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Research Article

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Multi-disciplinary Approaches to Prehistoric Kinship Systems of Europe

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Abstract

There has been much discussion of various lines of evidence—genetic, bioarchaeological, and cultural–phylogenetic—that indicate patrilineal and patrilocal kinship systems predominated in Neolithic to Bronze Age Europe. These patterns were unique to this time and place, however, and evidence from prior periods and from other regions outside of Europe suggest a broader diversity in kinship systems that was replaced over time. Moreover, practices such as cousin marriage might have emerged in distinct regions, influenced by subsistence strategies and particular lifeways. In considering this diversity, we propose that the patrilineal/patrilocal developments observed in Europe during the Neolithic and Bronze Age were a distinctive prehistoric process among livestock herders and agriculturalists who dispersed into this region. Patrilineal kinship spread with these dispersals, as it now appears that matriliny was practised at Neolithic Çatalhöyük and in Iron Age Britain, for example. In this context, we can argue for different kinship systems in continental Europe before, during and after the Neolithic.

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Sparked by recent interest in prehistoric kinship, this special issue offers to revisit the relationship between biological and cultural understandings of kinship through diverse methodologies. Since kinship systems can be inherited for long periods of time, it can be crucial to distinguish whether similarity between kinship systems is due to shared ancestry, as opposed to some biological universal. This is especially true for studies of prehistoric kinship in Europe, which was populated by a series of sweeping human dispersals, and therefore reflects broad similarities of genetic, linguistic and material-cultural diversity over time. In terms of prehistoric kinship, Europe should be viewed as a specific set of events over many millennia, and not representative of the variability and fluidity of kinship systems in the world, across time and continents. In Europe, key events for kinship change include the dispersal of Neolithic farmers into Central Europe after about 6000 BCE, followed by dispersals extending from the Yamnaya phenomenon around 3000 BCE.

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In recent years, archaeogenetic research has made a revolutionary contribution to our understanding of prehistoric kinship in Europe (Fig. 1) and other regions of the world (Dong *et al.* 2015; Kennett *et al.* 2017; Ning *et al.* 2021; Wang *et al.* 2025). The sites and interpretations from DNA and/or isotopic evidence from skeletal remains are summarized in Table 1. By integrating archaeological and isotope data with genetic analyses, these studies reconstruct a more nuanced picture of past social organization, revealing complexities and regional or site-specific variations in kinship practices.

Here we explore the case of kinship in prehistoric Europe, arguably the most well-studied in archaeology, in context with the deep evolutionary prehistory of hominins and the more recent prehistory of early farming villages such as Çatalhöyük in central Anatolia, which pre-dates the dispersal of early Neolithic populations into Europe. By doing so, we hope to illustrate that the deep prehistory of kinship was probably matricentric, and the kinship system at Çatalhöyük was possibly matricentric as well, or at least not patrilineal. It is only after the dispersal of relatively small groups of stock-herding farmers into central Europe that the onset of patrilineal kinship is detected through archaeogenetic and isotope studies, with support from cultural-linguistic phylogenetics. Despite the patrilineal organization of these

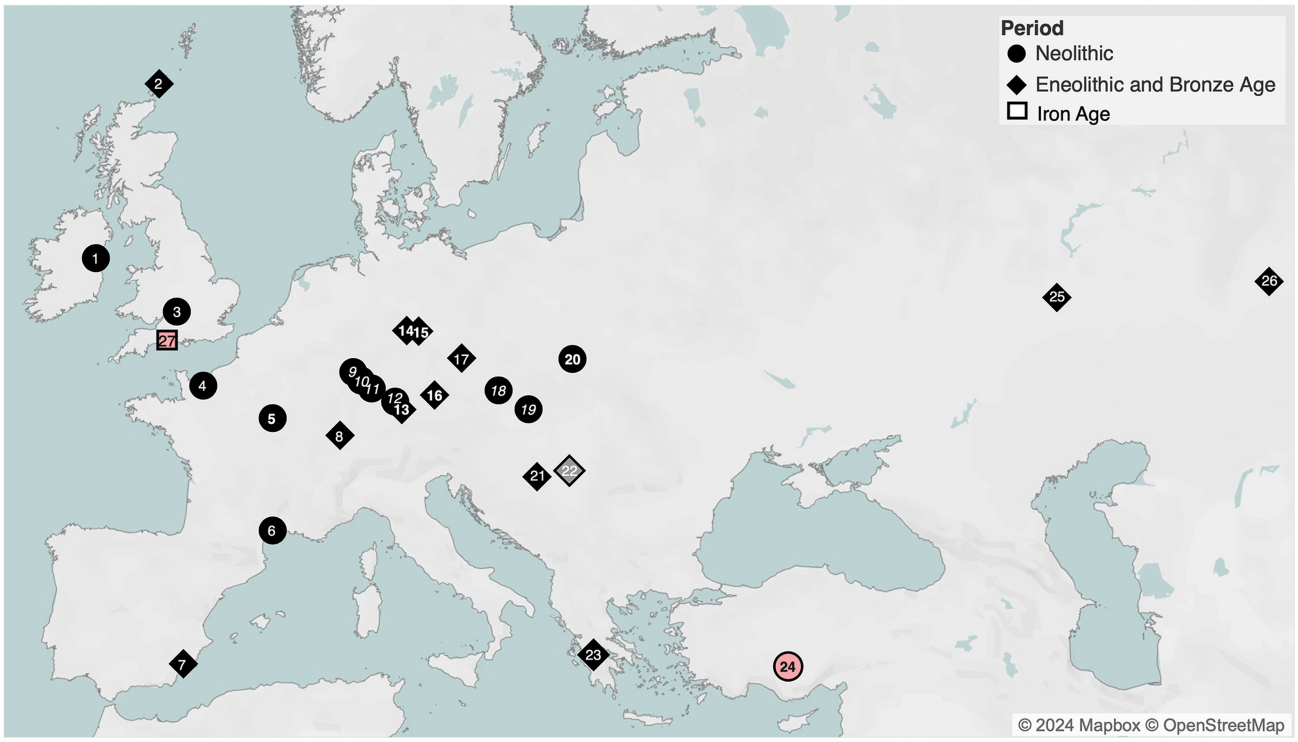

Figure 1. Map of kinship patterns observed through ancient DNA and isotopic studies from Neolithic and Bronze Age sites in western Eurasia (*c.* 7000–1000 BCE). Circles and diamonds represent pre-steppe dispersal Neolithic sites and sites from an Eneolithic or Bronze Age context influenced by steppe dispersals, respectively. A matrilinial Iron Age site in Britain is also shown. Studies based on ancient DNA and isotopes labelled in **bold**, studies based on ancient DNA in regular font and studies based on isotope analysis in *italic*. Black symbols indicate primarily patrilineal and/or patrilocal patterns, while other colours represent other patterns. Numbers indicate sites in Table 1.

early economies, high-status females consistently feature prominently in the archaeological record. Our intention is that by reviewing the series of changes in European contexts, we can help it become a better case study for sharp contrasts with the evolution of kinship systems in less intensively studied regions of the prehistoric world.

Kinship as a foundation of human society

We start with the deep prehistory of kinship as matricentric, which requires the consideration of hominin evolution (e.g. Hrdy 2009). Among hominins, increases in brain size and social complexity likely paralleled a long developmental childhood and extended lifespan (Chapais 2014; Hill *et al.* 2011). Since humans evolved as a highly cooperative species (e.g. Hrdy 2009), further developments enhanced the 'survival of the friendliest' among human groups (Hare 2017). Over the past 80,000 years, reductions in human testosterone levels and increases in serotonin—suggested by cranial 'feminization' in fossil records—indicate behavioural shifts toward reduced aggression, heightened social tolerance and greater cooperation (Cieri *et al.* 2014; Raghanti *et al.* 2018).

Pre-agricultural kinship systems likely coevolved with hormonal and behavioural adaptations that supported cooperative breeding—the shared provisioning and care of offspring. These adaptations included reduced aggression and enhanced nurturance, mediated by lower testosterone and higher oxytocin levels, respectively (Bribiescas *et al.* 2012; Hrdy 2009). For example, men with partners and children often show reduced testosterone levels (Gettler *et al.* 2011; Gray 2011). According to life history theory, the advent of agriculture may have shifted energy allocation away from intensive parental investment in individual children and toward increased reproduction and defence (Wells & Stock 2020). This investment shift from offspring quality to quantity likely favoured patrilineal inheritance systems (e.g. Borgerhoff Mulder 1998; Goodman *et al.* 2012; Holden *et al.* 2003; Shennan 2011).

Kinship behaviours allowed hominins to adapt to diverse and challenging environments by structuring cooperation within and between social groups through social conventions and rituals. Early hominin social organization was likely matricentric, with ancestral structures centred on mothers and their kin. This arrangement reflects the vital role of alloparenting—non-parental assistance in infant care—as a key strategy for provisioning and supporting offspring (Hrdy 2009; Perry & Daly 2017; Sear & Mace 2008; Wu *et al.* 2013). The mother's kin enhanced the survival of offspring in whom mothers were highly invested (Du & Mace 2019; Hawkes 2004; Mace 2013; Shenk *et al.* 2019). The evolution of post-menopausal longevity in humans, which allows post-reproductive grandmothers to assist their daughters and granddaughters, is proposed as an evolutionary outcome of kin-based cooperation on inclusive fitness (Apicella & Silk 2019; Hawkes 2004), even as new evidence for menopause in

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Table 1. Summary of kinship interpretations from ancient DNA and isotopic analyses of skeletal remains from European sites. Abbreviations: FE, female exogamy (patrilocal); P, patrilineal; Ma, matrilineal/matrilocal; N, Neolithic; LBK, *Linearbandkeramik*; MN, Middle Neolithic; LN Late Neolithic; BA, Bronze Age; EBA, Early Bronze Age; MBA, Middle Bronze Age; LIA, Late Iron Age; GW, genome-wide; mt, mitochondrial DNA; Y, Y-chromosomal DNA; Sr, strontium isotopes; O, oxygen isotopes.

Map #	Site/Location	Time period	Evidence	Kinship pattern	Reference
1	Irish megaliths	N	aDNA (GW)	??	Cassidy *et al.* 2020
2	Orkney	BA	aDNA (GW)	FE, P	Dulias *et al.* 2022
3	Hazleton North	N	aDNA (GW)	FE, P	Fowler *et al.* 2022
4	Fleury-sur-Orne	MN	aDNA (GW)	P	Rivollat *et al.* 2022
5	Gurgy 'Les Perrières'	LN	aDNA (GW), Sr	FE, P	Rivollat *et al.* 2023
6	Aven de la Boucle	LN	aDNA (GW)	FE, P	Arzelier *et al.* 2024
7	La Almoloya	BA	aDNA (GW)	FE, P	Villalba-Mouco *et al.* 2022
8	Switzerland	EBA	aDNA (GW)	FE, P	Furtwängler *et al.* 2020
9	Flomborn	LBK	Sr	FE	Bentley *et al.* 2002
10	Schwetzigen	LBK	Sr	FE	Bentley *et al.* 2012
11	Talheim	LBK	Sr	FE	Bentley *et al.* 2008
12	Dillingen	LBK	Sr	FE	Bentley *et al.* 2002
13	Lech Valley	LN to MBA	aDNA (GW), Sr, O	FE, P	Mittnik *et al.* 2019
14	Leubingen	EBA	aDNA (GW), Sr	FE, P	Penske *et al.* 2024
15	Eulau	CA	aDNA (mt, Y), Sr	FE	Haak *et al.* 2008
16	Alburg and Irlbach	CA	aDNA (GW), Sr, O	FE, P	Sjögren *et al.* 2020
17	Bohemia	LN to BA	aDNA (GW)	P	Papac *et al.* 2021
18	Vedrovice	LBK	Sr	FE	Bickle *et al.* 2014
19	Nitra	LBK	Sr	FE	Bickle *et al.* 2014
20	Koszyce	LN	aDNA (GW), Sr	P	Schroeder *et al.* 2019
21	Jagodnjak	N, BA	aDNA (GW)	FE	Freilich *et al.* 2021
22	Mokrin	EBA	aDNA (GW)	FE?	Žegarac *et al.* 2021
23	Aegean sites	N, BA	aDNA (GW)	??	Skourtanioti *et al.* 2023
23	Aegean sites	BA	aDNA (GW)	??	Skourtanioti *et al.* 2023
24	Çatalhöyük	Neolithic	aDNA (GW), Sr	Ma	Yüncü *et al.* 2025
25	Khvalynsk II	Eneolithic	aDNA (GW)	P	Anthony *et al.* 2022
26	Srubnaya-Alakul kurgan	BA	aDNA (GW)	FE, P	Blöcher *et al.* 2023
27	Late Iron Age Britain	LIA	aDNA (GW)	Ma	Cassidy *et al.* 2025

chimpanzees (Wood *et al.* 2023) somewhat complicates the grandmother hypothesis for early hominins, as it suggests menopause may be a conserved trait. Exchange networks involving extended kin groups were crucial for hominin survival at low population densities, fostering indirect reciprocity via second- and third-degree contacts (Chapais 2014; Hrdy 2009; Tomasello 2019).

Conditions that promote matriliny in humans—such as low paternity certainty and the absence of material wealth—are also characteristic of other primates. As a result, social bonds in primate societies generally favour matrilineal kin (Thompson 2019), unrelated females form affiliative associations (Langergraber *et al.* 2013) and gorillas even seek out old female friends after years apart (Martignac *et al.* 2025).

The shift from female-biased kinship systems, prevalent among early humans and other mammals (Hrdy 2009; Mattison *et al.* 2019), to the emergence of patriliny was a marked departure that happened in certain regions of the Neolithic world. One of these regions was Europe. Out of 1291 recorded populations in the *Ethnographic Atlas*, 160 are matrilineal, 590 patrilineal and 362 bilateral, yet none in Europe are matrilineal (Surowiec *et al.* 2019). This lack of variation contrasts sharply with the global diversity of

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kinship systems, where matrilineal practices have been common in many non-European societies (e.g. Dong *et al.* 2015; Kennett *et al.* 2017; Shenk *et al.* 2019; Surowiec *et al.* 2019; Wang *et al.* 2025). Understanding the emergence of patrilineal systems in continental Europe is all the more useful when those developments are contrasted with East Asia, the Americas and Africa during the spread of farming on those continents and the subsequent rise of complex societies and hereditary inequality (Kohler *et al.* 2017). Here we focus on Europe not as the standard, but as an exceptional case that provides a valuable comparison to other parts of the world in the prehistory of kinship.

In our discussion below, we use the term *exogamy* here to refer broadly to marriage outside the primary descent group—whether lineage, clan, or household. Exogamy implies a social rather than spatial boundary, and so could involve only short-range movement within a community network. Archaeologically, assuming such individuals would often have similar biogeographic signatures, isotopic methods would likely underestimate the number of migrants (e.g. Bentley 2006). Genetically, however, exogamy could be identified at a closer scale through aDNA.

Archaeologically, our use of unilineal kinship terms—such as patrilineal, patrilocal, matrilineal and matrilocal—is necessarily coarse-grained, inferred from archaeobiological indicators such as isotopic signatures and ancient DNA. Ethnographic evidence, however, shows that kinship systems were likely far more variable (e.g. Ember 2011; Ensor *et al.* 2017). Patrilineal descent is typically associated with female exogamy, in which marriage alliances link groups (Fox 1984; Lévi-Strauss 1949), but patrilineal systems themselves vary widely. Some involve strict virilocal residence and skewed male reproductive success, while others—especially among small-scale farming communities—exhibit more equitable reproductive patterns and flexible inheritance. Even under matriliny, men may acquire land or status through their wives or retain rights within their natal descent group. Both sexes may relocate at marriage, and in some cases men reside with their wives' families. In matrilocal systems where land is passed through daughters, men often lose ties to their natal groups and pursue mobile livelihoods such as hunting or trading. In both descent systems, land inheritance strongly shapes mobility: inheritors tend to stay, while non-inheritors are more likely to move. Broader cross-cultural patterns link kinship organization with modes of subsistence: in pre-industrial societies, matriliny is more common among horticulturalists, while patriliny tends to accompany intensive animal husbandry, agriculture and the accumulation of inheritable wealth (Goodman *et al.* 2012; Holden *et al.* 2003; Mace 2013; Shennan 2011).

Çatalhöyük: before patriliny

The remarkable diversity of kinship systems observed in recent centuries reflects millennia of cultural inheritance, adaptation and diversification (Bentley 2022; Moravec *et al.* 2018; Surowiec *et al.* 2019). Because the archaeology in Europe has been so extensively studied, the evidence for patrilineal kinship in prehistoric Europe should not be taken as evidence for this form of kinship in any other time or place. As Ruth Mace (2022) put it, 'Contrary to common belief, research shows that the patriarchy isn't some kind of "natural order of things"—it hasn't always been prevalent and may in fact disappear eventually. . . . And female leaders and matriarchal societies have always existed.'

Before patriliny became evident in Neolithic central Europe, earlier Neolithic cultures of southeast Europe and southwest Asia—ancestral to those in central Europe—were likely organized around mothers and their kin. Matrifocal societies were well suited to communal living, shared labour and collective child-rearing. Cross-culturally, it is observed that household complexes with communal features should facilitate collective child-rearing among female kin, creating multi-family compounds (Mace 2013; Sear & Mace 2008).

The early farming village of Çatalhöyük in Anatolia (Fig. 1, site #24), a dense settlement of mudbrick houses, exemplified such an arrangement from 7500 BCE. The tightly packed mudbrick houses with roof-entrances at Çatalhöyük suggest a layout that enabled women to maintain fluid access to their female kin, potentially fostering matrilocal practices (Larsen *et al.* 2015; Pilloud & Larsen 2011).

Other aspects of Çatalhöyük further suggest that its kinship system was not patrilineal. For instance, the plastered skull of a male was found placed within the earlier burial of an elderly female, possibly reflecting reverence for maternal figures (Haddow & Knüsel 2017). Burials under house floors showed little spatial patterning (Carleton *et al.* 2013), and isotopic analyses revealed no significant dietary differences between sexes (Larsen *et al.* 2015). Genetic evidence complicates the narrative: children buried within or around the same houses were often not closely related, indicating flexible and diverse kinship practices (Yaka *et al.* 2021a,b). This fluidity of kinship contrasts sharply with the patrilineal structures that later emerged in Europe.

This evidence is consistent, however, with possible matrilineal kinship. If matrilocality was indeed practised at Çatalhöyük, biodistances among females would likely cluster at the population level rather than within individual households (Alt *et al.* 2013). Recent genomic analysis of 133 palaeogenomes from Çatalhöyük indicates an absence of patrilocal residence patterns and supports the hypothesis of matrilineal kinship inherited from earlier foraging populations (Yüncü *et al.* 2025). In the site's early phases, burials often included close genetic kin, while Middle and Late period burials featured more genetically unrelated individuals. Female subadults received more elaborate burial treatments than males; in fact, female burials contained objects at five times the frequency of male burials. Mitochondrial DNA homogeneity was significantly higher within buildings than Y-chromosome homogeneity, reinforcing the presence of matrilineal organization (Yüncü *et al.* 2025). Simulations of residence patterns point to a mix of matrilocal and other non-patrilocal systems, consistent with Çatalhöyük's egalitarian and matrilineal social structure. Together, these findings suggest that Neolithic households at Çatalhöyük were organized around matrilineal kin groups (Arbuckle 2025).

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The abandonment of Çatalhöyük by 6000 BCE marked a shift in settlement patterns and social organization. Populations dispersed into smaller communities and nomadic livestock herding became more widespread. Over the generations, this may have put pressure on kinship systems to shift away from matriliny. Cross-cultural research shows that animal husbandry—representing mobile, male-controlled wealth—tends to favour patriliny, while matrilineal systems are more commonly associated with horticulture and less compatible with large domestic herds (Moravec *et al.* 2018; Sear & Mace 2008; Surowiec *et al.* 2019). In many societies, sons can use livestock as bridewealth, while livestock inherited by daughters often transfers to their husbands, facilitating polygyny and further concentrating wealth along male lines (Holden *et al.* 2003). Although population history complicates cross-cultural comparisons, phylogenetic analyses help control for shared ancestry and still support the conclusion that livestock economies are negatively associated with matriliny (Surowiec *et al.* 2019).

Neolithic patriliny in Europe

In Neolithic Europe, most communities practised mixed subsistence economies that included cereal cultivation and varying degrees of animal husbandry, setting the stage for a gradual shift toward patriliny. Broader reviews confirm that such transitions were especially common in contexts involving intensive agriculture, market integration and colonialism, all of which tend to align inheritance with male-dominated lines of descent (Price & Makarewicz 2024; Shenk *et al.* 2019; Smith *et al.* 2010). While cultural diffusion may have contributed to these patterns, the association between livestock wealth and patriliny remains robust across controlled comparisons.

As agricultural groups spread from Anatolia into central Europe, significant changes in kinship systems appear to have occurred. By 5000 BCE, stock-herding farmers in central and northwestern Europe established widely spaced villages, with large free-standing wooden houses surrounded by outdoor spaces for raising livestock and cultivating gardens and fields. In theory, the combination of inherited livestock wealth and land rights would be conducive to patrilineal kinship systems. Consistent with this, strontium isotope analysis of *Linearbandkeramik* (LBK) and other early Neolithic cemeteries in central Europe has consistently revealed a tendency for non-local isotopic signatures in female skeletons, in contrast with local signatures among male skeletons (e.g. Bentley 2013; Bentley *et al.* 2002; 2012; Bickle *et al.* 2014).

Female exogamy is frequently coupled with patrilocal residence, which can reinforce male-based descent systems. When women relocate at marriage and children are raised within the husband's lineage, inheritance and descent become linked along the male line, facilitating the emergence of patrilineal structures. As this interpretation has been critiqued as overly deterministic (e.g. Bickle & Hofmann 2022; Ensor 2021), we retain the association cautiously, focusing on cases where genetic, isotopic, and archaeological evidence converge to suggest enduring patterns of patrilocality and male-line inheritance.

That these were patrilineal, and not just patrilocal, kinship systems is indicated by LBK burials with a distinctive ground-stone adze, which were predominantly found with males yielding a local isotopic signature (Bentley *et al.* 2012). This suggests that LBK males with adzes represented those with privileged access to fertile *loess* soils (Bentley 2022). Perhaps local men, often buried with distinctive stone adzes, represented lineages tied to houses and agricultural land (Bentley 2013; 2022).

Recently, site-specific genetic studies have provided striking evidence of multi-generational patrilineal pedigrees (Fig. 1). At Gurgy 'les Noisats', France (Fig. 1, site #5), *c.* 4700 BCE, for example, genetic analysis revealed seven generations of males descended from a single male ancestor (Rivollat *et al.* 2023). At Hazleton North in England (Fig. 1, site #3), *c.* 3650 BCE, 15 males and female children, buried over five generations, shared patrilineal descent from a single male, while no genetic links existed among the adult women (Fowler *et al.* 2022). At Hazleton, a single male progenitor had children with four women, whose maternal lines remained spatially distinct across generations in the tomb—suggesting the presence of socially meaningful maternal sub-lineages. Although overall descent was patrilineal, the enduring recognition of these maternal branches highlights the social significance of founding women and illustrates differing ways of negotiating kinship in this Neolithic community (Fowler *et al.* 2022). Similar patterns are evident in the variation in tomb development and chamber arrangements across Early Neolithic Britain and Ireland (Fowler 2022), where genetic patterning in burial contexts may reflect a reconfiguration of descent and community membership after 3600 BCE (Carlin *et al.* 2025). Palaeogenomic analysis from five megalithic burial sites of Atlantic Europe reveals Y-chromosome continuity and male-biased burial of close kin, suggesting patriliny (Sánchez-Quinto *et al.* 2019).

Nevertheless, there was 'kinship trouble', in that surely these kinship systems were variable. Fowler (2022) interprets the genetic and isotopic analyses in Neolithic Britain and Ireland as indicative of a diverse range of kinship practices, with some tombs indicating close biological relationships and others housing individuals with broader social units than strict family groupings. Isotope analyses at sites in Wales, for example, suggest long-distance mobility and shared lifestyles among groups that used these tombs (Neil *et al.* 2017; 2020).

On the continent, an increase in inherited wealth and status, which began with agrarian fields and livestock, inevitably led to competition between villages and patrilineal clans. The emergence of patriliny in central Europe contrasts, tellingly, with southern Scandinavia, where more diverse kinship practices are exhibited (Frei *et al.* 2019). Both local and non-local strontium isotope signatures from an elite Bronze Age woman's molars at Ginderup Mound, Denmark, suggest a pattern of mobility that cannot be explained by simple marriage-related migration (Reiter *et al.* 2023). Similar evidence for multi-locational residence appears in the isotopic profiles of elite women buried at Egtved and Ølby, consistent with more flexible bi- or cognatic descent systems (Bergerbrant 2019; Melheim 2025; Reiter & Frei 2021). In southwestern Norway, analysis of 32 longhouses dating from

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the Early Bronze Age to the Early Iron Age suggests co-residence of matrilineal and patrilineal groups, along with designated spaces for non-related dependents—potentially reflecting shared child-rearing practices or fosterage systems (Eriksen & Austvoll 2020). Together, these findings point to a diversity of kinship strategies in southern Scandinavia, ranging from elite female mobility and bilateral descent to multi-generational, composite households.

In contrast, the patrilineal kinship of Neolithic central Europe was likely correlated with wealth inheritance, animal husbandry, stand-alone houses in small, clustered settlement, lineage rights to land for cultivation and livestock herding (Ember 2011; Perry & Daly 2017; Sear & Mace 2008). Towards 5000 BCE, escalating violence can be seen in Neolithic massacre sites, where remains show evidence of raiding rival villages for women and cattle. In Germany, the Neolithic mass grave at Talheim (Fig. 1, site #11), *c.* 5000 BCE, contains the remains of a village that was attacked and the women captured—the few adult females in the burial pit had non-local isotopes, whereas the men and children had local isotopes (Bentley *et al.* 2008). From around the same time, the mass grave at Schöneck-Kilianstädten contained the comingled remains of two dozen people killed by axe blows or shot with arrows. Fractures in many of their tibias indicate their legs were intentionally broken before they died (Meyer *et al.* 2015). These brutal attacks likely triggered retaliations and intergenerational feuds. In over 2000 skeletons from Neolithic Europe, about 10 per cent show violent injuries, primarily affecting men, including lethal stone-weapon blows to the head (Fibiger *et al.* 2023).

Kinship in Bronze Age Europe

The transition to the Copper and Bronze Ages in Europe coincided with the spread of a type of genetic ancestry that first emerged among pastoralists in the Pontic-Caspian steppe into Eastern and Central Europe in the early third millennium BCE, associated with newly emerging cultural complexes such as the Corded Ware and Bell Beaker cultural complexes (Allentoft *et al.* 2015; Haak *et al.* 2015; Olalde *et al.* 2018). The movements of people who brought this ancestry are also linked to the dispersal of most of the Indo-European languages and might have also introduced certain kinship and political systems (Lazaridis *et al.* 2022; 2024). For instance, it has been shown that post-Neolithic developments in Europe coincided with inherited social inequality (Kohler *et al.* 2017). Cultural-linguistic phylogenetic studies suggest that proto-Indo-European societies were predominantly patrilocal or virilocal (Fortunato 2011; Moravec *et al.* 2018).

We see early evidence of patrilineal organization in eastern European Eneolithic contexts that may be closely related to the groups from which the Yamnaya phenomenon of the Pontic-Caspian Steppe emerged, the cultural entity proposed as the most likely source of the Late Neolithic dispersals into central Europe (Anthony *et al.* 2022; Lazaridis *et al.* 2024). These pastoralist groups were highly mobile with wide-ranging marriage networks. At Khvalynsk II cemetery (Fig. 1, site #25), dated about 4500–4300 BCE, where a high proportion of burials are male, prominent grave goods were copper, animal sacrifice and polished stone mace heads. Ancient DNA revealed that males buried with copper were related through a multi-generational patriline and buried together with unrelated women and subadults (Anthony *et al.* 2022). As an exception, one of the identified pedigrees included two matrilineally related men (Anthony *et al.* 2022). Like the ground-stone adzes in burials of Neolithic males possibly marking lineages, perhaps the maces signified high-status leaders of an alliance of different ethnic groups who had converged in this population. In any case, the Khvalynsk II case study supports the notion that the ground-stone tools were representative of kinship lineages and resource access.

The patterns of patrilineality and exogamy observed in eastern European Eneolithic contexts appear to have persisted and spread with the expansion of steppe-related ancestry into central Europe. Sjögren *et al.* (2020) provide further evidence for continuity in Bell Beaker communities of southern Germany during the Copper Age (2300–2150 BCE). Their analysis revealed strong indications of patrilocality and female exogamy, with multiple generations of related males buried together, suggesting patrilineal descent.

The Lech Valley case study: kinship, mobility and inequality

Grave goods often indicate social inequality in past societies, as exemplified in southern Germany's Lech Valley (Mittnik *et al.* 2019; 2023). As the European Neolithic transitioned into the Bronze Age, increasing social inequality was closely tied to the development of patriliny, facilitating intergenerational wealth transmission. Multi-disciplinary evidence from human remains of the Lech Valley (Fig. 1, #13) included ancient DNA, strontium isotopes, radiocarbon dating, and archaeological materials (Knipper *et al.* 2017; Mittnik *et al.* 2019; 2023). Covering a 10×30 km area, this microregion contained densely settled farmsteads and cemeteries spanning the Final Neolithic to Middle Bronze Age (*c.* 2500–1500 BCE). The cemeteries, often located east of farmsteads, held several dozen graves, representing multi-generational 'households'.

The burial practices in the Lech Valley reflect increasing social stratification, with grave furnishings ranging from richly adorned to bare, indicating varying wealth and status. Unlike the contemporary Únětice culture with its elite 'princely graves', the Lech Valley lacked such conspicuous markers, instead emphasizing a moderate stratification tied to trans-regional trade and the adoption of metallurgical technology. Gender played a significant role in burial practices, with distinct burial orientations and differentiated grave goods by sex. These patterns suggest a society negotiating social hierarchies through kinship, trade networks and technological adoption.

Genetic analyses by Mittnik *et al.* (2019; 2023) revealed a highly admixed population which homogenized over time, incorporating steppe pastoralist-related ancestry and that of earlier local farming populations. These shifts likely reflect high individual mobility and shared cultural practices. Multi-generational pedigrees reconstructed at two sites showed exclusively patrilineal lineages, with no adult daughters

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among the excavated offspring. Adult sons remained in their parental communities, while daughters left, consistent with female exogamy. Adult women buried at these sites were unrelated to others except their offspring, underscoring a patrilocal residence system. Close biological relationships were mostly confined to individual cemeteries, with only one case extending between sites.

Markers of wealth and status, such as burial mounds and post alignments, were concentrated among members of the 'core pedigree'. These high-status individuals, including subadults, were often buried with multiple grave goods, suggesting inherited rather than achieved status. In contrast, a second group of individuals, isotopically local and biologically unrelated to the core pedigree and, with one exception, to each other, had poorly furnished graves, possibly reflecting transient residence and lower-status roles within complex households. Their precise contributions to the community—whether as menial workers or participants in other social systems—remain uncertain.

A third group comprised high-status, non-local women, identified through ornate grave goods and isotopic signatures indicating distant origins, sometimes over 350 km away. These women underwent residential changes during adolescence or later, as evidenced by varying strontium values in their teeth. Despite their high status, they left no genetic relatives within the communities where they were buried. Their roles may have involved cultural transmission, leveraging their acquired knowledge and status, but their precise contributions to these societies require further research.

Overall, the study in the Lech Valley highlighted the interplay of mobility, kinship and social inequality. Among 104 individuals analysed, parent–offspring pairs were predominantly male, consistent with patrilocal residence patterns (Mittnik *et al.* 2019). High-status men, often buried with bronze daggers, had close relatives within their cemeteries, while high-status women displayed non-local isotope signatures, contrasting with poorer local burials (Mittnik *et al.* 2019). These findings reflect the centrality of patrilineal inheritance and the integration of non-local women as significant agents of social and cultural dynamics in the transition to the Bronze Age (Mittnik *et al.* 2023).

Similarly, across various Bronze Age sites in Europe, mobile women retained high status within dominant and hereditary classes, as evidenced by burial practices. In Iberia's El Argar society (2200–1500 BCE), elite male warriors were often interred in graves where women had been previously buried, emphasizing their association with female prestige. At La Almoloya (Fig. 1, #7), one of many hilltop settlements of El Argar, ancient DNA revealed first-degree relationships exclusively among adult males, with no close genetic ties between the women (Villalba-Mouco *et al.* 2022). One of the most lavish burials of the European Early Bronze Age at La Almoloya featured a woman in her late twenties, interred with an unrelated man under a large housing complex. The woman was adorned with a silver diadem—a symbol of royal status—and other finely crafted silver items, including bracelets and earlobe tunnel plugs, amounting to half a pound of silver. This wealth, valued at the equivalent of a thousand days' wages or several tons of barley, contrasted starkly with the man's burial, which included less expensive copper items.

Further east, Iron Age women also held significant positions of power and influence. In Macedonia around 700 BCE, a Paeonian priestess was buried with a bronze wand, bracelets and beads, reflecting her religious and social prominence (Gyucha & Parkinson 2023). In Illyria, a tribal society in the Balkan Peninsula's iron-rich regions, a 12-year-old girl was interred with remarkable wealth: dozens of bronze bracelets, a heavy neck torque, large bronze hoops and a bronze sun disc placed on her abdomen (Gyucha & Parkinson 2023). These burials highlight the enduring roles of women as symbols of wealth, status and cultural significance, even as broader societal structures shifted towards male-dominated systems in Europe.

In Late Iron Age southern Britain, genomic analysis of 57 individuals from Durotrigian burials reveals a matrilocal kinship structure centred on a dominant maternal lineage (Cassidy *et al.* 2025). In contrast to continental European patriliny, Cassidy *et al.* (2025, 1138) propose 'the possibility of a patrilocal society transitioning to matrilocality'. Further evidence for flexible gender and descent roles comes from Viking Age Scandinavia, where ancient DNA and burial data suggest that some elite women held military and leadership roles (Hedenstierna-Jonson *et al.* 2017; Jarman 2021; Price *et al.* 2019). Together, these spatial and temporal patterns suggest that patriliny was not a universal norm, but rather a tradition most strongly rooted in the Neolithic societies of central and northwestern Europe.

In southeastern Europe and the Aegean, evidence since the Neolithic points to flexible kinship systems, illustrating that the adoption of patrilineal organization was not uniform across Europe. At the Mokrin site in Serbia (Fig. 1, #22), dated to 2100–1800 BCE, female exogamy appears to have been practised, yet there is little indication of patrilineality; instead, status may have been conferred through maternal lines (Žegarac *et al.* 2021).

This flexibility is also reflected in variations in settlement organization (Furholt 2016), the presence of shared open spaces (Souvatzi 2017) and the region's complex demographic history. Two major gene flow events shaped Aegean populations (Skourtanioti *et al.* 2023). The first, in the late fourth millennium BCE, introduced Anatolian farmer- and Caucasus-related ancestry alongside the emergence of metallurgy, complex architecture and expanding Mediterranean trade networks. The second, in the late third millennium BCE, brought Steppe pastoralist-related ancestry, likely tied to climatic disruption and migration (Clemente *et al.* 2021; Lazaridis *et al.* 2017; 2022; Skourtanioti *et al.* 2023). This ancestry became widespread in the Late Bronze Age, coinciding with the rise of Mycenaean elites, whose shaft graves reflect increasing regional power and possible military expansion, including into Crete by the fifteenth century BCE.

Isotopic studies of mobility in the Aegean remain limited (Nafplioti 2008; Prevedorou & Stojanowski 2017; Triantaphyllou *et al.* 2015), though the presence of non-local women in Grave Circle A at Mycenae supports elite female exogamy (Nafplioti 2009; 2011). Genetic analyses now offer

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deeper insight into social structure and burial practices. At Mygdalia (Fig. 1, #23), a Late Bronze Age collective grave for at least eight perinatal infants revealed that six were children or grandchildren of one couple, and a seventh was likely a maternal cousin (Skourtanioti *et al.* 2023). This suggests household-based burial and biological relatedness as key organizing principles—alongside flexible residence strategies such as sibling dispersal, rather than rigid patrilocal or matrilocal norms.

Genomic data also indicate a high frequency of first- and second-cousin unions, consistent with deliberate, endogamous marriage rather than population bottlenecks. Though unevenly sampled, cousin marriage appears widespread across the region. Lévi-Strauss (1949) famously proposed cross-cousin unions as a mechanism for forging bonds between lineages, though this idea remains debated. In the Aegean, reliance on olive cultivation—which promotes sedentism and long-term landholding—may have encouraged such practices to preserve property within extended families.

These findings, though preliminary, highlight the interplay between genetic relatedness, social organization and mortuary practice. In the Bronze Age Aegean, kinship systems appear to have been shaped by localized traditions that maintained both social and biological cohesion.

Discussion

This review of the evidence raises new questions. The first question is, why did patrilocal and patrilineal kinship systems, which were exceptions rather than norms before the Neolithic, become entrenched in much of post-Neolithic Europe? Patrilocal-patrilineal patterns in Neolithic and Bronze Age central Europe—demonstrated through isotopic, genetic and archaeological analyses (e.g. Blöcher *et al.* 2023; Knipper *et al.* 2017; Mittnik *et al.* 2019)—are particularly striking given that matrifocal social structures likely predominated before the Neolithic (Hrdy 2009). Outside Europe, comparative studies reveal diverse kinship systems during the Neolithic and post-Neolithic, including matrilocal and ambilocal practices (Bentley *et al.* 2021; Ensor *et al.* 2017; Goldberg *et al.* 2017). The prevalence of matrilineal descent in many regions, including parts of Southeast Asia and North America, underscores the variability of kinship systems globally (Bentley 2022; Ember 2011). In human behavioural ecology, patriliny is often considered a more recent adaptation. Factors such as wealth inheritance, pastoralism and intensive cultivation have been identified as key drivers of patrilineal systems (Holden *et al.* 2003; Perry & Daly 2017; Sear & Mace 2008). By contrast, matriliny may persist where paternity uncertainty incentivizes investment in daughters (Mattison *et al.* 2019; Scelza *et al.* 2020). Coastal societies, such as prehistoric Austronesian groups, often favoured matrilocality and matriliny, as prolonged male absences for fishing or trade placed greater emphasis on women managing kinship resources.

A second question is, how did patrilineal kinship systems associated with post-Neolithic Indo-European dispersals differ from, and interact with, existing Neolithic social structures? Some of the very distinct variations observed in different European Neolithic sites (Cassidy *et al.* 2020; Fowler *et al.* 2022; Rivollat *et al.* 2023) might reflect *longue durée* (micro-)regional developments. While Bronze Age dispersals from the steppe may have introduced more standardized patrilineal practices, prior Neolithic customs might have been integrated and transmitted further. With case studies demonstrating predominantly patriliny, patrilocality and female exogamy in both periods, these commonalities in social practices may have facilitated the adoption and assimilation of migrating peoples, despite distinct cultural backgrounds. The convergence of patrilineal systems, albeit with potential variations, could have provided a framework for social cohesion and cultural exchange during the significant demographic change of the European Bronze Age.

Critiques of interpretations emphasizing patriliny point to potential biases, such as heteronormative assumptions or an overemphasis on nuclear family structures (Bickle & Hofmann 2007; Ensor 2021; Frieman 2021; Frieman *et al.* 2019). As interdisciplinary archaeogenetic research deepens our understanding of kinship systems in prehistoric Europe, notable exceptions and heterogeneity have been identified within the widespread and consistent patrilineal practices (e.g. Bickle *et al.* 2025; Carlin *et al.* 2025; Fowler 2022). Tracing patterns across various dimensions of social life allows for meaningful comparisons across different cultures and communities. New analytical techniques continue to challenge assumptions about kinship identities on an individual scale (e.g. Ávila-Arcos *et al.* 2023; Teschler-Nicola *et al.* 2020). For example, debates over whether biological relatedness should serve as a proxy for kinship highlight the constructed and dynamic nature of social relationships (Brück 2021; Frieman *et al.* 2019).

For instance, bioarchaeological evidence suggests women in these patrilineal systems were not merely passive participants. Mobile women, often identified via isotopes, were buried with greater wealth than local women, suggesting that women—particularly those of high status—played active roles within these patrilocal kinship systems (Mittnik *et al.* 2019). Additionally, in Chalcolithic and Bronze Age Britain, central burial positions of female inhumations within mortuary monuments may signal their significant roles within patrilineal communities (Booth *et al.* 2021). Female exogamy does not inherently imply reduced status for women. In fact, isotopic signatures suggest that post-Neolithic men were often more restricted in their movements than women, who enjoyed significant mobility. Bioarchaeological evidence further reveals the physical strength of women during this period, comparable to modern athletes (Macintosh *et al.* 2017). Recent aDNA and isotopic studies also highlight the agency of women in patrilocal kinship systems, where high-status women appear to have played significant roles in these societies.

Wealth and status provide a compelling explanation for this pattern. The burial of a woman at Postillionstrasse, for instance, included a dagger—typically reserved for high-status male burials—alongside other prestigious items such as a neck ring, copper pins and antler disks. This burial underscores her exceptional role within the community.

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Similarly, the richly adorned burial of a woman at Bronze Age La Almoloya in Iberia (2200–1500 BCE), alongside an unadorned man, suggests that patrilocality allowed elite women to move between high-status hilltop settlements (Villalba-Mouco *et al.* 2021). In Scandinavia, the Egtved woman may have travelled extensively to perform regional rituals (Bergerbrant 2019). Reevaluations of Viking-era burials further reveal that women held elite roles and, in some cases, were recognized as warriors (Blank *et al.* 2021; Hedenstierna-Jonson *et al.* 2017; Moen & Walsh 2021; Price *et al.* 2019). These findings invite a broader reassessment of women's roles in prehistoric and early historic European kinship systems (Pope 2022), acknowledging both the constraints and opportunities that women navigated within evolving social structures. Ancient DNA identification of individuals with intersex conditions (Hegarty *et al.* 2018; Petersen 2020) will further enrich interpretations of prehistoric perceptions of gender.

Certain marital practices, such as cross-cousin marriage, are integral components of some kinship systems. The emergence of communities exhibiting high frequencies of cousin–cousin unions in the Bronze Age Aegean may provide insights into the institutionalization of such practices. These unions might have been influenced by factors such as geographical isolation or specialized agricultural economies.

Conclusion

In conclusion, patrilocal and patrilineal kinship systems, while dominant in parts of prehistoric Europe, were neither universal nor static. These systems emerged as cultural adaptations to local conditions, shaped by socio-economic trends such as wealth inheritance, settlement patterns and mobility (Guyon *et al.* 2024). In early patrilineal systems, women were agents of both social cohesion and mobility. This highlights the importance of viewing kinship not solely as a biological construct but as a dynamic and culturally mediated system (Robb & Harris 2018).

Integrating archaeogenetic and archaeological data reveals broad regional trends in kinship organization. Interpreting these patterns broadly, we highlight a contrast between the relatively homogenized patrilineal systems inferred for Neolithic and Bronze Age Central Europe and the more diverse, flexible kinship structures of southeastern Europe and the Aegean. Recent evidence for matriliny both preceding, following and outside the Indo-European dispersals—at Neolithic Çatalhöyük (Yüncü *et al.* 2025) and Iron Age Britain (Cassidy *et al.* 2025), respectively—suggests that a family of patrilineal kinship systems may have spread into central Europe alongside other cultural practices associated with steppe ancestry. Beyond this region, in southeastern Europe, the Aegean, Anatolia and Scandinavia, more variable kinship systems appear to have persisted, likely shaped by complex population histories, subsistence variation, and pre-existing local traditions.

Outside prehistoric Europe, the resilience of matrilineal and ambilocal systems in many regions worldwide (Shenk *et al.* 2019) challenges biological determinism and underscores the fluidity of social identities. The diversity and transformation of kinship systems from the Neolithic to the Bronze Age reflect broader processes of adaptation and change, as seen in shifts from matrifocal to patrilineal systems in Europe.

Moving forward, the integration of bioarchaeological and cultural theory (Cveček 2023; Johnson & Paul 2016; Souvatzi 2017; Stojanowski & Duncan 2015) is essential for uncovering how biology, culture and social organization co-evolved to shape prehistoric societies. Combining multiple lines of evidence reveals how reconstructing prehistoric kinship requires a multi-disciplinary approach. Bioarchaeological evidence, including analyses of human remains, can provide vital insights, but these must be contextualized with archaeological, linguistic and theoretical perspectives. Kinship systems are cultural constructs that influence material culture, social interactions, and belief systems, and integrating diverse sources of evidence allows for a fuller understanding of their complexity and variability.

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