethnographic data cannot provide answers (i.e. direct evidence for archaeological theories), only models, hypotheses, and ideas that need to be tested on the archaeological data (Hayter 1994).

Although comparative ethnology broadens our imagination, it can be counterproductive if we become too attached to it. It can weaken our understanding of the diversity of past societies, since it is possible that there were different ways of life in the past that have no counterpart in ethnographically documented societies (French 2019). Unfortunately, no one has yet reliably confirmed that all modern behavior had analogies in the past, nor that all past behavior has reflections in the present.

In terms of methodology, comparative ethnology is still a developing field, and the quality of the studies presented above varies in this regard. While some use complex models, Bayesian statistics, and control for a number of confounding factors, including common ancestry, geographical proximity, the effect of depopulation etc., other studies use only simple correlations based on p-values. It is therefore possible that the results of many studies may not stand up to closer scrutiny, as the problem of the "replication crisis" in other disciplines is currently demonstrating (Baker 2016, Collaboration 2015).

One example is phylogenetic methods, which have helped to reinvigorate cross-cultural research in recent decades. Although they allow the reconstruction of unobservable histories of cultural traits and the identification of directional causality in the contemporaneous distribution of traits, their use is not without pitfalls and their appropriate application is therefore still under debate (Evans *et al.* 2021, Lukas *et al.* 2021). At the same time, other new methods to explore causality from observational data are being developed (Major-Smith 2023, Pearl, Mackenzie 2019). One of the next important steps is therefore to establish certain methodological standards and "best practices". Similarly, "standards for data collection, organization and analysis must be improved and widely adopted" (Slingerland *et al.* 2020: 1).

The aim of this article has been to highlight the possibilities that comparative ethnology can bring to the study of the human past. We hope that this has been successful and that more and more archaeologists will incorporate these methods into their research.

ACKNOWLEDGEMENT

We thank two anonymous reviewers for their insightful feedback on the manuscript. This work builds in part on the knowledge that Václav Hrnčíř gained at the 2021 NSF HRAF Summer Institute for Cross Cultural Anthropological Research (NSF Grant #2020156).

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Václav Hrnčíř
Max Planck Institute for Evolutionary Anthropology, Department of Linguistic and Cultural Evolution, Leipzig, Germany
E-mail: vaclav_hrncir@eva.mpg.de

Petr Květina*
Czech Academy of Sciences, Institute of Archaeology, Prague, Czech Republic
E-mail: kvetina@arup.cas.cz

*Corresponding author.