DH-04 Archaeology of gender before writing

The archaeological investigation of gender in preliterate societies represents one of the most methodologically complex frontiers in the study of the human past. For decades, the discipline was hindered by an uncritical projection of contemporary gender binaries and the "Man the Hunter" paradigm onto deep antiquity. As Joan Gero and Margaret Conkey articulated in their foundational 1991 volume *Engendering Archaeology: Women and Prehistory*, the assumption that the material record is primarily a product of male behaviour led to severe interpretive biases that obscured the diverse realities of prehistoric social organization[1]. To understand how early human groups organized their lives, divided their labour, and conceived of their identities, researchers must navigate the intricate relationship between biological sex and socially constructed gender roles.

This foundational report synthesizes peer-reviewed primary literature, systematic reviews, and meta-analyses to evaluate what the archaeological record of the Palaeolithic and Neolithic can and cannot reveal about sex roles. To avoid the epistemological trap of conflating the biological with the social, this analysis strictly decouples the evidence into three distinct but interacting layers: physiology (measurable biological sex and metabolic markers), behaviour (statistical distributions of activity, labour, and trauma), and culture (highly variable symbolic expressions, mortuary rites, and iconography). By distinguishing population averages from individual variances, this report presents the strongest empirical evidence across ongoing controversies, providing a rigorous baseline for understanding how men and women have historically lived together.

The Physiological Layer: Measurable Markers of Sex and Subsistence

The physiological layer encompasses the measurable, biological realities of the prehistoric body. It forms the empirical baseline upon which behavioural and cultural analyses are built. Historically, the primary limitation in this layer has been the inability to confidently assign biological sex to sub-adult remains, as sexually dimorphic skeletal traits—such as the width of the greater sciatic notch in the pelvis or the robusticity of the supraorbital torus (brow ridges) on the cranium—only fully manifest after the onset of puberty. This methodological blind spot forced bioarchaeologists to largely exclude children and infants from gendered analyses, masking potential early-life inequalities such as sex-selective infanticide or differential weaning practices.

Paleoproteomics and the Resolution of Sub-Adult Sex Estimation

Recent advancements in liquid chromatography-mass spectrometry (LC-MS) have revolutionized sex estimation, moving beyond the morphological limits of visual osteology and the degradation problems inherent to ancient DNA (aDNA) analysis. Parker et al. (2019), publishing in the *Journal of Archaeological Science*, alongside foundational work by Stewart et al. (2017), demonstrated the efficacy of analyzing sexually dimorphic amelogenin protein

fragments preserved in tooth enamel[5]. Enamel is the hardest, most mineralized substance in the human body, providing a highly protective matrix that preserves these peptides long after nuclear DNA has fragmented or degraded due to taphonomic processes.

The methodology targets two specific protein isoforms: AMELX (encoded on the X chromosome) and AMELY (encoded on the Y chromosome). Parker et al. (2019) tested this minimally destructive acid-etch method on a large sample of 130 individuals from medieval Great Moravia, which crucially included 43 non-adults, as well as samples from open-air archaeological contexts dating back 7,300 years[6]. The study reported a near-perfect success rate that was in close agreement with established osteological estimates for the adult specimens.

In terms of diagnostic reliability, the presence of AMELY peptides unambiguously indicates male sex. However, the absence of AMELY could theoretically result from either a female sample (XX) or a male sample with a degraded AMELY signal (a false negative). To resolve this, Parker et al. (2019) developed a probabilistic framework utilizing a logistic regression curve of female sex as a function of the logarithm of the AMELX signal, achieving a highly significant predictive accuracy ($p < 0.0001$)[6].

Estimation Method	Target Material	Applicable Age Range	Diagnostic Markers	Typical Error Rate / Limitations
Visual Osteology	Pelvis, Cranium	Post-puberty (>16 years)	Sciatic notch, nuchal crest	High ambiguity in fragmented/gracile remains[10]
aDNA Analysis	Petrous bone, teeth	All ages	X and Y chromosomes	High contamination risk, severe degradation in antiquity[5]
Paleoproteomics	Tooth enamel	All ages (incl. infants)	AMELX, AMELY peptides	Highly robust, statistically minimal false negatives[6]

The ability to accurately and routinely sex infants and children is a paradigm shift. It allows researchers to definitively track whether differential treatment based on sex—such as unequal access to nutrition or gendered burial goods—began at birth, or if societies only responded to the differences between boys and girls as they matured into adult reproductive roles.

Isotopic Evidence of Diet, Resource Access, and Inequality

Beyond biological sex, the physiological layer captures the long-term nutritional realities of prehistoric populations. Stable isotope analysis of carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) in bone collagen provides a direct, measurable record of dietary intake over the last years of an individual's life. Carbon isotopes serve as a proxy for the types of plants consumed (differentiating between C3 and C4 photosynthetic pathways, or terrestrial versus marine sources), while nitrogen isotopes indicate trophic level, serving as a highly accurate proxy for the consumption of high-value animal proteins.

The evidence spanning the Neolithic transition shows immense regional and chronological variability in how resources were allocated between the sexes. At the sprawling Neolithic settlement of Çatalhöyük in central Anatolia (occupied roughly 7100 to 5950 BCE), Ian Hodder's extensive, multi-decade excavations revealed a society with minimal physiological stratification. Isotopic analyses conducted by Pearson across a large, multi-generational sample of burials demonstrated no statistically significant differences in the carbon and nitrogen ratios between adult males and females[11]. Both sexes consumed identical proportions of domestic sheep, goat, and C3 plants (such as wheat and barley).

This dietary parity at Çatalhöyük aligns perfectly with indoor spatial analyses, which indicate that men and women spent similar amounts of time engaged in domestic, indoor activities, sharing similar micro-environments[11]. The synthesis of this physiological data points to a highly egalitarian social structure where biological sex did not dictate access to calories, high-value proteins, or spatial mobility.

Conversely, late Chalcolithic and Early Bronze Age contexts frequently display marked physiological disparities, tracking alongside the rise of metallurgy and wealth accumulation. At the Varna 1 and Varna 3 necropolises in Bulgaria (circa 4560–4450 BCE), Higham et al. (2007) and Gaydarska et al. (2022) in the *Oxford Journal of Archaeology* utilized AMS dating and isotopic modelling (using FRUITS software) to reconstruct the diets of 29 individuals (19 from Varna 1, 10 from Varna 3)[14]. The data revealed distinct sex-based differentiation in diet across the population, indicating that emerging social hierarchies and wealth concentrations were physically inscribed into the bodies of the inhabitants[14].

Interestingly, Gaydarska et al. (2022) identified a small cluster of five isotopic outliers, including a five-year-old female whose distinct isotopic signature and steppe aDNA ancestry strongly indicated she was a migrant to the Varna area[14]. This demonstrates that while population averages show men and women consuming different diets in hierarchical societies, individual mobility and exogamy (marrying outside one's group) introduced distinct variances that disrupt a perfectly monolithic narrative of ancient gender roles.

The Behavioural Layer: Averages, Variances, and the Division of Labour

The behavioural layer examines how bodies actually moved, worked, fought, and suffered in the physical environment. Unlike physiology, which is largely categorical based on chromosomal sex (with the exception of intersex variations), behaviour is statistical. It is

characterized by overlapping distributions—bell curves where the population averages of men and women may differ significantly, but individual variances span a massive, overlapping spectrum.

Skeletal Activity Markers: Bone Rigidity and Manual Labour

The transition from mobile foraging to sedentary agriculture required unprecedented, gruelling levels of manual labour, fundamentally altering the mechanical loading on the human skeleton. According to the biomechanical principles of Wolff's Law, bone is a highly dynamic tissue; under repetitive mechanical stress, it remodels, adding cortical thickness and altering its cross-sectional geometry to optimize for specific loading trajectories.

In a landmark study published in *Science Advances*, Macintosh, Pinhasi, and Stock (2017) utilized 3D laser scanning and peripheral quantitative computed tomography (pQCT) to measure the polar second moments of area (J)—a mathematically derived proxy for bone rigidity, torsional strength, and resistance to bending—in the humerii (upper arms) and tibiae (lower legs) of prehistoric Central European women. The archaeological sample spanned from the early Neolithic (7400 BP) through to the Iron Age (2500 BP)[15].

Crucially, rather than comparing these prehistoric women solely to prehistoric men, Macintosh et al. (2017) compared their bones to a modern control sample of 94 living women with highly documented, specific activity levels. This modern sample included sedentary controls, endurance runners, football players, and elite collegiate rowers[17].

The reported effect sizes were substantial and completely upended assumptions about the physical weakness of ancient women. Macintosh et al. (2017) found that Neolithic women possessed average humeral (arm) rigidity 11% to 16% greater than that of modern elite collegiate rowers, and nearly 30% greater than sedentary modern students[16]. Their tibial (leg) strength, however, was highly variable but generally lower than that of modern runners, resulting in interlimb loading proportions that most closely matched the modern rowers[18].

This intense, asymmetric unimanual and bimanual upper-limb loading in Neolithic women is attributed to hours of daily, repetitive grinding of grain using heavy saddle querns, alongside arduous hide processing and pottery production[15]. By the Bronze Age (4300–4500 BP), the female averages shifted slightly: arm bones remained about 10% stronger than modern rowers, but their leg bones were around 12% weaker than their Neolithic predecessors, suggesting a decrease in terrestrial mobility and an increasing tethering to the domestic sphere[16].

In a parallel analysis of male biomechanics, Craig (2020) utilized Macintosh's datasets to analyze male Central European farmers. The results showed a lack of significant change in the intensity of upper-limb loading over 6,150 years, but documented a significant, continuous decline in male tibial (leg) loading across all time periods relative to the Neolithic baseline[21]. Thus, the transition to agriculture disproportionately reduced male lower-limb loading (as hunting and ranging decreased), while maintaining extreme upper-limb loading for both sexes.

However, emphasizing the distinction between statistical averages and individual realities is vital. While the population *average* for prehistoric women showed intense upper-body loading, Macintosh et al. (2017) explicitly noted a massive individual spectrum. Some prehistoric women possessed the tibial strength and cross-sectional geometry of modern elite ultramarathon

runners, indicating high mobility and ranging, while others possessed tibiae that resembled modern sedentary students[16]. This statistical overlap proves that while a broad, gendered division of labour existed in aggregate, individual women engaged in highly varied behavioural niches, defying monolithic, essentialist categorization.

The Great Hunting Controversy: Dismantling "Man the Hunter"

No debate in prehistoric gender archaeology is more fiercely contested than the sexual division of labour regarding the hunting of large game. The traditional evolutionary narrative, deeply rooted in mid-20th-century anthropology, posited a strict, biologically deterministic dichotomy: men hunted, women gathered. This paradigm was theoretically formalized by researchers such as Kuhn and Stiner (2006) in *Current Anthropology*. They argued that a complementary division of economic labour—where men focused on high-risk large game and women focused on gathering and small game—emerged only in the Upper Palaeolithic[22]. According to Kuhn and Stiner, this gendered division provided *Homo sapiens* with a dietary breadth and demographic advantage over Neanderthals, who allegedly lacked such a division and relied entirely on group hunting of megafauna[24].

This paradigm was aggressively challenged by a watershed discovery published by Haas et al. (2020) in *Science Advances*. During excavations at the high-altitude Andean site of Wilamaya Patjxa in Peru (circa 9000 BP), Haas identified the burial of a 17-to-19-year-old individual (designated WMP6) interred with a comprehensive, unambiguous big-game hunting toolkit[26]. The grave goods included five complete stone projectile points, a knife, and various hide-scraping tools designed for dispatching and processing large mammals like vicuña and taruca[27]. Proteomic analysis of the tooth enamel definitively sexed the individual as female[27].

To determine if WMP6 was an isolated anomaly, Haas et al. (2020) conducted a meta-analysis of 27 Late Pleistocene and Early Holocene burials across the Americas that were clearly associated with big-game hunting tools. The sample yielded 11 females and 16 males[29]. Based on this sample size, Haas et al. concluded that early big-game hunting in the Americas was practically gender-neutral, estimating female participation at between 30% and 50%[28]. Haas theorized that the use of early weaponry like the atlatl (spear-thrower)—which relies less on absolute upper-body strength and more on leverage and early childhood practice—facilitated equal participation before the advent of the bow and arrow, which required longer developmental mastery[30].

Building on this momentum, Anderson et al. (2023) published an ethnographic meta-analysis in *PLOS ONE*, reviewing the D-PLACE database to assess modern and historical foraging societies. From an initial pool of 391 societies, they identified 63 societies with explicit data on hunting practices[31]. Anderson et al. reported that in 79% (50 out of 63) of these societies, there was explicit evidence of women hunting, and in 33% of those societies, women purposefully hunted large game[32]. The authors concluded that the "Myth of Man the Hunter" should be entirely dismantled, arguing that the gendered division of labour is a largely artificial construct projected backward by sexist 20th-century anthropologists[32].

However, this sweeping conclusion sparked immediate, forceful scientific pushback. Venkataraman et al. (2024), publishing a formal rebuttal in *Evolution and Human Behavior*,

presented a rigorous critique of the Anderson et al. (2023) methodology[33]. The critics argued that Anderson's methodology suffered from severe sample selection bias. By excluding hundreds of well-documented foraging societies that lacked specific paragraphs explicitly detailing female hunting strategies, the resulting sample of 63 was highly skewed, artificially inflating the prevalence of female hunting to 80%[34].

Furthermore, Venkataraman et al. (2024) pointed out numerous coding errors and argued that equating opportunistic small-game capture (e.g., a woman killing a lizard or rabbit encountered while gathering) with intentional, logistical big-game hunting severely misrepresented the energetic, spatial, and evolutionary realities of forager life[33]. They argued that while women absolutely can and do hunt, a statistically significant gendered division of labour remains a robust, universal feature of every known contemporary hunter-gatherer society[35].

The strongest evidence, therefore, suggests a nuanced middle ground. The gendered division of labour is a real, statistically robust feature of both ancient and modern foraging societies when looking at population averages; men generally hunt larger game more frequently. However, gender roles were highly flexible, and female participation in hunting—especially with early projectile technologies, hunting with dogs, or in communal game drives—was far more common than the rigid 20th-century paradigms allowed. Individual women routinely stepped outside statistical averages to act as apex predators[30].

Violence, Trauma, and the Architecture of Conflict

Interpersonal violence leaves distinct, measurable signatures on the human skeleton. Bioarchaeologists carefully distinguish between healed trauma (indicating that the victim survived, pointing to habitual, socially regulated, or non-lethal conflict) and unhealed perimortem trauma (inflicted at or near the time of death, indicating lethal violence, execution, or warfare).

Fibiger, Ahlström, Meyer, and Smith (2013) published a massive, comprehensive regional study in the *American Journal of Physical Anthropology* analyzing 378 crania from Neolithic Denmark and Sweden (spanning 3900–1700 BCE)[38]. They found a crude skull trauma prevalence of 16.9% in the Danish sample and 9.4% in the Swedish sample, indicative of widespread, endemic violence throughout the region[38].

The statistical distribution of this cranial trauma is heavily gendered, yet reveals complex social dynamics. Males were significantly more likely to display *healed* cranial injuries. Crucially, these injuries were overwhelmingly located on the left anterior (front-left) side of the skull[38]. In forensic anthropology, this pattern is the classic signature of face-to-face, right-handed blunt force combat. This strongly suggests that men were the primary, active participants in habitual, socially regulated, or non-fatal inter-group violence, actively engaging each other in ritualized or territorial disputes[38].

However, when the researchers examined *perimortem* (fatal, unhealed) injuries, the gender gap vanished: males and females were affected equally[38]. This dynamic is illuminated by the discovery of specific Early Neolithic mass graves, which represent acute episodes of warfare rather than habitual brawling. At the Linearbandkeramik (LBK) site of Talheim (Germany), 34 men, women, and children were massacred and thrown into a pit[39]. The fatal cranial injuries

were predominantly struck from behind, suggesting the victims were killed while fleeing a raid[42].

Similarly, Fibiger et al. (2023) in *Nature Human Behaviour* and *PNAS* analyzed the mass grave at Gomolava (Serbia), where 77 individuals were executed. Genetic and demographic analysis revealed a selective bias: the victims were predominantly biologically unrelated women and children drawn from a wider regional population[43]. The annihilation of specific community sectors (while sparing or capturing others) indicates that cross-regional conflict involved the strategic targeting of women and youths to break the reproductive and socio-economic continuity of rival groups[43].

Conflict Type	Skeletal Signature	Primary Victims	Social Mechanism
Habitual / Regulated	Healed, left-anterior cranial trauma	Adult Males	Face-to-face combat, territorial disputes, status rivalry[38]
Asymmetrical Warfare	Perimortem trauma, often posterior	Men, Women, Children	Raids, massacres, flight responses (e.g., Talheim)[38]
Strategic Annihilation	Perimortem trauma, mass graves	Unrelated Women & Children	Demographic targeting, shifts in regional power (e.g., Gomolava)[43]

The behavioural reality of Neolithic violence dictates that while men were the primary combatants in structural and habitual violence, women and children were equally, if not preferentially, victimized in episodes of asymmetrical massacres and total warfare.

The Cultural Layer: Symbolism, Ritual, and Iconography

The cultural layer involves the symbolic, artistic, and ritualistic projection of gender through material culture. It is highly variable, rarely maps perfectly onto the physiological or behavioural realities of the society, and is the most susceptible to the interpretive, presentist biases of modern archaeologists.

Cave Art and the Sex of Hand Stencils

The parietal art of the European Upper Palaeolithic (found in deep caves such as Pech Merle in France and El Castillo in Spain) features hundreds of vivid hand stencils, created by blowing pigment over a hand pressed against the rock wall. Traditionally, these stencils were uncritically assumed to be the work of adult male hunters documenting their kills or engaging in hunting magic[44].

Dean Snow (2006, 2013), writing in *American Antiquity* and *Antiquity*, sought to challenge this assumption by analyzing the biometrics of the stencils. Biologically, the ratio between the length of the index finger (2D) and the ring finger (4D) is sexually dimorphic, heavily influenced by fetal androgen exposure in utero. Females generally have a 2D:4D ratio near 1.00 (index and ring fingers of roughly equal length), while males tend to have a lower ratio (ring fingers visibly longer than index fingers)[45].

Snow utilized photogrammetry and image processing algorithms (converting images to HSV colour space to segment fuzzy contours) to extract measurable data from a sample of 32 European hand stencils[44]. Using a two-step algorithm based first on overall hand length (to separate adult males from smaller hands) and second on the 2D:4D and 2D:5D (pinky) digit ratios, Snow concluded that 75% of the measurable hand stencils in his sample were produced by females[44]. This finding generated global headlines, suggesting that women were the primary creators of Upper Palaeolithic cave art.

However, the methodology remains heavily contested, demonstrating the difficulty of projecting statistical averages onto individual artifacts. R. Dale Guthrie (2005) argued that the stencils belong primarily to adolescent boys, whose hand sizes and proportions overlap significantly with adult females during prepubescence[46]. Furthermore, Kralik and Nelson criticized the reliance on 2D:4D ratios, noting that modern human populations display immense overlap between the sexes[50]. Snow's own foundational data highlights this replication issue: when testing his algorithm on known modern hands, step one had a 79% success rate, but step two (the digit ratio) had only a 60% success rate in accurately differentiating adolescent males from adult females[48]. Snow argued that sexual dimorphism in the Pleistocene was simply more pronounced than it is today, pushing the ancient hands to the extreme ends of the spectrum[44]. While the absolute certainty of assigning a specific sex to an individual stencil remains debated, Snow's findings successfully dismantled the default assumption of male-only artistic production, proving empirically that both sexes actively participated in the deepest symbolic life of the Palaeolithic[51].

Monumental Architecture and Hyper-Masculine Iconography

The transition to sedentism and agriculture in the Early Holocene brought the first monumental architecture and new, intense iconographies, displaying a vast spectrum of cultural gender expression.

At Göbekli Tepe in southeastern Turkey (circa 9600–8200 BCE), monumental circular enclosures feature massive T-shaped limestone pillars, some standing over 4 meters tall. The iconography carved in high relief across these pillars is overwhelmingly and aggressively male. As analyzed by Lee Clare, Julia Gresky, and Oliver Dietrich (2017, 2019), the animal depictions—which include foxes, boars, aurochs, and waterfowl—are frequently shown in threatening, predatory postures, and crucially, they regularly exhibit erect penises[54].

Human representations are rare but echo this theme. The pillars themselves are abstract, T-shaped representations of the human form, with arms and hands carved into the sides meeting at a belt, sometimes adorned with a loincloth[54]. Anthropomorphic statues found at the site or nearby (such as the Kilisik sculpture or Urfa Man) frequently depict individuals grasping

their own genitals[54]. Furthermore, Gresky et al. (2017) identified modified human crania at the site with deep incisions, suggesting a specialized skull cult where fragmented, decapitated heads were hung or displayed as part of ancestor worship or trophy displays[57].

The total absence of domestic evidence (no hearths, no trash middens of daily life) combined with the fierce, male-centric, and deadly iconography has led researchers to hypothesize that the enclosures were highly restricted spaces. Clare and colleagues suggest Göbekli Tepe may have been utilized by a specific subset of society for male initiation rites, hunter-guild rituals, or as a locus for charismatic leaders to mitigate conflict during the stressful transition to sedentism[55]. The site stands as a testament to how specific genders could dominate public, monumental culture, even if the daily, behavioural reality of the society involved both sexes equally.

The 'Great Goddess' and the Danger of the Naturalistic Fallacy

The hyper-masculine symbolism of Göbekli Tepe contrasts sharply with the broader Neolithic of Europe and Anatolia, which produced tens of thousands of female figurines (often erroneously and anachronistically grouped as 'Venus' figurines). In the mid-20th century, Lithuanian-American archaeologist Marija Gimbutas synthesized these figurines into a sweeping, unified theory of the "Great Goddess."

Gimbutas (1991) argued that "Old Europe" (pre-Indo-European Neolithic societies) was a peaceful, egalitarian, matrilineal, and matrifocal utopia that worshipped a singular life-giving Earth Mother[61]. According to her theory, this idyllic, goddess-worshipping civilization was violently overthrown and replaced by patriarchal, warlike, horse-riding Kurgan invaders sweeping in from the Pontic-Caspian steppes[62].

While Gimbutas's work was deeply influential in second-wave feminist spirituality, it has been heavily critiqued and largely dismantled by contemporary feminist and post-processual archaeologists. Scholars such as Lynn Meskell (1995) in the *Journal of Archaeological Method and Theory*, alongside Ruth Tringham, argued that Gimbutas committed a severe naturalistic fallacy—projecting a modern, utopian New Age desire onto the distant past[62].

By interpreting literally every female figurine as a manifestation of a singular deity, Gimbutas inadvertently stripped prehistoric women of their actual, varied social agencies, reducing them to an essentialist, biological symbol of fertility and motherhood[65]. Modern interpretations view these figurines through a localized, contextual lens. Depending on where they are found (in trash pits, under hearths, or in graves), they are now interpreted as ancestor representations, didactic tools for pregnancy, initiation objects, or even children's toys, rather than evidence of a monolithic matriarchal religion[65].

Mortuary Wealth and the Invisibility of Industrial Labour

Burial goods provide the most direct insight into how societies valued gender upon death, marking the intersection of the cultural and physiological layers. At the Varna 1 necropolis, Grave 43 contained a 40-to-50-year-old adult male buried with immense quantities of prestige goods, including copper axes, flint blades, and over a kilogram of gold[14]. Most notably, the burial included a golden sheath positioned over the pelvis, frequently interpreted as a gold phallus cover (though some metallurgists debate it may be an imitation of a bellows tuyère)[14].

This grave represents one of the earliest archaeological proofs of a patriarchal, highly stratified society where elite male prestige was explicitly tied to wealth accumulation, martial prowess, and phallic symbolism.

Conversely, mortuary and skeletal evidence from the Bronze and Iron Age salt mines at Hallstatt (Austria) reveals a much more inclusive integration of gender and age into early economic production. Because the high salinity of the mines perfectly preserves organic material, researchers have access to a wealth of tools and clothing. Research by Kerstin Kowarik, Hans Reschreiter, and Katharina Rebay-Salisbury has conclusively shown that deep underground mining was not an exclusively adult male domain[67].

The archaeological record at Hallstatt includes ergonomically scaled tools, specifically sized leather caps, and carrying sacks tailored for smaller bodies[67]. Combined with skeletal biomechanics from the associated burial grounds, the evidence indicates that women and children were active, integral participants in the hazardous, heavy-industrial extraction and transport of salt[69]. The Hallstatt evidence serves as a critical warning against projecting the industrial-era, 19th-century separation of the "domestic female sphere" and the "public male workplace" backward into prehistory.

Summary of Robust Findings

1. **Paleoproteomics:** Amelogenin peptide (AMELX/AMELY) analysis reliably sexes sub-adults and highly degraded remains, closing a major demographic gap in bioarchaeology.
2. **Division of Labour:** The gendered division of labour was statistically real (as population averages) but possessed massive individual overlap; biological sex did not strictly dictate task capability.
3. **Female Biomechanics:** Prehistoric women performed extreme unimanual and bimanual labour (e.g., grain grinding), achieving upper-limb bone rigidity 11-16% greater than modern elite athletes.
4. **Female Hunters:** Women actively participated in big-game hunting, particularly in the Early Holocene Americas (e.g., Wilamaya Patjxa), disproving the absolute "Man the Hunter" paradigm.
5. **Male Combat Trauma:** In Neolithic Europe, men suffered significantly higher rates of non-lethal, face-to-face cranial trauma, indicating their primary role in habitual, socially regulated structural violence.
6. **Asymmetrical Victimization:** Women and children were equally susceptible to lethal perimortem trauma, frequently targeted in asymmetrical massacres and strategic regional warfare (e.g., Gomolava, Talheim).
7. **Palaeolithic Art:** Upper Palaeolithic cave art (hand stencils) was produced by both sexes, dismantling the assumption of a male-only artistic class, with biological ratios pointing to a potential female majority.
8. **Dietary Stratification:** Isotopic diets show highly egalitarian resource distribution in early Neolithic sites (Çatalhöyük) but severe sex-based stratification in later Chalcolithic sites (Varna).
9. **The Goddess Myth:** The "Great Goddess" matriarchal utopia is an essentialist projection

lacking rigorous archaeological support; female figurines served highly localized, practical, and ritual functions.

10. **Role Flexibility:** Gender roles were locally negotiated; women engaged in everything from apex elite hunting to heavy underground mining (Hallstatt).

Contested or Open Questions

- **The 2D:4D Ratio Reliability:** Does the 40% statistical overlap in modern digit ratios invalidate Snow's (2013) algorithm for sexing Palaeolithic hand stencils, or does the intense robusticity and physical loading of Pleistocene populations make the ratio more dimorphic and thus reliable in antiquity?
- **Prevalence of Female Hunters:** Does Anderson et al.'s (2023) claim of 79% female hunting participation suffer from fatal sampling bias (as argued by Venkataraman et al. 2024), or does the critique overly rely on 20th-century ethnographic assumptions that dismissed female logistical hunting?
- **Meaning of Göbekli Tepe:** Do the exclusively male, aggressively ithyphallic iconographies represent a society-wide patriarchal dominance, or merely a localized, highly specific male cult/initiation space within a broader, more egalitarian society?
- **Figurine Functionality:** Without Gimbutas's unifying Goddess theory, how do archaeologists systematically categorize the function of Neolithic female figurines without defaulting to generic, untestable "fertility" or "motherhood" assumptions?

5 to 10 Most Important Sources to Read in Full

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Implications for living together

The archaeological record emphatically rejects biological determinism regarding human social organization. It reveals that the rigid, binary division of a "public, productive male sphere" and a "domestic, passive female sphere" is a recent historical anomaly driven by 19th-century industrialization, not a biological default of the human species. The extreme upper-body strength of Neolithic female farmers, the apex female big-game hunters of Wilamaya Patjxa, the egalitarian dietary intake at Çatalhöyük, and the heavy industrial mining by women at Hallstatt prove that human societies thrive on vast, pragmatic behavioural flexibility.

However, avoiding the naturalistic fallacy is critical: simply because a behaviour is "ancient" or "natural" does not render it "good" or desirable for modern implementation. The deep antiquity of endemic, male-dominated structural violence, the horrific victimization of women and children in strategic massacres at Gomolava, and the physiological embedding of severe wealth inequality at sites like Varna demonstrate that prehistory was no peaceful, matrifocal utopia.

For modern couples, families, and organizations, the takeaway is one of radical adaptability and conscious design. Human biological sex produces statistical averages in behaviour, risk-taking, and physical capacity, but it is the organizational culture—the explicit agreements we make about how to share power, allocate resources, and divide labour—that ultimately dictates whether a society functions equitably or descends into stratified violence. Roles are not hardwired by our Pleistocene past; they are constantly negotiated. Modern groups should rely on communication and meritocratic flexibility rather than assumed biological mandates to structure their lives together.

Works cited

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