

HARNESSING HORSES FROM PREHISTORY TO HISTORY

Approaches and Case Studies



KATHERINE **KANNE**, HELENE **BENKERT**
& CAMILLE M.L. **VO VAN QUI** (EDS)

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Foreword

It is indisputable that, of all animal species humans interact with, the relationships of people with horses and dogs are the closest. Dogs were the earliest domesticate and clearly capable of deep bonds with humans. This relationship most likely developed so early due to a shared interest in the spoils of hunting, providing the potential for an almost symbiotic cooperation in that activity. Horse domestication, conversely, was comparatively late, and the emergence of a close bond might, on the face of it, have seemed less likely, given a long history of human predation and consumption of equids in our hunter-gatherer past. So how was it that a wary quarry was transformed into a best friend of its former predator? The initial interest in domesticated horses most likely also revolved around food, but with the advent of pastoralism came husbandry, intimate practices such as milking and, at some stage, the riding of horses to aid in the herding of other animals. It is the riding that is the game changer in the relationship, requiring a close understanding of each other's body movements and cues. What makes the relationship between an equestrian and horse so special is that when riding they almost become a single physical entity. The impact of this on a personal level is quite something, but equestrianism also changed societies, at both local and global scales. Horsepower created the fastest land transport for millennia until the advent of steam trains, increased connectivity, extended trade and transformed the nature of conquest and warfare. The last of these activities was perhaps also the origin of many of our equestrian sports, so prominent in the modern day. The nature and development of equestrianism is a complex and multi-stage story, but it is one of archaeology's bigger questions given the wide-ranging impact of domestic horses on economy, society, culture and the individual.

Perhaps no single volume can cover every aspect of this relationship, but this one provides a commendably broad treatment of key topics and a holistic methodological approach that interweaves the many-stranded lines of evidence. Section 1 tackles research methods from the skeletal and scientific to the historical and artistic. Section 2 provides a series of case studies aimed at covering key time periods, but also different regions of the world. The final section is thematic in nature and deals with different aspects of husbandry and the range of roles that horses have fulfilled within society. The majority of the authors contributing to this volume are not only academic specialists, in their given fields, but also accomplished and passionate equestrians, adding valuable reflection and insight, and bringing the book to life.

Alan K. Outram
Exeter, July 2024

Introduction

Katherine Kanne, Helene Benkert
and Camille M.L. Vo Van Qui

Without a doubt, horses are the most iconic, captivating, and affecting animals that chose to throw their lot in with humans through domestication. Very little of the human past can be written without mention of horses or other equids. From our ancestors' earliest hunting sites in Europe in places like Boxgrove, England (400,000 BP) and Schöningen, Germany (300,000 BP) to the western Eurasian steppes where the modern domestic horse rose (2,200 BC), on the medieval battlefield, or participating in the modern Olympic Games, we have been engaging with some form of *Equus* for as long as we have been human. Horses are a large part of what it *means* to be human. Ultimately, the horse story is a human story – how we became equestrian, how we practised equestrianism together over the millennia, and how we continue to become equestrian in new ways. Our desire to know the horse links enthusiasts and scholars in a common goal. The more we know about horses, past and present, the better we can live with them, and discover how our future together may look. Our present volume, we hope, will contribute to these dialogues, as well as move them forward into new pastures.

This book was born out of an online workshop and seminar series organised by the Equine History Collective, a non-profit consortium of enthusiastic, equine-focused scholars, including the editors who were all working, at the time, at the University of Exeter in England, on the Arts and Humanities Council funded interdisciplinary project *Warhorse: Archaeology of a Medieval Revolution?* Brought together by the passionate study of the horse in the past, we put out an open call for scholars interested in better understanding or integrating other disciplines in their research. The seminar, *History for Archaeologists–Archaeology for Historians*, was the result. Bringing in nearly fifty scholars from all over the world, we discussed how best to inform each other about how we conduct research in our disciplines, and how we could do that in a way that would foster interdisciplinary, collaborative research. After meeting over the course of a year, we decided on producing an edited volume dedicated to approaches, methods, and case studies of horses in the ancient and more recent past. Another open call was distributed for submissions with the help of the Equine History Collective and its members, as well as online social and archaeology communities.

We are very pleased to present the results of our efforts in *Harnessing Horses From Prehistory to History: Approaches and Case Studies*. Our goal was to produce accessible methods chapters and interdisciplinary case studies for established scholars seeking to integrate other methods in their research design, and to serve as an introductory text for new students who wish to study horses in the past. Seventeen authors from nearly as many countries have contributed chapters to this volume, many of whom are early career scholars, and most who are not native English speakers. All authors aimed to share their passion for horse history, or “horse-tory” as some call it, with as broad an audience as possible. We are especially pleased at the range of coverage of the chapters,

from India to Latvia, Japan to England, Türkiye to Crete, and the breadth of methods and topics. The authors are archaeologists, historians, art historians, classicists, veterinarians, translators, and more. Most of the authors are dedicated and accomplished equestrians who live or work with horses in a wide range of disciplines, some professionally, some for the fun of it. We feel that being around horses on a regular basis not only provides a much-needed break for overwhelmed academics, but also allows us to provide a more nuanced understanding of the depth and breadth of human-horse relationships. Though some have been accused of lacking objectivity in our research because of an “over-familiarity with horses” in the present, we feel that deep knowledge of our subjects is a strength, rather than a limitation. As equestrians, we are able to provide new interpretations of the equestrian past, and to offer correctives on some of the less horse savvy statements that get repeated uncritically in the literature.

The volume is divided into three parts. The first presents the methods that can be used in different disciplines to study past equines. Starting with archaeology, already a highly interdisciplinary field, Kanne and Benkert present an overview of a variety of methods exploring the various lines of evidence which may be used. These include traditional zooarchaeology, which looks at the animals’ remains, as well as material culture, covering objects such as tack, decorative items and horse care equipment, along with iconography and written sources utilising artistic and linguistic depictions of equids and equine culture. An outline of other subdisciplines is provided, for example bioarchaeology and landscape archaeology. French builds upon zooarchaeological methodology by guiding us through more advanced techniques, including cutting-edge scientific approaches such as genetic analysis and palaeoproteomics, stable isotope analyses, geometric morphometrics and histological methods. She concludes with the importance of an integrated approach to maximise the impact of these methodologies on our understanding of horse history. Delpeut introduces the uses of art history for exploring horse/human relationships and our perceptions of different equines throughout time and space. Next, Willekes illustrates the methods employed by classical scholars, or those who study the cultures of the ancient Mediterranean and contemporary neighbours. As with archaeology, this field utilises a number of different materials and mediums to examine the rich equestrian cultures in this region. Historians delve into the written evidence preserved from past generations and cultures, including a diverse corpus of sources. Vo Van Qui describes the common methods used to investigate these sources through the example of medieval horses in Europe.

The second part of this book presents case studies from different periods and regions of the world that put into practice the methods examined in the first part

from an interdisciplinary perspective. Leading the way is Kanne’s paper on horse domestication and the early use of horses. She illustrates the very beginnings of our relationship with equids, from domestication processes on the Eurasian steppes to the first evidence for riding and driving, presenting a timeline based on our most current understanding of these complex processes. Following in the theme of origins of horses, Delpeut and Köpp-Junk examine the arrival of the horse in Ancient Egypt and trace its subsequent success in the Near East through an interdisciplinary lens. Similarly, Kim explores the impact of horses being introduced to Japan by Korean settlers in the Kofun period. His paper focuses specifically on the Osaka region where some of the earliest evidence for equestrianism on the Japanese archipelago was found. Both Bühler’s and Evans Tang’s chapters take us back to Europe. Bühler introduces the Avars, an early medieval people who were famous for their horsemanship and advanced equestrian technology, while Evans Tang explores the horse in the Viking world, giving examples of horse management, care and use in Scandinavia and Iceland, especially in relation to funerary rites. Closing this section of the book, is Chandra’s gallop through the Indian subcontinent. She provides an extensive overview of a neglected species in India’s history and utilises multiple lines of evidence to support her narrative.

Finally, the third part presents the horse in various aspects of human society, spanning many periods and regions. Vo Van Qui examines horse training in medieval Europe through the works of Jordanus Rufus, reflecting on his methods and advice from a practical as well as historical point of view. Rufus’ writings concentrate on warhorses in particular, and Benkert and Bühler outline the role of horses in warfare through time in the next chapter. Horses were used in battle early on and in a myriad of ways, changing the course of human history in the process. Probably just as old is veterinary care offered to equine companions and workers; Genç provides an extensive overview of the history of equine veterinary medicine from its origins, including disease control, preventative procedures and common treatments. French then takes us on a trot through the history of hippophagy, the practice of consuming horse meat. While taboo in many countries nowadays, horse was not an unusual source of food in many cultures and periods, and hippophagy is still practised in various regions of the world. With a seeming predominance of female equestrians in the modern horse world, Keil-Steentjes mounts up for an exploration of women in the saddle, and the sidesaddle in particular, in European history. Ropa and Oliveros highlight horse/human relationships through the lens of literature and examine changes in our perception of horses through time via three choice genres: medieval chivalric romance, Elizabethan drama, and modern literature with a focus on the rise of children’s literature. Horses have a long history

not only as partners in war, but also as sports companions, and Ropa takes us on a whistlestop tour of equestrian sports through the ages, including a wide range of horse-related recreational and educational activities, such as racing, mounted games and archery, dressage and (show) jumping. Concluding this section and the book is a chapter on the Cretan horse. Klontza describes this old but endangered breed and advocates for its preservation as part of Cretan heritage, and human heritage more broadly.

We realise that there are geographical and temporal gaps in the volume, especially in the Americas and from African countries. There are also disciplines that are

not directly represented, like anthropology or ethology. We envision this book as the first in a series and invite prospective authors to get in touch with the editors. We especially wish to invite Indigenous scholars, academics from underrepresented countries and regions of the world, as well as early career researchers, and disciplines not yet represented here, to be included on the next volume of *Harnessing Horses*. We would like a broad cohort to participate in this shared endeavour. Horses connect us – on their backs, through time, cross-culturally, and academically. We have much to learn from voices not yet heard, and horses not yet known.

PART I
METHODS

The Archaeology of the Horse

Katherine Kanne and Helene Benkert

Introduction

The archaeology of horses is unique compared to the study of other domesticated animals because of the nature of horse/human relationships. Horses in archaeology includes not only the study of their bones and teeth, but also examination of the material culture related to them, such as tack, and other evidence visible in the archaeological record, like stables, as well as the skeletal evidence for riding or driving in humans. As such, the archaeology of horses benefits from a broad, interdisciplinary approach, including the bioarchaeology of horses and people, material and visual culture studies, and landscape archaeology, which is further aided by equine veterinary medicine, horse behaviour (ethology), anthropology (ethnography) of horse peoples, and many other related disciplines.

In this chapter, we introduce the basics of the investigation of horses in archaeology, with a focus on their skeletal remains, and offer an overview of established and current methods. The purpose of this chapter is to collate the protocols for studying horse bones from archaeological sites, and to give a brief overview of the additional kinds of archaeology used to investigate horses and horse/human relationships in the past. Our aim is to provide clear definitions, key resources, and the standard methods, so that those beginning to study horses in archaeology can gain a broad comprehension of how it is undertaken, and so that scholars from outside archaeology can understand the terminology and archaeological data with a view to integrating it into their research.

Zooarchaeology

The analysis of animal bones from archaeological sites is called *zooarchaeology* (Olsen 1971), alternatively referred to as *archaeozoology*. In Europe, zooarchaeology is also bioarchaeology. *Bioarchaeology* in the broadest sense is the study of biological remains from archaeological sites, including human, animal, plant, and insect remains (Clark 1971, 1972) while it can also be called *osteochaeology*, referring to both animal and human remains (Uerpmann 1973). In the United States, the term bioarchaeology is generally restricted to human remains (Buikstra 1977).

An incredible amount of information can be gleaned from horse remains utilising the standard methods described here, as well as from the increasing array of advanced techniques (French, this volume). General zooarchaeological textbooks are a good place to begin. They provide the history of the discipline, detail the methods, and offer some theory, as well as geographical, species, and temporal case studies (Albarella et al. 2017; Gifford-Gonzalez 2018; Rowley-Conwy et al. 2017; Reitz and Wing 2008). There are often country specific standards and methods for the analysis of animal bones from archaeological sites, as well as varying recording schemes used by academic and commercial zooarchaeologists. Many times, the data will look different even if the same information is recorded, so keep this in mind. As an example, the guide from Historic England (Baker and Worley 2019) is an accessible and detailed manual of the

best practices for the archaeology of animal bones, from recovery to analysis, publication to archive.

Excavation and Context

Each archaeological site and excavation are different, as are the people who excavated them, and the ways in which they do it. Unless an excavation removes all or most of an entire archaeological site, like Must Farm in England (Knight et al. 2024), excavation and recovery usually cover only a small portion of a site. Excavation can be a targeted sampling that addresses the excavator's research questions, the discovery and mitigation of what has been found through developed archaeology for modern infrastructure or construction, or chance finds that have been discovered and disturbed in construction activities that need to be excavated prior to further disturbance of the site. The animal bone recovered is a sample of this sample.

Context is everything in archaeology; without it, the bones and artifacts recovered may become almost useless because the critical information that informs interpretation is lost. Context refers to the provenience of the find, which includes its location within the site, its location within the stratigraphic levels of the site, and in the various features, such as house floors, middens (trash deposits), and associated bone groups (ABGs), which can be a burial or deposit of selected animal bones (Morris 2008). Context also includes the time period and type of archaeological site where it was discovered. During excavation, context information is exactly recorded, and an archive of finds, drawings, and photos will be produced. Gifford-Gonzalez (2018:149–184) offers an introduction to excavation through recording with a zooarchaeological perspective.

Recording

As the material is excavated, archaeologists record the context data. Identification numbers are usually assigned by a context or find number, as the material is bagged and tagged for the journey to the lab. When the material has been brought back from the field, it is cleaned and dried and readied for specialist analyses, like zooarchaeology. The total animal bone from the site is called a *faunal assemblage*. The entire assemblage will be recorded, including horse bones, and helps the analyst determine the relative abundance of different kinds of animals (see quantification methods below). Accurate recording is a critical part of this process. Additional identification numbers may be given to individual bones, and zooarchaeologists take care not to lose any of the identifying context information associated with the bone or tooth. If integrating archaeological datasets into any research, keeping track of the identification numbers is absolutely essential for maintaining the context data. Most researchers enter the data directly into an Excel workbook, Access database or other digital database

system, e.g., Ossobook (Kriegel et al. 2009); an increasing number are utilising different R (R Team 2013) packages such as 'zoolog' (Pozo et al. 2021; Trentacoste et al. 2018) or zooaRch (Otárola-Castillo et al. 2016) to record, interpret, and visualise the basic information described below.

When working with legacy datasets, such as those stored in digital or physical repositories, including those from sites that were excavated prior to standardised field methods and computerised recording, the quality of the recording and context detail is variable, but may be retrievable via archival research. Some countries have online databases and report repositories that make archaeological data, including zooarchaeological data, available to the public, such as the Archaeological Data Service (ADS) in England, the Digital Archaeological Record (tDAR) in the United States, DANS Data Station Archaeology in the Netherlands, or ARIADNEplus for Europe more generally, where faunal datasets can be searched and downloaded. These are valuable resources for scholars working in other disciplines to utilise, and for archaeologists wishing to compare data across time or regions. The datasets will contain many, if not all, of the categories described below, and generally have a key for discerning the shorthand used in recording sheets. The general reports from the archaeological sites which contain horse bone finds, and most often the specialist zooarchaeology reports, include essential information for interpreting the finds, such as the contexts, associations, and time periods from which they were recovered, as well as radiocarbon dates and other advanced analyses which were carried out for that site (see French 37–46, this volume).

Identification

The first step in zooarchaeological analysis is identification, which is established for the entire assemblage using reference faunal collections (skeletons of known species of different domestic and wild animals, birds, and fish to compare against) and general sources of animal skeletal anatomy (Barone 1972; Burdas et al. 2012; Ellenberger et al. 1956; Schmid 1972; Sisson 1938). Fortunately, horse bones are relatively easy to distinguish from the other livestock or wild animals, because of their large size, their unique teeth as herbivorous non-ruminants, and because they are *perissodactyla* ('odd-toed ungulate') (Figure 1a). This means they have an odd number of toes or digits – one, in the case of the horse, comprised of the metapodium, proximal (first) phalanx, medial (second) phalanx, and the distal (third) phalanx (on a live horse, this includes the cannon bone, fetlock, pastern, and hoof, respectively). Other similarly sized livestock, like cows, and similarly sized wildlife, like deer, are *artiodactyla* ('even-toed ungulates'), with two or four toes, making lower limbs quickly identifiable as belonging to horse or other animals. Horse teeth (Figure 1b) are also distinctive from cattle, sheep, goats, and pigs; their

Source	Content	Weblink
University of California, Davis J.D. Wheat Veterinary Orthopedic Laboratory	anatomical posters of equine fore and hind limb	https://vorl.vetmed.ucdavis.edu/photo-galleries/equine-anatomy-forelimb-and-hindlimb-bone-posters
OsteoID Bone Identification	high-res photos of long bones, coxae & scapulae; incl. horse	OsteoID Bone Identification, https://boneidentification.com
Sketchfab	searchable database of 3D models	https://sketchfab.com/search?type=models
ArchéoZoothèque: Plateforme de ressources numériques en archéozoologie	vectorised anatomical drawings & high-res photos of reference specimens, incl. a foetal horse	ArchéoZoothèque : Plateforme de ressources numériques en archéozoologie (archeozoo.org)
Laetoli Production	3D models of individual horse bones & full skeleton; requires account (free)	Laetoli Production (laetoli-production.fr)

Table 1. Online Resources for Horse Identification (Static and 3D).

hypsodont teeth continually erupt throughout the animal's life, unlike the teeth of other livestock.

General identification of equids from other taxa based on bones is done using primary references, such as Schmid (1972) and Barone (1972), as well as reference collections, or more recently, ZooMS (Zooarchaeology by Mass Spectrometry: see French this volume: 37-46) (Figure 1). Online identification resources are becoming increasingly detailed (Table 1). In lieu of a reference collection on hand, 3D models in Sketchfab (Table 1) are also an invaluable resource for identification because they allow the manipulation of the skeletal element in order to see all sides, which may not be illustrated in the standard texts.

Domestic horse (*Equus caballus*) bones are difficult to tell apart from other domesticated and wild equid species, if they can be distinguished at all. Other equids include zebras (*Equus grevyi* and *Equus quagga*), donkeys (*Equus asinus*) and their hybrids, including mules (*Equus asinus* stallion x *Equus caballus* mare) and hinnies (*Equus asinus* mare x *Equus caballus* stallion), as well as other species such as onagers (*Equus hemionus*), and their hybrids, like the kunga (*Equus hemionus hemippus* or Syrian wild ass stallion x *Equus asinus* mare), an elite draft equid from the 3rd millennium BC in Mesopotamia (Bennett et al. 2022). Methods for distinguishing equids have been attempted with variable success using Geometric Morphometrics or GMM (Cucchi et al. 2017; Hanot et al. 2017; Heck et al. 2018; Mohaseb et al. 2023) (French this volume: 37-46). Resolving species identification is increasingly done by DNA (Granado et al. 2020). Without these newer techniques, distinction between equid species is done using dental and skeletal characteristics as delimited by Baxter (1998), Eisenmann (1986, 2006), Johnstone (2004) and Hanot and Bochaton (2018), with improved, but still not certain, success.

Size differences between species are often helpful to distinguish them, and metrical analysis also can be used to aid species discrimination (e.g., Baxter 1998; Davis 1982; Eisenmann and Beckouche 1986). Additionally, the context can help, especially the time period and place from which the bones were recovered. For example, outside of Italy,

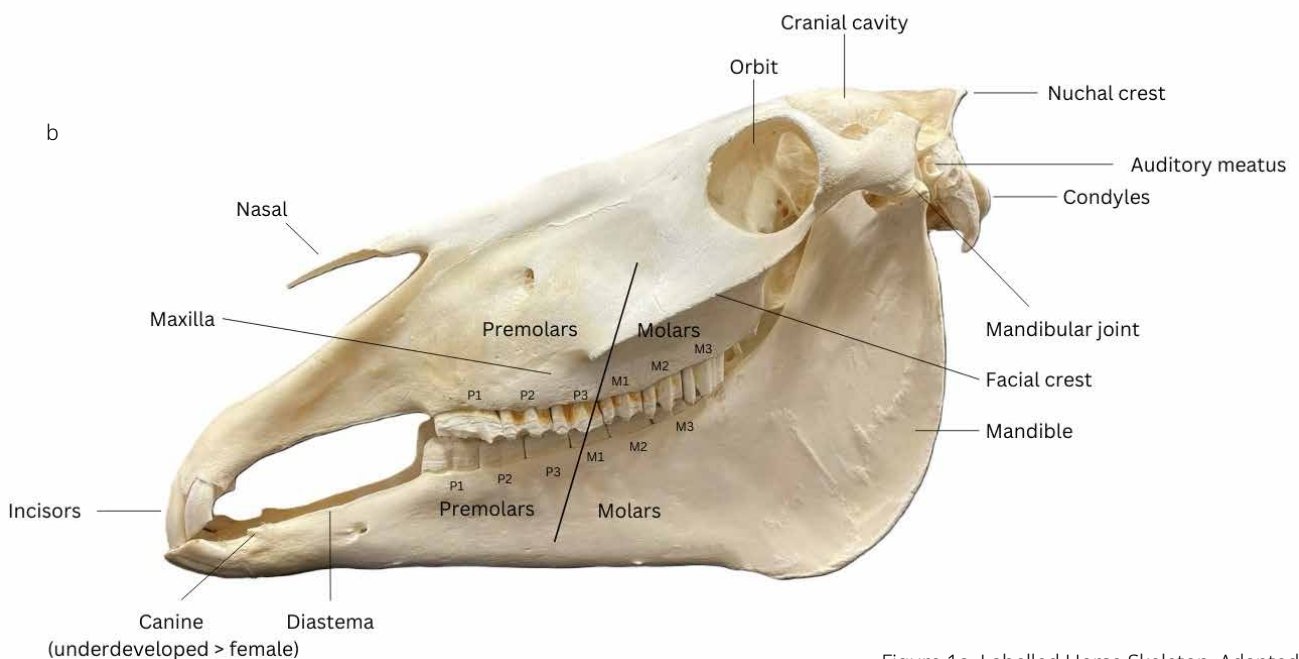
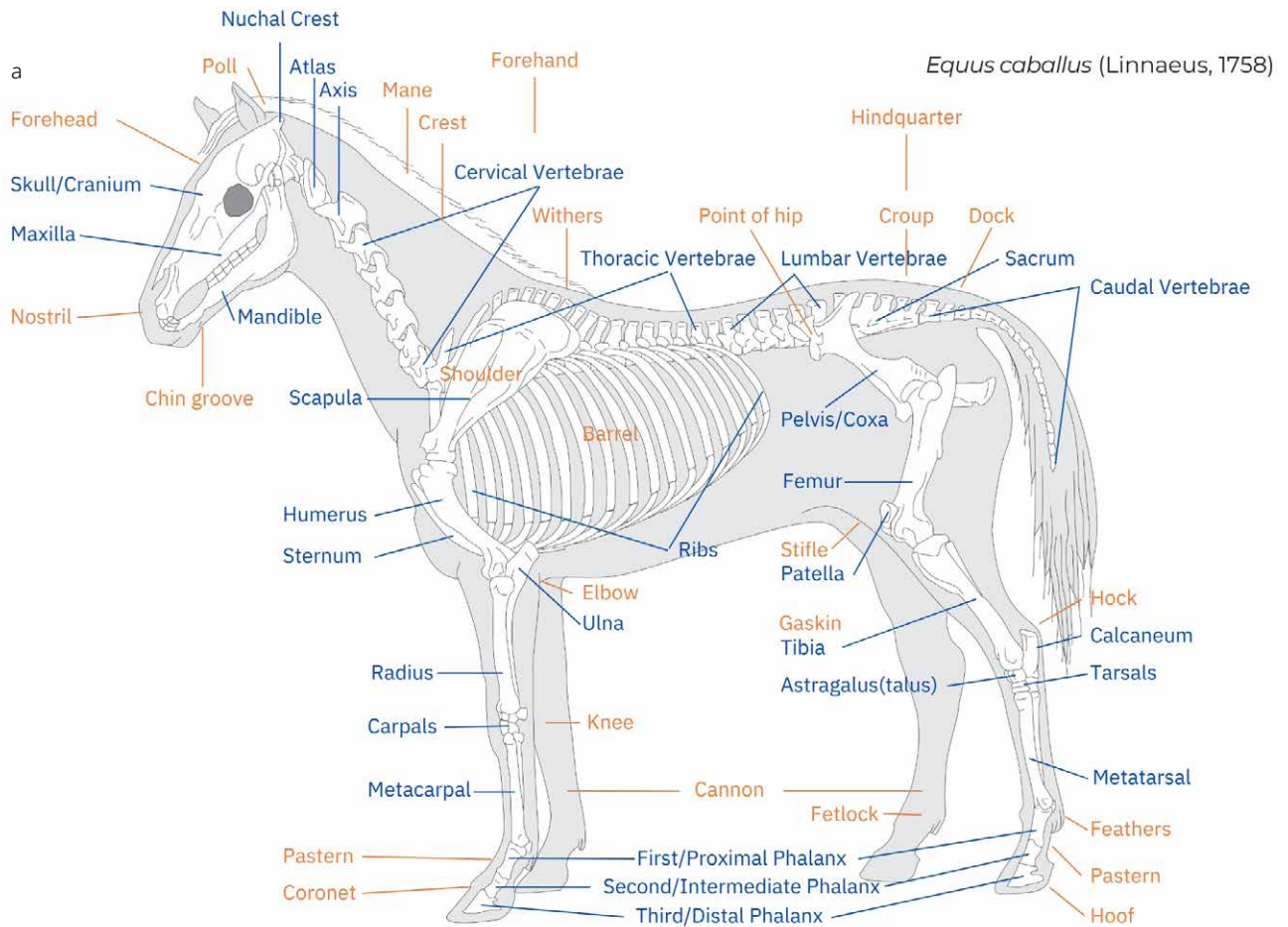
donkeys generally do not appear in Europe in any numbers until the Iron Age at the earliest, and then only in Iberia and Mediterranean Gaul (Boulbes and Gardeisen 2018; Fages et al. 2019). Romans significantly increased the numbers of donkeys and mules in Europe and beyond, but they appear notably absent from areas north of the Alps during much of the subsequent medieval period (Benecke 1994; Bökönyi 1974; Johnstone 2004).

Quantification

In order to understand how horses were utilised in the past, quantifying horse remains from archaeological sites is of paramount importance. Primary references discuss the various intricacies of using typical quantification methods to discern information about the faunal assemblage, including horses, that are measures of relative taxonomic abundance (Gifford-Gonzalez 2018:185–202; Lyman 2018; Reitz and Wing 2008:202–210). Measures of relative abundance give the relative frequency of different species of animals recovered from archaeological sites, and are not without caveats to understanding what these measures actually describe. We focus here on NISP (Number of Identified Specimens) and MNI (Minimum Number of Individuals) because they are the most often recorded and published, and frequently the only quantifications that may be comparable between sites (see Lyman 2018 for the state of quantification in zooarchaeology), though other kinds of quantifications have their use and merit in interpreting faunal assemblages.

NISP

The Number of Identified Specimens (NISP) is a record of how many specimens of an individual element (element is the name of the bone, e.g., femur, metacarpus III, phalanx 1), and bone fragments of these elements which can be identified taxonomically (i.e., to genus or species), that are found within a faunal assemblage from an archaeological site. If body side can be determined, that is also recorded, alongside age and sex if discernible. The percentage of the bone that a fragment comprises, as well



Deciduous dental formula

$$\frac{3.0.3.0}{3.0.3.0}$$

Permanent dental formula

$$\frac{3.1.3(4).3}{3.1.3(4).3}$$

Figure 1a. Labelled Horse Skeleton, Adapted from ArcheoZoo.org/Michel Courtureau (Inrap), in collaboration with Vianney Forest, after Barone (1976).

1b. Labelled Horse Skull with dental formulas.

ID	Site	Anatomical Element	Side	Sex	Fusion proximal	Fusion distal	GL (mm)	SD (mm)
37	Most	Cranium	R	M	-	-	-	-
38	Most	Other	L	-	-	-	-	-
39	Most	Femur	L	-	F	F	377	40
40	Most	Femur	R	-	F	F	355	38
41	Most	Metatarsus	L	-	-	F	275	31

Table 2. Example of zooarchaeological data recording. Legend: M=male horse; F=fused (epiphyseal fusion); GL=greatest length (von den Driesch 1976); SD=smallest width of the diaphysis (von den Driesch 1976). This table only shows the first nine columns of the spreadsheet. There are a number of additional measurement categories, as well as for how complete the element is, the pathologies present, and their measurements (like bit wear).

as if it is a proximal (top), shaft (middle), or distal (bottom) fragment, are often recorded (Table 2).

These numbers are usually converted to a percentage of the livestock or domesticates recovered at one site, or as a percentage of all the animal bone recovered, and expressed as NISP%. For example, to determine the relative abundance of horses among other livestock at a site, the formula is: $\text{Horse NISP\%} = \text{NISPhorse} / (\text{NISPcattle} + \text{NISPsheep/goat} + \text{NISSpig})$. This percentage can also be calculated for all the animal bones at the site, including dogs and wild species. Different projects ask different questions, so the NISP percentages are calculated in a number of ways to examine the relative abundance of different species, and attention should be paid to determine how the relative abundance of horse was established.

Horse bones are nearly always found in low numbers and as a low percentage of the total animal bone or domesticated animals present. Very often they constitute less than 3% of the total animal bone, even if they were important at the time, for a variety of reasons, including their long working and breeding lives, and the typically different contexts they were placed in upon death (Kanne et al. 2025). As a result, they enter the archaeological record at a slower rate than other livestock, because there are more food animals, that were culled more often, with typically shorter lives (Outram et al. 2012). Because they were not often primary food animals or eaten (though see French this volume: 227-231), they do not end up in the middens with the same frequency as most of the other livestock. A number of cultural and practical reasons inform why their remains are treated differently upon death (see *Taphonomy* below), and this is reflected by their typically low frequency on archaeological sites.

MNI

The Minimum Number of Individuals (MNI) is another useful quantification, which is an estimate of the least number of animals that can be identified from a site. To determine this number, the element (usually a sided long bone, for example a proximal right humerus, a bone in the

upper foreleg) which has the highest NISP for a particular species is chosen. For example, if at a given site, the horse is present with a NISP of 22 and there are 3 proximal right humeri, the MNI for horse is 3. More than three horses may be present, but not less than three.

Issues with quantification of NISP and MNI

NISP and MNI are not without their issues because of the nature of the archaeological record, and because of the nature of skeletal material. NISP and NISP% are affected by sample size. A small sample size can quickly skew the relative abundance of a species when compared to a larger sample size. The ways in which the assemblage was collected can also affect this relative abundance, as larger animals like horses and cows are more easily spotted during excavation, and because their bones are large, they are less prone to fall through a sieve (screen). They also tend to preserve better than smaller bones. Moreover, not all animals have the same number of bones, or they have different numbers of elements within their limbs. For example, most mature horses have 205 bones, with some variation in the number of ribs, whereas pigs typically have 223 bones. For these reasons, the sample size, the way it was collected (by hand and/or sieved), and often the school or tradition of zooarchaeology practised are listed so that the NISP can be compared between sites. Bendrey (2007a:220) proposed another horse specific index, called Horse Relative to Cattle (HRC). HRC partially overcomes biases in the low relative abundance of horses on archaeological sites, because cattle and horses are similarly sized and likely to have been collected in the same manner. The index of horse relative to cattle (HRC) : $\text{NISPhorse} / (\text{NISPcattle} + \text{NISPhorse}) * 100$.

Element and Body Part Representation

The Minimum Number of Elements (MNE) is another quantification of horse bones that can provide the Body Part Representation (BPR), or the number of each bone (element) of the horse's skeleton recovered from archaeological contexts. Both of these are important to understand how horses were treated upon death, and

if they were treated the same or differently from other livestock. Utilisation of the carcass for tools and hides must also be considered when looking at body part representation through skeletal element abundance; horse bones used for tools and butchery marks (see *Taphonomy* below) help discern these applications.

Body part distribution at sites is calculated by the minimum number of elements (MNE), which are recorded using the presence of bone zones, following Serjeantson (1996) or Dobney and Rielly (1988), and the symmetry of each bone. The minimum animal units (MAU) are derived from the MNE divided by the number of each distinct element in a skeleton ($MAU = MNE_{observed} / MNE_{skeleton}$). These values are then normed (%MAU) by dividing the MAU value for a given skeletal element by the greatest MAU value in the assemblage (Binford 1978; 1984). Another method is to norm the NISP, where NNISP is the value of the NISP per skeletal element divided by the number of times that element occurs in the skeleton (Greyson and Frey 2004). These measures are calculated to make the representation of elements comparable across species that have different numbers of bones in the skeleton. The frequency of particular skeletal elements present can suggest uses, such as for food and ritual, which are evaluated with food utility indices (below). Often the typical meaty elements of horses are not present on archaeological sites, only the lower limbs, cranial elements and teeth, which suggests that horses were treated differently upon death from other livestock (Kanne 2022a:300, Figure 8; Outram 2006).

Meat and Marrow Utility Indices

Uerpmann (1973; 1982) developed a 3-part quantification of body part representation that took into account the meat quality, which many European zooarchaeologists continue to use; it divides the relative contribution of meat from the skeleton into low (A), medium (B), and high (C). This system is less applicable to horses, as the utility of the horse carcass is unique, even compared to their close kin such as zebras. Outram and Rowley-Conwy (1998) developed Meat (MUI) and Marrow Utility Indices (MI) specifically for horses, calculated into a Standard Food Utility Index (SFUI). The meatiest elements for the horse are the trunk (including the vertebrae, ribs, and the pelvis), the upper hind limb (femur), while the upper forelimb (humerus) has noticeably less meat and the lower limbs have none. They further documented that marrow yields are relatively low from horses compared to similarly sized livestock, with the upper limbs yielding the most marrow. Employing this horse specific SFUI, along with the placement of cut marks (below) and other depositional information, helps archaeologists determine if people were using these animals as food and under which circumstances (i.e., normal or extreme, such as starvation).

Metrics and Biometry

After identification and quantification, the next step is to record basic metric information, i.e., the lengths and measurements of bones. The primary standard text with protocols for measuring horse bones, as well as other mammals and birds, is by von den Driesch (1976: Table 3). Some scholars also employ methods from Eisenmann (1986) which are specifically for equids, but largely correspond to those from von den Driesch. Others still utilise recording based on the “diagnostic zones” method developed by Davis (1992) and modified by Albarella and Davis (1994). Some additional measurements on teeth, used to discriminate species, may be used following Davis (2002). Most commonly, the von den Driesch (1976) measurements are recorded and can be used to estimate withers height and the slenderness index (see below, Table 3).

Measuring horse bones allows quantification of the variability in populations from one site or across several. This may potentially identify selection for different traits, or changes in selection pressures, either anthropogenically or environmentally directed (Albarella et al. 2008; Bartosiewicz and Gál 2013; Johnstone 2004; Kysely and Peške 2016). A small degree of variance may indicate the presence of a homogeneous population or perhaps standardisation of a type. A larger variability of size may demonstrate a wide genetic pool, trade in horses, or the presence of different types of horses within a population.

Withers Height

Withers height (WH), that is the height of the animal from the ground to the top of the shoulder (withers), is described in metres and centimetres in Europe, and can be expressed in hands high (hh), where a hand is 4 inches or 10.16 cm (Table 3). Withers height is calculated based on the length of long bones multiplied with factors as developed by Vitt (1952) and Kiesewalter (1888) and corrected by May (1985) (Table 3). Knowing which of these factors was applied is vitally important when comparing datasets. If the original measurements are available, even if WH has been calculated, they can be recalculated and standardised. May (1985) is the standard that most archaeologists currently employ. Eisenmann’s (2009) factors for determining WH estimates for horses and other equids have also been applied (Uzunidis et al. 2023). Onar and colleagues (2018) have reassessed the current methods for determining WH, but it has yet to be largely used. Documenting the original raw von den Driesch (1976) measurements from the bones themselves is crucial to understand, apply, or correct WH estimates from the existing literature, or to recalculate them in the future, and should always be kept with any faunal assemblage.

Several authors have correlated the internal measurements of the skull, specifically the cranial cavity, or *neurocranium*, to height at the withers, which is helpful

Table 3a. Common von den Driesch (1976) measurements		
Anatomical Element	Length (mm)	Width/Depth
Cranium	1,13,14,21,22	41,42,47
Mandible	6,15	-
Atlas	GLF	-
Axis	LCDe	-
Scapula	DHA	SLC
Humerus	GL, GLC	SD, Bp, Bd, BT
Radius	GL, LI	SD, Bp, Bd, BFp, BFd
Pelvis	GL	LA, LAR
Femur	GL, GLC	SD, Bp, Bd
Tibia	GL, LI	SD, Bp, Bd, Dd
Astragalus	GH	GB, BFd, LmT
Calcaneum	GL	GB, GD
Metapodia	GL, LI	SD, Bp, Bd, Dp, Dd, DD, CD
Phalanx 1	GL	SD, Bp, Bd, Dp, Dd
Phalanx 2	GL	SD, Bp, Bd, Dp, Dd
Phalanx 3	GL	GB, HP, Ld
Sacrum	PL	-
Vertebrae	PL	-

Table 3b. Factors by May (1985) to determine withers height		
Anatomical Element	Lateral Length (LI)	Greatest Length (GL)
Humerus	0.4868	0.4624
Radius	0.4317	0.4111
Metacarpus	0.6403	0.6102
Femur	0.3501	0.3501
Tibia	0.4361	0.3947
Metatarsus	0.5331	0.5239

Table 3. Metrics. 3a. Common measurements taken on horse bones according to von den Driesch (1976); 3b. factors used to determine WH and 3c. how to convert withers height (WH) to hands high (hh) measurements.

when long bones are not present (Chrószcz et al. 2021; 2014). Other ways to establish ranges of WH are through the measurement of horseshoes recovered archaeologically, which provides a very rough estimation, as withers height increases as shoe width does, for both fore and hind legs (Outram and Creighton et al. 2025). Though the size of horses' heads does not vary in direct proportion to height at the withers, several measurements of horse head armour, or shaffrons, are found to correlate in a broad sense

Table 3c. Conversion from hh to cm	
Withers Heights	
hh	cm
10	101.6
10.1	104.14
10.2	106.68
10.3	109.22
11	111.76
11.1	114.3
11.2	116.84
11.3	119.38
12	121.92
12.1	124.46
12.2	127
12.3	129.54
13	132.08
13.1	134.62
13.2	137.16
13.3	139.7
14	142.24
14.1	144.78
14.2	147.32
14.3	149.86
15	152.4
15.1	154.94
15.2	157.48
15.3	160.02
16	162.56
16.1	165.1
16.2	167.64
16.3	170.18
17	172.72
17.1	175.26
17.2	177.8
17.3	180.34
18	182.88

with WH, such as a range between 14–16hh, but not with enough accuracy to determine precise stature (Creighton et al. 2024). Despite the modern horse tack industry using withers heights to market bridle bits, there is far too much variation in horse head size, the nasal part of the skull, and the oral cavity by type, age, and sex (Anttila et al. 2022; Engelke and Gasse 2003:161; Evans and McGreevy 2003) to be able to determine the height of horses based on the size of bits found archaeologically with any accuracy.

Mandible: Lower jaw premolars and molars						
Age (years)	P2 (mm)	P3 (mm)	P4 (mm)	M1 (mm)	M2 (mm)	M3 (mm)
0-1	-	-	-	-	-	-
1-2	-	-	-	(83-91) +*	-	-
2-3	-	-	-	91-89+	(83-86+)	-
3-4	(60-59+)	(81-82+)	-	89-81	86-82+	(70-77+)
4-5	(59-55)	(82-78)	(80-79+)	81-72	82-76	(77-78+)
5-6	55-49	78-69	79-73	72-64	76-70	(78-71)
6-7	49-43	69-60	73-65	64-56	70-63	70-64
7-8	43-38	60-52	65-56	56-49	63-57	64-58
8-9	38-33	52-45	56-48	49-44	57-50	58-51
9-10	33-28	45-39	48-42	44-38	50-44	51-46
10-11	28-24	39-34	42-37	38-33	44-39	46-42
11-12	24-20	34-30	37-33	33-29	39-35	42-37
12-13	20-17	30-28	33-31	29-26	35-32	37-33
13-14	17-15	28-25	31-30	26-24	32-29	33-29
14-15	15-12	25-23	30-28	24-22	29-27	29-26
15-16	12-10	23-22	28-27	22-21	27-24	26-24
16-17	10-8	22-20	c. 27	21-20	24-23	24-23
17-18	8-6	20-19	c. 27	c. 20	23-22	23-22
18-19	6-5	c. 19	c. 27	20-19	22-21	22-21
19-20	< 5	< 19	< 27	< 19	< 21	< 21
20+	< 5	< 19	< 27	< 19	< 21	< 21

Table 4. Levine (1982) cheek-tooth measurement to age chart. Age ranges in years are listed in the left-hand column by the crown height measurement of each tooth, where (P)=Premolar and (M)=Molar. * Defines the tooth as in wear, (parentheses around numbers) are for wear not to the whole occlusal face, and + is the measurement greater than the numbers in the column for that age range.

Slenderness Indices

Slenderness Indices (SI) are based on Brauner (1916) and Chersky (1891), which are measures of the overall robusticity or gracility of the bones examined, most often the metapodia. The SI are calculated by SD/GL and Bd/GL, where SD is the smallest breadth of the diaphysis, Bd is the greatest distal breadth of the element, and GL is the greatest length (von den Driesch 1976). Ll is the lateral length, and may have formerly been used to calculate withers heights. These ratios have been used in differentiating equid species (Eisenmann and Beckouche 1986) and identifying early domesticated horses (Outram et al. 2009). The idea is that certain types of horses cluster together or tend to group at either end of the spectrum, that selections for particular types of horses or improvements in breeding change this index, and that this can be tracked over time and in different regions (cf. Ameen et al. 2021:7, Figure 4; Kanne 2022b:34, Table 2). More robust SI may indicate denser bone so that the horse is able to withstand heavier weight and activity induced stress. Horse people may describe robust bone as 'good bone' via the circumference of the cannon bone (metapodia), though what constitutes 'good bone' is variable

culturally and breed specific. Because of their load bearing function, in-life activity also affects the shape of the bones and cortical bone density, which are likely to vary by the kind of work (Brooks et al. 2010); so, this needs to be considered when employing SI. Currently, in-life activity is not thought to affect the SI so substantially that the measurement is not useful in gauging overall limb robusticity, but parameters of age, sex, and any known use should be included in the overall analysis.

Geometric morphometrics (GMM) is a way to digitally model bones in 3D to quantify and compare their morphology (shape) to identify type, use, and species (Hanot et al. 2021; French this volume: 37-46). With GMM, certain elements like the astragalus and calcaneus may divulge breed characteristics and in-life use respectively, based on how prone the element is to load bearing remodelling (Hanot et al. 2017). X-ray analysis and comparison of cortical thickness is another promising method to explore in-life activity and how it may be able to be measured on archaeological specimens (Bozi and Szabó 2020). Niskanen (2023) used measurements from the metapodial dimensions with regression equations to estimate both the body mass of archaeological horses

Maxilla: Upper premolars and molars						
Age (years)	P2 (mm)	P3 (mm)	P4 (mm)	M1 (mm)	M2 (mm)	M3 (mm)
0-1	-	-	-	-	-	-
1-2	-	-	-	(55-92+)	-	-
2-3	(65-70+)	-	-	(92-89+)	(88-89+)	-
3-4	(68-70+)	(81-80+)	(83-85+)	89-90	(89-86+)	(80-82+)
4-5	70-68+	(80-76)	(85-81)	80-73	86-80	(82-83+)
5-6	65-60	76-70	81-74	73-66	80-74	82-75
6-7	60-54	70-63	74-65	66-59	74-67	75-65
7-8	54-48	63-57	65-58	59-53	67-60	65-55
8-9	48-42	57-50	58-51	53-48	60-53	55-48
9-10	42-37	50-45	51-45	48-43	53-48	48-42
10-11	37-32	45-40	45-41	43-40	48-42	42-37
11-12	32-28	40-36	41-37	40-36	42-39	37-33
12-13	28-24	36-33	37-35	36-33	39-35	33-31
13-14	24-20	33-30	35-32	33-30	35-33	31-29
14-15	20-18	30-27	32-30	30-27	33-31	29-27
15-16	18-16	27-25	30-28	27-25	31-29	27-25
16-17	16-14	25-22	28-27	25-24	29-28	25-24
17-18	14-13	22-20	27-26	24-23	28-27	24-23
18-19	13-11	20-19	26-25	23-22	c. 27	23-22
19-20	< 11	< 19	< 25	< 22	< 27	< 22
20+	< 11	< 19	< 25	< 22	< 27	< 22

Table 4 continued.

and their weight-bearing ability, which are useful measures not yet widely applied. Moreover, body size in horses also affects strain on the enthesal surfaces (areas where tendon, ligament, fascia and capsule are attached to bone), which may be discerned archaeologically and should be considered when reconstructing use (Niskansen and Bindé 2021).

Log-ratio Method

Another common method for examining size is the log-ratio method, or log-size index (LSI), which is particularly helpful to explore changes through time (Ameen et al. 2021:5, Table 2, Figure 3). Log-ratio methods compare relative rather than absolute dimensions of archaeological specimens to a standard individual, which is typically a modern Icelandic or Mongolian horse (Benkert 2023; Johnstone 2004), whose elements were recorded according to von den Driesch (1976). The logarithm (base 10) of the ratio between the archaeological measurement and the standard (Meadow 1999) is then calculated, which can provide a robust indicator of size difference. LSI can readily be calculated in R (R Team 2013), in the 'zoolog' package (Pozo et al. 2021; Trentacoste et al. 2018).



Figure 2. How to measure cheek teeth for ageing according to Levine (1982).

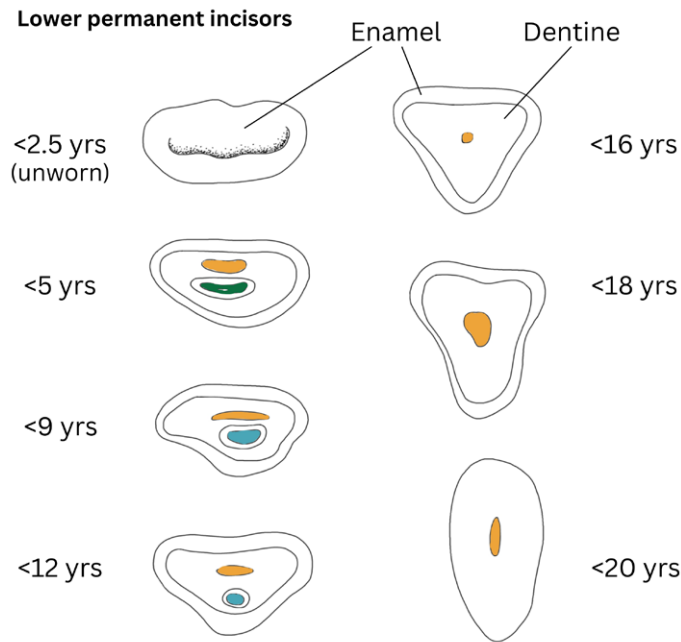


Figure 3. Incisor appearance for ageing horses. Green - dental star; yellow - cup (primary infundibulum); blue - mark/central enamel/enamel ring (secondary infundibulum). The dental star is a darker patch of dentine, in central position from c. 15 years. The cup is the upper part of the infundibulum, which is hollow, and often disappears between 5-9 years. The mark is the lower part of the infundibulum, which commonly disappears in central incisors between 12-18 years. Permanent dentition is complete and in wear by 5 years. Based on Komárek (1993) and Martin (2010).

Tooth	Age of Eruption	Age of Eruption
	Habermehl (1972)	Silver (1963)
dI1	1w	at birth
dI2	3-8w	3-4w
dI3	5-9m	5-9m
I1	2.5y	2.5-3y
I2	3.5y	3.5-4y
I3	4.5y	4.5-5y
C	4y	4-5y
dP2	at birth	at birth
dP3	at birth	at birth
dP4	at birth	at birth
P2	2.5y	2.5y
P3	2.5y	2.5y
P4	3.5y	3.5y
M1	1y	7-14m
M2	2y	2-2.5y
M3	4y	3.5-4.5y

Table 5. Tooth eruption rates for ageing horses, where (d)=deciduous tooth, (I)=incisor, (C)=canine, (P)=premolar, and (M)=molar.

Ageing and Mortality Profiles

Teeth

Ageing data is primarily derived from teeth, as horses' high-crowned hypsodont teeth are worn down at known intervals, and the incisors are altered in appearance through life. Crown height measurements on cheek teeth are taken after Levine (1982), using callipers on clearly identified teeth, which includes the three premolars (PM2, PM3, PM4) and three molars (M1, M2, M3) of the mandible and maxilla (Figure 2). The first premolar or 'wolf tooth' is not included, as it is not regularly present in many horses. These are recorded in mm, and then matched to reference values for age intervals in order to estimate an age-at-death, following Levine (1982) (Table 4). Incisors can be used for age estimation as well as tooth eruption, following Martin (2010), Müller (2013), Silver (1963), or Westenberger (2002) (Figure 3, Table 5). New methods in DNA analysis (see French this volume: 37-46) have enabled determining age-at-death in archaeological horses, which corresponds very well to these more traditional dental ageing methods (Clavel et al. 2022). Sometimes the presence or absence of a Galvayne's groove is referred to in order to determine age, but its length is too variable in relation to the age of the horse, even when present (Martin 2010:8-9), and should not be used to establish age-at-death.

Fusion Rates

For ageing, the fusion state (unfused, fusing, fused) of bones is recorded for particular bones whose fusion rates are known; these rates can vary between types, breeds and populations. Age-at-death, based on epiphyseal fusion, can be estimated following Silver (1963) and Habermehl (1975) (Table 6). Between birth and about 6 years, the epiphyses in

a horse's skeleton are fused, with the majority completely fused by 3.5-4 years.

Mortality Profiles

Age-at-death estimated from teeth and fusion stages are then converted into age-at-death, or mortality profiles, for the horse bone assemblage. These are used to ascertain the herd structure, which ages of horses are at the site, and to determine potential cultural and economic use or trade. Mortality profiles are used for the other livestock to establish if the primary use was for meat (culling many as soon as they attain full body weight), dairy (culling young males early, older females long-lived), or mixed use (Payne 1973). Some zooarchaeologists use ageing data based on teeth only, either molar height or incisors or both, and some combine them with fusion data. Fusion data provides a much more limited age range, only until the animal is an adult and all bones are fully fused. As horses are long-lived and are not often culled as early as other livestock, fusion data without dental data should only be used if there are no ageable teeth available in the faunal assemblage.

Interpreting mortality profiles is not straightforward in horses. In many times and places, they provided meat, milk, and traction, which produce different patterns of culling, but all may be occurring at one settlement. Additional information about the assemblage, such as the sex of the animals, cut marks, evidence for riding or driving, and depositional contexts are helpful to contextualise the mortality profiles. Earlier studies used mortality profiles to try to discern if horses were hunted or domesticated, which is notoriously difficult (Olsen 2006). The presumption is that archaeological sites with herders that are seeking

Anatomical Element	Habermehl (1972)		Silver (1963)	
	Proximal	Distal	Proximal	Distal
Scapula	-	10-12m	3y	1y
Humerus	3.5y	15-18m	3-3.5y	15-18m
Radius	15-18m	3.5y	15-18m	3.5y
Ulna	3.5y	-	3.5y	-
Metacarpus	-	12-15m	-	15-18m
Pelvis/Acetabulum	10-12m	5y	1.5-2y	4.5-5y
Femur	3.5y	3.5y	3-3.5y	3-3.5y
Tibia	3.5y	2y	3-3.5y	20-24m
Calcaneus	3y	-	3y	-
Metatarsus	-	12-15m	-	16-20m
Proximal Phalanx	12-15m	8d	13-15m	-
Intermediate Phalanx	10-12m	8d	9-12m	-
Vertebral Plates	4-5		5y	

Table 6. Fusion rates of horse bones in months (m) and years (y).

to maintain the long-term viability of their herds whilst producing animals for meat or dairy, will result in a different demographic profile of animals than hunters seeking to maximise their return on their efforts (Zeder 2006). Non-food domesticated animals typically follow patterns of livestock that are used for their “secondary products” (Sherratt 1981, 1983), where there would be a full breeding population present, from neonates to very old animals and including prime aged animals. If certain age and sex classes are missing or overrepresented from the mortality profiles, this could indicate the utilisation of animals for their meat and dairy products, wool, or trade. For horses, hunting profiles are assumed to be a mix of ages and sexes if hunters are targeting ‘family bands’ which are multiple mares and their offspring and a single stallion (Olsen 2006), while a traction profile includes subadults and horses over twenty years, with the majority between 6–15 years (Taylor 2017). More adult males are generally expected in horses used for riding and driving than in hunted herds, since stallions and geldings can be ridden and were often important in funerary practices, though if hunters targeted ‘bachelor’ bands, this too could show an overabundance of older male animals (Olsen 2006). In other livestock, many male animals are culled at a young age for meat. When horses are used as a meat supply, their age distribution skews towards young animals (Benecke and von den Driesch 2003; Olsen 2006). A population of animals that is produced for export would lack prime-aged animals, and if their production were not directed for consumption, many animals would survive into old age (Reitz and Wing 2008:192). Obtaining the average age-at-death for the horses within an assemblage can be helpful for looking at changes in use or production through time (cf. Chechushkov et al. 2019:8, Table 3; Kanne 2022a:295–298, Figure 5).

Sexing

The sex of an archaeological horse is determined based on shape of the pubic bone of the pelvis (Getty 1975:303–304; Sisson 1914:109, 111–112) and presence or absence of large canines (Sisson 1914:399; St. Clair 1975:465). Mares typically do not have canines, or if they are present, they are underdeveloped. On the pelvis, male horses are thought to have a robust pubic tubercle, a distinctive shape of the ischiatic arch, the ischio-acetabular ramus, and the obturator foramen, though Nistelberger and colleagues (2021:116) point out that unequivocal sexing is not possible based on these features, and effects of castration upon pelvic morphology are not known. Additionally, finding intact pelvises is relatively rare, as is finding mandible or maxilla fragments where the presence or absence of canines can be determined. DNA analysis provides sex data early on in the screening process, is increasingly used to assign sex in archaeological populations (Clavel et al. 2022;

French this volume: 37–46; Pryor et al. 2024), and can also identify castrates (geldings) (Liu et al. 2023).

Pathologies

Identifying the pathologies on the bones and teeth of archaeological horses divulges use, disease, and injury, thus providing archaeologists with information to interpret past human/horse relationships. Several general resources and edited volumes provide a broad overview of animal paleopathology (Baker and Brothwell 1981; Bartosiewicz and Gál 2013; Davies et al. 2005). Individual cases are the most frequently reported in the literature, with some large scale, comparative studies beginning to collate data from particular time periods and regions (Bendrey 2011; Bulatović et al. 2014; Daugnora and Thomas 2005; Dzierżęcka et al. 2008; Onar et al. 2012; Janeczek et al. 2024; Kanne 2022a; Kanne et al. 2025; Kirillova and Spasskaya 2015; Kveiborg and Nøgaard 2022; Li et al. 2020; Marković et al. 2015; Makowiecki et al. 2021; Pluskowski et al. 2010). Veterinary literature is another resource that is invaluable to understand injuries and rates of injuries in certain kinds of populations. *Adams and Stashak’s Lameness in Horses* (Baxter 2020) provides a good introduction.

Methods for recording pathology have been recently outlined by Thomas and Worley (2019). Visible changes to the bone should be described in detail including the precise anatomical location, the size and shape of the lesion, and the nature, and appearance of new bone formation or destruction. Differential diagnoses must be applied to archaeological cases, where any other possible causes of the lesions must be excluded before a diagnosis can be suggested, with terminology following veterinary examples (e.g., Baxter 2020; Thompson 2007). Paleopathologies that are visible on bone include *trauma, joint disease, metabolic disease, and infection and inflammation*.

Trauma, excluding bit wear and saddle/harness pathologies (discussed below), includes fractures and dislocations, haematomas, and bone penetrating wounds, all of which are known from archaeological cases (Antikas 2008; Dzierżęcka et al. 2008; Janeczek et al. 2023, 2024; Kanne 2022a; Kanne et al. 2025; Lepetz 2013; Lepetz et al. 2020; Onar et al. 2012; Rannamäe et al. 2019). *Joint disease*, or arthropathy, is quite common, which is caused by age or activity related degenerations. These can manifest in osteophytosis (bone spurs), lipping, broadening, and eburnation (polishing) of the articular surfaces, and may progress to ankylosis (fusion) of the joints (Daugnora and Thomas 2005; Janeczek et al. 2017, 2023; Kanne 2022a, 2025; Onar et al. 2012; Marković et al. 2015; Stevanović et al. 2015). Bone spavin, a type of arthropathy, is frequently seen in archaeological horses and encompasses osteoarthritis and/or ankylosis of the joints in the hock. Other horse specific conditions include ‘splints’ (the ossification of the interosseous ligaments of the accessory

Bit wear Type	Type 1	Type 2	Type 3	Type 4	Type 5
Author	Anthony & Brown 2011	Bendrey 2007a	Bendrey 2007a	Bendrey 2008	Taylor et al. 2015
Definition	Wear facet or bevel typically on the lower second premolars (LP2s) created by the horse grasping the bit between the tips of its LP2s & upper premolar teeth (UP2s).	Anterior enamel / dentine exposure, an abrasion on the mesial vertical edge of the LP2, created by the rider pulling the bit back against the LP2; a narrow vertical patch of abraded enamel on the vertical prow of the tooth.	Remodelling or new bone formation, bone spurs, or bone loss on the diastema of the mandible caused by inflammation of the gums in locations wounded by the bit.	New bone formation at the site of the nuchal ligament attachment of the skull.	Medial & lateral grooves on the nasal process of the incisive bone caused by nosebands from tightened halters or bridles or from the cheek pieces of bridles.
Measurement Criteria	A bevel of 3mm or more on the occlusal surface of an adult horse (>3yrs). The measurements are taken by placing a ruler across 2nd and 3rd lingual cusps so that the ruler forms a right angle with the mesial side of the tooth. Callipers are then used to measure the distance between the bottom of the ruler and the point on the tooth at which the occlusal surface meets the mesial edge, round to nearest 0.5 mm.	Enamel/dentine exposure height (EDH) > 5 mm; anterior exposure must not be similar to, or less than, any exposure on the lingual or buccal sides and the form of the exposure should be an approximately parallel-sided band. Measurements of the enamel/ dentine exposure height (EDH) are measured from the anterior occlusal corner towards the root/mandible, & width (EDW) at the widest point.	This is scored from (0) with no discernible changes to the diastema, to (4) with pronounced or markedly flared continuous changes and bony projections > 5 mm. Bone loss to the diastema is also recorded from (0) with no changes, to (++) with pronounced bone loss, viewed laterally at > ¼ the height of the diastema.	Less pronounced stages: two areas (A & B) are scored separately from (0) absent, no discernible development, to (3) palpable, bony (hypertrophic) projection. More pronounced stages (scores 4–6) are hypertrophy of bone that covers areas A & B, awarded one score for the combined area from a (4) bony projection, of less than 0.75 cm in length, that covers A & B, to (6) bony projection, of more than 1.5 cm in length, that covers A & B.	Maximum depth of medial & lateral nasal grooves from the point of deepest groove formation, with straight line drawn along the plane of the nasal process of the incisive bone at the point of intersection between the groove wall and the arc of the bone's dorsal surface.

Table 7: Methodology for identifying bit and bridle/halter wear in archaeological horse remains (Table after data in Anthony and Brown 2011, Bendrey 2007a, 2007b, 2008, Taylor et al. 2015).

metapodia), which are extremely common (Bendrey 2007c), infectious arthritis (which may result in ankylosed joints) (Janeczek et al. 2010), articular osteochondrosis, spondylosis, and ankylosing spondylitis of the spine (Bartosiewicz and Bartosiewicz 2002; Bartosiewicz and Gál 2013).

Though prevalent today, *metabolic diseases* are less well documented or common in archaeological horses. These diseases are induced by over or underfeeding, poisoning, or environmental stress. In archaeological animals, these can be seen through growth disturbances in the teeth, including enamel hypoplasia and Harris lines, more typically seen in other livestock species. *Infection and Inflammation* can result in bony lesions from systemic infection, like tuberculosis and brucellosis, or localised trauma, like osteomyelitis or periostitis (Antikas 2008; Bendrey et al. 2008, 2011; Makowiecki et al. 2022; Onar et al. 2012). Periodontal disease is not uncommon, which is often caused by the uneven overgrowth of the molar teeth, resulting in malocclusions, abscesses, and tooth loss (Kanne et al. 2025; Makowiecki et al. 2023; Onar et al. 2012). The traumatic fracture of a tooth has been recently documented (Marković et al. 2023). Focal overgrowths (rostral hooks) on the upper second premolars can cause wear on the lower second premolars, but this varies in the present and in the past, and is more common in stabled horses rather than pastured ones (Maslauskas et al. 2008). If the maxillary teeth are present, this can rule out hooks being the cause of any wear on the mandibular teeth, including bit wear.

Bit wear

Bit wear has received a lot of attention, which was first identified by earlier archaeologists (Azzaroli 1985; Bökönyi 1972; Clutton-Brock 1974), then experimentally quantified by Anthony and Brown (1991). This method was critiqued (Levine 1999; 2004; Olsen 2003; 2006) then retested and reaffirmed by Anthony and colleagues (Anthony et al. 2006; Anthony and Brown 2011). Bendrey (2007b) and Taylor et al. (2015) have offered additional methods to identify bit and bridle or halter wear. Protocols following Anthony and Brown (2011), Bendrey (2007a, 2008), and Taylor et al. (2015) should be used together to identify five kinds of potential bit and bridle/halter wear (Table 7). The palate should also be examined for damage the bit, and the lesion documented (Onar et al. 2012; Kanne et al. 2025:243, Figure 8.21). Even if it is unclear if the wear on the teeth, mandible, or cranium is caused by bit wear, it is vital that the information is recorded according to these protocols, as well as photographed, and examined under a microscope if possible, so that it can be examined and assessed at a later date. All potentially cultural damage or wear to the horse's skeleton should be documented as well.

Riding and Draft Pathologies

Levine and colleagues (2000; 2005) devised a recording method for riding-based pathologies of the spine. Additional research has substantiated the use of vertebrae to discern riding or driving pathologies based on the location in the

spine and the nature of the lesions involved (Bertašius and Daugnora 2001; Daugnora and Thomas 2005; Janeczek et al. 2014; Kanne et al. 2025; Kveiborg and Nørgaard 2022; Li et al. 2020; Marković et al. 2015; Schrader et al. 2018; Zhang et al. 2023). The lower thoracic and lumbar vertebrae are affected by the weight of the rider, while the cervical and upper thoracic vertebrae are more commonly affected when horses are driven (Zhang et al. 2023:12). Driving may also cause pathology to the shoulder and hip (Schrader et al. 2018). Additional methods in identifying work-related changes to the horse skeleton have been recently developed and applied, such as scoring of enthesal changes to determine the type of use (Bindé et al. 2019; Bozi and Szabó 2020).

Taphonomy

Taphonomy is evidence of the processes, events, and their sequence that occurred between the time of death of the animal, to how the remains entered the archaeological record, including excavation and analysis (O'Connor 2019:39). Three stages can be outlined: 1) from death to entry into the archaeological deposit; 2) the time in which the remains are in the deposit; to 3) their excavation, sampling and analysis. The first stage is the focus of most archaeologists, that is, the cultural and local processes surrounding death and the processing of animal remains for food and burial, including identifying the way the animal died, if or how the carcass was processed, and how it entered the archaeological record.

Causes of Death

Death can be natural, intentional or accidental, through predation, disease, or trauma, but cause of death can be hard to discern archaeologically. One manner of intentional culling that is visible archaeologically is pole-axing, the dispatching of livestock via a sharp blow to the head that pierces the frontal bone of the cranium and enters the brain (Banfield et al. 2019; Lepetz et al. 2020). Relatively humane, the process is roughly similar to a captive bolt method used in modern slaughter facilities, where the animal quickly dies from the initial or successive blows. Archaeologically, pole-axing is evident from a hole or unhealed, depressed fracture in the centre of the forehead, and has been seen on horses from at least the 4th millennium BC at Botai (Chechushkov et al. 2020; Dobat 2006; Krause and Koryakova 2013; Lepetz 2013; Lepetz et al. 2020; Olsen 2003). Battle wounds are another cause of death, recently documented in an early medieval horse from Poland (Janeczek et al. 2023).

Intentional Deposits

Intentional deposits of horses can include individual burials (with or without people) as well as internments as part of ritual, feasting, or other sacrificial, and even practical, events (Dobat et al. 2014; Hukantaival 2009; Josefson and Olofson 2006; Nicodemus 2018; Makowiecki

et al. 2020; Moriarity 2015; Szczepanik et al. 2024). Whilst often considered iconic, burials of horses on their own or with people are culturally and temporally specific (Bertašius 2012; Bertašius, and Daugnora 2001; Bliujienė 2009, and papers therein; Cross 2011; Dönmez 2019; Ganciu and Dumitrascu 2015; Groot 2012; Gudea et al. 2024; Fedele 2020; Fern 2012; Kmeťová 2013; Leifsson 2012; Lepetz 2013; Mattioli 2021; Nachmias et al. 2021; Pluskowski 2012, and papers therein; Salvadori 2012; Sikora 2004). They can be rare in one region and common in another during the same time period, such as in medieval England, where only one burial ground has been found (Pryor et al. 2024), in contrast to the European continent, where horse burials with humans in them are frequent in certain areas during the Middle Ages (Benkert 2023).

Cut / Butchery marks

Butchery or cut mark analysis can be useful to explore subsistence practices, but also how people of the past perceived different animals (Seetah 2007:75). These marks are identified and recorded to see if and how the horse may have been processed after death, either for consumption, or, commonly, also for hides and tools. Although the presence of cut marks is invariably used to suggest that animals were consumed, this should not always be assumed. The primary use of carcass materials for different purposes, such as procurement of certain bones or teeth for tools, hides, or other resources, also may leave marks. There are different kinds of butchery marks, with chop marks and cut marks being the most common, and their nature, frequency, and location on the animal's skeleton can inform about various carcass processing practices, such as skinning and dismemberment. The latter may not necessarily point towards meat consumption as horse meat was often used as dog food; it should also be considered that for disposal purposes, it may have been necessary to divide the carcass of a horse into smaller parts (Outram 2001).

Other settlement taphonomy

There are a number of additional taphonomic processes caused by humans, other animals, and the environment. Breaking up or splitting of horse bones by hitting them with other implements like hammerstones (percussion) is relatively common, especially to obtain the marrow (Outram and Rowley-Conwy 1998). Burning is also frequently encountered in faunal assemblages. It may be related to cooking, refuse disposal, fuel use or cremation (Bond 1994; 1996; Fern 2007; Nolde 2020). Archaeologists record the presence of burned bone, and the degree of burning. Weathering and (dog) gnawing are additional types of typical taphonomic evidence that occurs on horse bones. Having one or both of these is evidence that the bones were either deposited unburied, or in a shallow midden or pit which was accessible to dogs and/or scavengers. Weathering identifies if certain elements were differentially

or wholly exposed to sun and the full strength of the local climate, and may indicate how the animal was placed in the ground if only part of the bone is weathered. Dog gnawing is common in areas where slaughter was undertaken, and the dogs were able to retrieve the bones. In other cases, such as post-medieval England, dogs were fed with horse meat which is not only indicated by differential disposal and weathering patterns, but excessive marks from dogs' teeth (Thomas and Lacock 2000; Wilson and Edwards 1993).

Bone working

Tools and ornaments are commonly made from horse bones (Choyke 2000; 2003; Choyke and O'Connor 2007, and references therein; Choyke et al. 2004). Evocative anthropomorphic figurines, generally thought to be female, were created from proximal horse phalanges since the end of the Palaeolithic, c.19,000 BC (Choyke 2003; Christidou et al. 2009; Olsen and Harding 2008; Otte and Beldiman 1995; Otte et al. 1995; Pawłowska and Barański 2020). Thong smoothers for working leather, potentially for horse tack or ropes, could also be crafted from horse mandibles, such as those at Copper Age Botai (Olsen 2001). Phalanges were used for burnishers or game pieces, while metapodia and radii were commonly fashioned into awls, skates, or sled runners (Choyke 2003; Choyke and Bartosiewicz 2005; Choyke et al. 2004; Küchermann and Zidarov 2005; Li et al. 2021; Maltby 2017). Horse teeth were often drilled and worn as pendants or on dress (Choyke 2003).

Additional areas of analysis

There are a host of additional kinds of archaeological evidence of horses that we can only list here, including a wide variety of *material culture*, *visual culture*, *structures and landscapes*, and *the bioarchaeology of equestrianism*. Each type of evidence has various different traditions of research and methodologies to record and interpret the finds. Though this list is not exhaustive, it is a brief overview of the main categories of horse archaeology aside from the bones. All of these strands of evidence can, and should, be integrated for a more comprehensive study whenever possible.

The *material culture* related to horses includes tack (comprising a wide variety of types of bits and bridle parts, saddles and saddle pads, stirrups, breastplates, girths, cruppers, harness and harness parts, including harness pendants), vehicles and vehicle parts, horseshoes and nails, horse armour, masks, weapons used on horseback, spurs, as well as grooming equipment. Studies of bits have been a preoccupation of archaeologists, and range from the earliest metal bits in 3rd millennium BC (Greenfield et al. 2018), to the many Bronze Age types (Boroffka 1998; Hüttel 1981), as well as the explosion in the Iron Age and later, which are thoroughly detailed in other *Prähistorische Bronzefunde* (PBF) volumes (Dietz 1998; Hase 1969; Palk 1984; Werner 1988) and elsewhere (Jensen and

Kveiborg 2021; Lau 2009, 2014, 2015, 2018; Maguire 2021; Metzner-Nebelsick 1994; Oexle 1992), as well as the vast array of simple to exorbitant medieval bits (Clark 2011, 2020; Kazanski 2016; Nordqvist 2017; Ramqvist 2017; Pedersen and Schifter Bagge 2021; Viallon 2018).

Saddle cloths have been recovered archaeologically from the Bronze Age in areas that are conducive to the preservation of organic materials, such as Egypt (Delpout and Köpp-Junk, this volume), and can be seen in ancient Greek and Roman art (Willekes, this volume). Pad saddles are attested to by the mid-first millennium BC (727–396 calBC) in a woman's burial in China (Wertmann et al. 2023). The Scythian Pazyryk burials have also yielded pad and semi-rigid saddles, as well as other practical and decorative horse equipment, that date slightly later in the first millennium BC (Junkelmann 1992; Stepanova 2006, 2016). An excellent, thorough review in Stepanova (2021) describes the semi-rigid Scythian and later saddles of the Hun-Sarmatian period (2nd c. BC to 6th c. AD) as well as saddles and early stirrups from China, Korea and Japan (Kim, this volume). Roman saddles are fairly well known (Connolly and van Driel-Murray 1991; Watson 2022), with additional frame saddles documented in the early 1st millennium AD (Bayarsaikhan et al. 2024), and many others recovered in subsequent periods (cf. Gráfík 2005; Gřešák et al. 2019; Pedersen et al. 2021; Stepanova 2011, 2014, 2021; Viallon 2015). Stirrups have also been of great interest, known from roughly AD 300 in east Asia, becoming more widely used in the late first millennium AD, and arriving to medieval England last (Csiky 2021; Curta 2008; Penn et al. 2021; Stepanova 2021; Webley 2025). Grooming equipment has not been extensively studied, though Clark (2004) has detailed medieval examples that could be helpful elsewhere.

Visual culture is another fertile area of analysis. People have been painting horses and making portable art and sculpture from the Palaeolithic (Kanne 2022b:15–18 and references therein). The history of horses in all kinds of art and other imagery has deep roots, which can provide helpful visualisations of human-horse relationships in the past (Creighton 2025; Delpout, this volume; Feldman and Sauvage 2010; Knörle and Becker 2024; Recht and Morris 2021; Spruyt 2023). The presence of horses can also be discerned from *structures and landscapes*, such as the the corrals at Botai (French and Kousoulakou 2003; Olsen et al. 2006; Outram et al. 2009), the stables at Megiddo (Franklin 2019) and in the Byzantine Empire (Tütüncü 2008), as well as the stables of medieval England (Liddiard 2021, Baker et al. 2025) and Poland (Dejmal et al. 2014).

The *bioarchaeology of equestrianism* has accelerated in recent years, with a suite of related skeletal markers in humans that identify riders from prehistory to the present, including changes in the shape of the acetabulum (hip socket) and enthesal changes on the pelvis, femurs, and tibiae (review in Berthon et al. 2023). 'Rider's Syndrome' has been cautiously identified in people as early as the

5th millennium BC (Trautmann et al. 2022), and now regularly into the Bronze Age (Hyrchała and Lorkiewicz-Muszyńska 2024; Kanne 2022a), including women and men, and in many later populations (see Bühler, this volume; Anđelinović et al. 2015; Berthon et al. 2019; Bühler and Kirchengast 2022a; Bühler and Kirchengast 2022b; Bühler and Kirchengast 2022c; Erickson et al. 2000; Hagmann et al. 2024; Khudaverdyan 2024; Khudaverdyan et al. 2016, 2022; Molleson and Blondiaux 1994; Pálfi and Dutour 1996; Wenz and Grummond 2009; Zejdlík et al. 2021).

Conclusions

The horse has played a crucial role in human society for many millennia and influenced our past in countless ways. The archaeology of horses is closely linked to ours and can, therefore, be explored from just as many angles. Here, we have introduced the basics and outlined the most common

lines of inquiry of the study of the horse in archaeology, stretching across archaeological subdisciplines, namely zooarchaeology, but also others such the bioarchaeology of humans and material culture analysis, and including other disciplines, like art history, as well as veterinary and medical sciences. Horses have held considerable interest within archaeological research, due to their unique relationship with humans, but certain periods, regions and aspects have been neglected. In recent years, however, some of those topics have caught the attention of scholars, many of whom bring practical equestrian knowledge to the field. With the rapid development of many new advanced methods, and much needed interdisciplinary approaches, we have been able to greatly enlarge our understanding of equine history and horse-human relationships in the past, a research trajectory that is only expanding into the future.

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Advanced Methods in Zooarchaeology

Katherine M. French

Technological innovations continually revolutionise the practice of zooarchaeology by widening the scope of research and our ability to ask penetrating questions of ever smaller samples. The twenty-first century's 'Third Scientific Revolution' includes advances in Big Data, quantitative modelling, and biomolecular techniques (Kristiansen 2014). This chapter covers advanced methods in zooarchaeology, such as biomolecular, histological, and advanced metrical approaches to studying equines in the past. Methodological advances are explained, their research potential emphasised, and examples of specific findings are highlighted.

Ancient DNA

Archaeogenetics and the study of ancient DNA (aDNA) has revolutionised our understanding of equines in history, and, in turn, archaeological remains of horses have been central to the development of the field. The very first ancient mitochondrial DNA sequences published were sampled from archived tissue of an extinct species of equid, the South African Quagga (*Equus quagga*) (Higuchi et al. 1984). An aDNA fragment of a 700,000-year-old horse recovered from the Siberian permafrost represents one of the oldest recovered DNA molecules sequenced to date (Orlando et al. 2013).

Loog and Larson (2020) provide a thorough introduction to methods in archaeogenetics. DNA molecules fragment and damage over time, so aDNA methods are based on the analysis of these short, altered fragments, the length of which can be calculated to date the sample (Allentoft et al. 2012). Whole genomes are now sequenced at ever-increasing speeds and lower costs due to Next Generation Sequencing (NGS) (Goodwin et al. 2016). NGS allows for the sequencing of millions of loci from smaller amounts of DNA than was possible with older, PCR-based technologies (Orlando et al. 2021). Any biological tissue with preserved DNA can be submitted for genetic analysis, but successful extraction depends on the age and burial condition of an archaeological specimen. If the individual is very ancient or the burial conditions are poor for DNA preservation (e.g., tropical environments), then the petrous bone or cementum layer of tooth roots should be preferentially sampled to maximise the chance to extract DNA (Hansen et al. 2017). There are many available methods to extract DNA, and the amount of available sample, the state of preservation, and the genotyping method are all important considerations when deciding on extraction protocols (Xavier et al. 2021). In general, skeletal or dental samples are mechanically pulverised, demineralised, and then DNA is purified to remove all contaminants and other types of protein. The sampling and extraction of aDNA is a destructive process that involves damaging or destroying archaeological material, a finite and non-renewable resource. Therefore, the ethical implications of any sampling strategy must be fully considered (Pálsdóttir et al. 2019). Despite technological developments focused on

prevention and detection, modern contamination is a perennial issue during sampling and extraction (Llamas et al. 2017). Personal protective equipment such as gloves should always be used when handling samples selected for aDNA analysis. Extraction and processing are conducted in a clean laboratory setting with protocols designed to minimise contamination (Fulton 2012).

Genetic evidence has become central to many high-profile zooarchaeological debates involving equids, particularly since the initial sequencing of the whole genome of a Thoroughbred named *Twilight* in 2007 (Wade et al. 2009). This achievement was accelerated by an international collaboration of researchers who first met at the International Equine Gene Mapping Workshop in 1995 and worked contemporarily with the Human Genome Project (Bailey and Binns 1998). Genetic data are now fundamental to diverse research topics such as *Equus* evolutionary history (Librado and Orlando 2021; Vershinina et al. 2021; Orlando et al. 2013), domestication (Librado et al. 2024; 2021, 2017; Taylor et al. 2023; Gaunitz et al. 2018; Schubert et al. 2014; Gerbault et al. 2012), breed diversity and trait selection (Todd et al. 2023; Petersen et al. 2013), coat colour and preferential hunting patterns (Pruvost et al. 2011; Ludwig et al. 2009), identification of equine hybrids (Schubert et al. 2017), dispersal of donkeys (Todd et al. 2022), castration status and age at death (Liu et al. 2023), as well as sex preferences for hunting and ritual uses (Clavel et al. 2022; Nistelberger et al. 2019; Taylor et al. 2018).

One consequence of the domestication of the horse was the greater mobility of human populations. This increased mobility in early horse cultures has also been studied through the study of human gene flow. For example, de Barros Damgaard and colleagues (2018) used human genetic samples to test the veracity of the “steppe hypothesis”, which stated that Yamnaya steppe populations were associated with the dispersal of both horse domestication and Indo-European languages to Anatolia and Central Asia during the Bronze Age (Anthony 2010). They determined that the Yamnaya were genetically distinct from Botai populations where the earliest evidence for horse domestication has been identified. Further, genetic data suggest that the Yamnaya were not responsible for the dispersal of DOM2 horses (Librado et al. 2024), but also did not migrate to Anatolia and Central Asia during the Bronze Age. This is just one example of how archaeogenetics allows for fresh approaches to studying the dynamic impact of equid species on the development of human culture and society.

Palaeoproteomics

While the genome refers to the library of genetic information within an individual, the proteome refers to the comprehensive set of proteins that are expressed by an individual. In other words, the proteome is how an individual's genome is expressed given the environmental

conditions in which the individual has developed. Hendy et al. (2020) give an overview of the emerging field of proteomics and how the study of proteins can benefit zooarchaeological analysis. Peptides, or short protein fragments, often survive better than aDNA; therefore, the field of proteomics can extend deeper in time or recover biomolecular evidence in environments where aDNA would not survive (Demarchi et al. 2016).

The most popular proteomics method is currently Zooarchaeology by Mass Spectrometry (ZooMS), which identifies small fragments of tissue, including bone, utilising collagen peptide mass fingerprinting (Buckley 2018). The development of this method allowed for identification of bone fragments at a fraction of the cost of DNA analysis (Buckley et al. 2009). Equines are included in the ZooMS collagen fingerprinting database and can be successfully identified using this approach, although identifications below the genus level are typically not available at this time (Brandt et al. 2018; Taylor et al. 2018). More research is required to identify species-specific peptides that will allow differentiation between types of equids. Fortunately, these developments are already in progress, and a peptide marker distinguishing donkey and horse has been identified (Paladugu et al. 2023).

Isotope Analysis

The analysis of radioactive, radiogenic, and stable isotopes grows increasingly routine in zooarchaeology for dating, dietary analysis, paleoclimatic reconstruction, and mobility/sourcing research. Britton (2020) and Richards (2020) provide introductions to the range of methods and applications for archaeological questions. Reconstructions of equine diet, seasonality, and mobility have particularly benefited from isotopic approaches. Multiproxy isotope research, or studies that measure two or more types of isotopes, provide more comprehensive and robust datasets for such reconstructions (Madgwick et al. 2021). Nitrogen and carbon are typically combined in studies of ancient diet, whereas strontium and oxygen, and, to a lesser extent, sulphur and lead, are isotope proxies used in the study of ancient mobility.

Sample selection and strategy in isotope studies is highly dependent on research design (Vaiglova et al. 2023). Isotope analysis is a destructive process, and therefore the ethical implications of the research must be carefully considered (Pálsdóttir et al. 2019). Dietary isotopic studies (e.g., $\delta^{15}\text{N}$ or $\delta^{13}\text{C}$) usually sample collagen from bone or dentine (Richards 2020). For mobility studies where the goal is to identify animals who have been transported during their lifetime and buried in a different location, it is important to analyse tissue that retains the juvenile isotope signature, such as the enamel of teeth (Hoppe et al. 2004). Bone remodels, or turns over, during the lifetime, thereby replacing the isotope signature of juvenile animals. Non-calcined bone is

Figure 1. Chemistry fume cabinet set up for column chromatography, a common procedure in strontium isotope analysis. Specialised resin is added to the columns and prepared thoroughly using water and acids. Cleaned horse tooth enamel is dissolved in acid then added to the column. Using ion-exchange chemistry, calcium is separated from the sample, then strontium is eluted from the sample and collected. The ratio of ^{87}Sr to ^{86}Sr is then measured in a mass spectrometer. Source: Katherine French.



also subject to a process called diagenesis, in which bone (and dentine) will lose the *in vivo* strontium signature and take on the strontium signature of the burial environment (Budd et al. 2000). In contrast, highly mineralised enamel is not affected by diagenesis and does not remodel during life.

There are two main strategies for sampling teeth for isotope analysis: bulk or sequential. In bulk sampling, a defined length of enamel or dentine is sampled from the tooth, averaging the isotopic signature from across the period of formation. Sequential sampling, in contrast, captures intra-tooth variation in isotope composition by analysing multiple samples along the length of the tooth crown (Balasse 2002). Sequential sampling allows for greater resolution and captures change over time; however, it is more time consuming and expensive as it involves a higher number of samples per tooth. For sampling horse teeth, the timing of mineralisation (Hoppe et al. 2004) and the unique anatomy and ontogeny of cheek teeth need to be carefully considered. Mineralisation is not consistent over the length of the tooth and equally spaced samples may not represent the same time frame (Bendrey et al. 2015).

All equids are terrestrial herbivores, and therefore dietary isotope studies of horse samples are more narrowly focused relative to studies of omnivore populations. Dietary reconstructions typically combine data from carbon and nitrogen isotopes to capture information on both the photosynthetic pathways of plants (e.g., C_3 versus C_4 plants) and the protein content consumed. Seasonal variations in

$\delta^{13}\text{C}$ have been used to infer winter foddering of prestige horses selected for ritual sacrifice (Makarewicz et al. 2018), and an enriched $\delta^{15}\text{N}$ can signal an increase in consumption of fodder grown on manured fields (Bogaard et al. 2007). Isotopic analysis of modern horsehair proves that even short-term dietary changes in C_3 versus C_4 plant consumption can be tracked on a high-resolution scale (West et al. 2004); unfortunately, hair does not tend to survive archaeologically.

Strontium and oxygen isotopes are used to study the movement of horses across geologically and climatically distinct landscapes on seasonal or long-term timescales (Makarewicz et al. 2018; Bendrey et al. 2017, 2009). A series of recent studies using strontium isotopes ($^{87}\text{Sr}/^{86}\text{Sr}$) document several instances of long-distance, overseas horse transport during the European medieval period, including evidence for Scandinavians travelling with horses to England during the Early Viking Age (Löffelmann et al. 2023), horse trading in medieval London (Pryor et al. 2024), and horses imported from the Fennoscandian Peninsula used in funerary horse sacrifices from the 11th to 13th centuries in the Eastern Baltic (French et al. 2024).

Horse teeth, both from extinct and modern species, have been used for paleoclimatic reconstructions. Reconstructions of seasonality and paleoenvironment for fossil equids using $^{87}\text{Sr}/^{86}\text{Sr}$ and $\delta^{18}\text{O}$ have been particularly popular (Sharp and Cerling 1998; Bryant et al. 1996).

Studies of modern horses demonstrate that sequential sampling across horse cheek teeth can build a composite chronology that allows seasonal changes to be identified over multiple years (de Winter et al. 2020). Data from horse teeth have been used to study climate change over the *longue durée* (Stevens and Hedges 2004). Britton et al. (2019) used sequential $\delta^{18}\text{O}$ samples from excavated horse teeth to reconstruct the mean annual temperature during a period of climatic shift during the Middle Pleistocene in Central Europe.

Lipid Residue Analysis

Lipid residue analysis is the biomolecular identification of fats, waxes, and resins recovered from ceramic, glass, stone, or other vessels, and the interpretation of their origin from various animal fat sources, such as meat or dairying (Cramp et al. 2023; Irto et al. 2022; Evershed et al. 2002). The general process involves extraction of the lipid mechanically and/or chemically, separation of the lipids (e.g., using gas chromatography), and then measuring the chemical composition using mass spectrometry (see Vykukal et al. 2024 and Craig et al. 2020 for a detailed overview of techniques). The origin of the compounds is then interpreted based on the “fingerprint” of the identified biomarkers. Interpretation of biomarker data also requires detailed knowledge about how lipid molecules may degrade or decay over time in the burial environment (Whelton et al. 2021). Lipid analysis of ceramic sherds has been successful in identifying cooking vessels used to process both equine meat and milk in prehistory (Outram et al. 2011, 2009). Lipid residue samples identified as equine in origin from Kazakhstan have been directly radiocarbon dated to as early as the Neolithic (6th millennium BC) (Casanova et al. 2022).

Histological Methods

Histology is the study of tissue and has multiple applications in anthropology and archaeology, including taphonomic, taxonomic, and ageing studies (Crowder and Stout 2012). Bone histomorphology is the study of the appearance of bone at the tissue level of organisation, whereas histomorphometry is the quantitative study of the size and shape of histological structures. Bone or teeth samples can be prepared as cross-section slides for traditional transmitted light microscopic analysis. Typically, this involves dehydrating the sample using a solvent, embedding the sample in resin (e.g., epoxy, acrylic), cutting the sample down to a thickness of approximately 50–100 μm , and polishing the surface to minimise scratches. Use of a scanning electron microscope (SEM) with backscattered electrons (BSE) imaging is also growing in popularity and can eliminate the need for destructive thin sectioning (Hillier and Bell 2010). An and Martin (2003) provide detailed information of sample preparation, slide production, and analysis for hard tissues, including bone and teeth.

The histological organisation of bone can be described based on its ontogeny (primary bone formed from modelling or secondary bone formed from remodelling processes), vascular pattern, and collagen organisation (Cuijpers 2006). Equid primary, or juvenile, bone is fibrolamellar plexiform, which is the same bone type found in other fast growing domesticated animals, including bovids, cervids, and ovicaprids (Figure 2; French et al. 2022; Cuijpers 2009). As horses age, bone remodels, or replaces itself, forming secondary osteons. Research has shown that the organisation of primary bone or the size and shape of secondary osteons (Haversian systems) formed during bone remodelling events may be species specific (Urbanová and Novotný 2005). For example, horse and cattle bone can be difficult to differentiate if highly fragmentary due to similarities in size. Cuijpers and Lauwerier (2008) developed a method to differentiate the species based on the predominance of the lamellar component in horses and the predominance of the fibrous component in cattle. Histology has also been used to explore the growth rates of extinct equids (Nacarino-Meneses and Orlandi-Oliveras 2021) and their burial environments (Nacarino-Meneses et al. 2021). Histological methods can also be employed in the differential diagnosis of palaeopathological lesions or conditions (e.g., Marković et al. 2023).

Incremental growth marks in tertiary tooth cementum have also been analysed using histological methods for ageing and seasonality studies (Naji et al. 2022). Teeth are prepared for cementum analysis using established methods (Beasley et al. 1992). Methods for estimating age and season of death from horse cementum have been developed based on modern samples (Burke and Castanet 1995) and applied to assemblages of archaeological horse teeth (Prilepskaya et al. 2020).

Geometric Morphometrics

Geometric morphometric (GMM) analysis quantifies and compares three-dimensional shapes. This is useful in the study of changing skeletal morphology, for example, to compare morphological differences between wild and domesticated horse skeletons. In standard metrical analysis, an osteologist will collect two-dimensional data and compare size, or perhaps the ratio of greatest length of a limb versus breadth of a long bone shaft (e.g., von den Driesch 1976). GMM standardises data to compare the shape of a morphology of a skeletal element regardless of differences in size. Webster and Sheets (2010) introduce the application of GMM in biological and anthropological research. Anatomical landmarks are defined on a bone type (e.g., craniometric points on a skull) that can be standardised across multiple individuals. Spatial data is then collected from different specimens by defining where the landmarks are positioned relative to each other in three-dimensional space using a microscribe digitiser, three-dimensional laser scanners, or CT scans. In equine

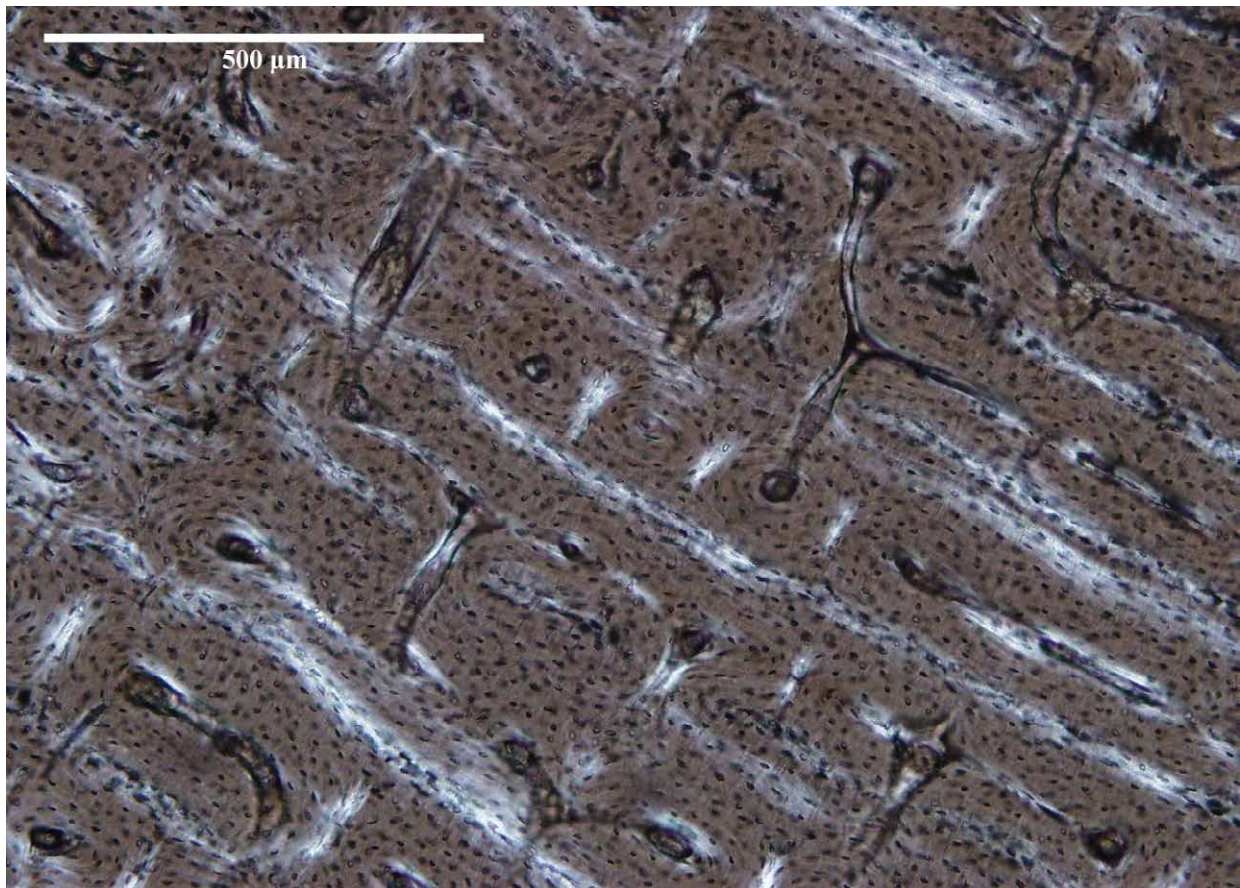


Figure 2. Cross-section micrograph of anterior midshaft of a femur from a 3-year-old Thoroughbred mare showing primary fibrolamellar plexiform bone. Cross-polarised light, x10 magnification. Source: Katherine French.

studies and zooarchaeology, GMM has been employed to study such issues as individual welfare (Sénèque et al. 2019), population diversity (Seetah et al. 2014; Bignon et al. 2005), sexual dimorphism (Parés Casanova et al. 2013), effects of artificial selection on the appendicular skeleton (Hanot et al. 2018), and functional traits (Hanot et al. 2020). Identification of equids is also a key application of GMM (Cucchi et al. 2017; Hanot et al. 2017; Heck et al. 2018).

Integrated Methods

The power of new analytical methods or technologies is magnified when research design integrates data from multiple approaches or techniques, such as combining multiple biomolecular methods or integrating results with traditional zooarchaeological data. For example, French and co-authors (2024) sampled horses selected for sacrifice in the Eastern Baltic region from the 5th to 13th centuries AD to determine whether they were locally-sourced stallions, as suggested by previous research. Using a combination of aDNA and strontium isotope analyses, they determined that one in three individuals were mares and that some of the horses starting from the Late Viking Age had been imported long-distances, almost certainly from the Fennoscandian

Peninsula. Sharif et al. (2022) successfully combine aDNA with GMM and traditional osteomorphology to refine sub-genus identifications in an assemblage of Central European Roman period equids. They identified one in six individuals as mule, demonstrating the importance of the mule in both military and economic contexts.

Conclusions and Future Directions

Technological innovations in archaeology and related fields are constantly opening new research avenues to improve our understanding of equids and horse culture in the past. Meta analysis-style approaches will widen the impact of smaller genetic and isotopic case-studies (e.g., Leggett 2022; Leggett et al. 2021). Novel applications of AI will also allow for the processing of greater amounts of data (Tenzer et al. 2024; Bickler 2021). For example, machine learning approaches have already been deployed to create global reference isoscapes, broadening applications in isotopic mobility research (Baitaille et al. 2021, 2018). The continued creative and ambitious integration of datasets has the potential to augment the technological developments and push the field of zooarchaeology forward to a greater understanding of equid-human history.

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Art History for Historians and Archaeologists: Using Visual Culture as Source Material

Lonneke Delpout

Introduction

Images of horses go as far back as prehistory. Both two and three-dimensional, they can provide a wealth of information. We have to be careful however how we approach these images. There are certain things we should always consider. First of all, we should consider the original purpose of the image. Why was it made? The function of the image greatly influences the content and the appearance of the content, so *what* is depicted and *how* it is depicted. Secondly, we should consider the target audience of the images. Who was it made for? Who had access to the image, and who did not? Why? If the image is meant for a specific group of people, like a family, or someone's colleagues, it is unsurprising if people outside of this group will be unable to understand what it conveys. Thirdly, who made or commissioned the image? Often, people who have artworks commissioned have a certain status; there is social power in images (Bryson 1991). Lastly, one should always consider how the images worked in the culture they appear within.

Once these four key questions are answered, we can start asking how images can be used as a source of information. Images can tell us about the culture they are found within, the knowledge people possessed, how they used and treated horses as well as who had access to them. Depending on the function of the image, they can also tell us about what the horses looked like. The Western obsession with reality often blurs our approach to, and treatment of the images, disconnecting the images' purpose from their appearance (Delpout and Willekes 2023). It was long thought that the famous prehistoric depictions, for example those inside the cave in Pech-Merle, were scenes serving shamanistic significance or that it was simply art for art's sake (Pruvost et al. 2011:18626), and that they were unrealistic. Recent research however has shown that these cave paintings accurately reflect the coat colour of these horses (Pruvost et al. 2011). This is a perfect example of how our modern bias has influenced the assessment of an image, and the people who made it. In this case, the artist was underestimated and their work not considered as "accurate". It can also go the other way. We often like to recognise things in images, which might cause us to identify something that is not actually there, for example the idea that ancient Egyptian horses are so-called "proto-Arabians" (Delpout and Hetteema 2021). The process of looking for, and recognising modern concepts, ideas and customs in ancient depictions is called "retrojection" and should be avoided at all costs (Webb 2014). Lastly, the horse has always been studied in relation to people, which in itself is not necessarily a bad thing; however, we must ensure that this anthropocentric focus does not limit our research.



Figure 1. Cave painting in Chauvet, France. c. 30,000 BCE. © Patrick Aventurier, Communication Grotte Chauvet 2, CC BY-SA 4.0, via Wikimedia Commons.

Depictions of horses through time: a short overview

The following overview aims to give an insight into the various kinds of horse depictions found all over the world and in different time periods. The time span ranges from prehistory until Edward Muybridge captured the motion of the horse on camera in 1878. The earliest two-dimensional depictions of horses are found in caves in France and Spain, as for example in Chauvet, France (Figure 1). It is the oldest known illustration, dated to about 30,000 ago, and shows several wild animals, including four horses in the middle. Their manes are standing upright on their necks and their coat is filled unevenly with a dark colour while their muzzles are kept light on purpose. The outlines are darker than the rest of their coat, creating somewhat of a three-dimensional effect and highlighting their figures against the background. These cave paintings are not as intensely coloured as for example the famous example from Lascaux but do show the artist's keen observation skills. Although we cannot be sure about the exact function of these paintings, genetic confirmation that the coat colours depicted did exist at the time (Pruvost et al. 2011) suggests that there was at least a partial intention to portray these animals naturalistically.

During the Bronze Age, depictions of horses rapidly became more common, following their domestication and use in Europe, the Middle East and North Africa. This introduces a change in the depictions: whereas previously the main subjects of cave paintings and rock carvings were those of wild horses, the images now concern mainly domesticated horses. The first images of horses in Egypt arrive around 1,600 BCE (cf. Figure 2). These horses are located in the tomb of Rekhmire, a rich Egyptian nobleman who had the resources to eternalise himself (and these horses) in the superstructure of his tomb, which was meant to be seen by people. The tomb paintings were meant to memorialise the identity of the deceased in this life, and project it into the next. It also had to convince the tomb visitors that Rekhmire was important enough to live forever, and to convince them to contribute to his cult. He was therefore trying to impress them with these depictions. The horses follow the characteristic Egyptian canon, i.e., way of depicting, and are introduced into the pictorial tradition shortly after the introduction of the horse into Egypt. The painting shows a grey and a chestnut horse; this later becomes the Egyptian staple of depicting their horses. There are no sex markers visible and the horses are shown in motion, with



Figure 2. Tomb painting from Theban tomb 100, tomb of Rekhmire, Mayor of Thebes. c. 1504–1425 BCE. © Metropolitan Museum of Art, New York. Inv. no. 31.6.41.



Figure 3. Cast of a wall panel depicting a lion hunt in relief. c. 875–860 BCE, from the central palace in Nimrud, Iraq. © Trustees of the British Museum. Inv. no. 124579. CC BY-NC-SA 4.0.



Figure 4. Qin bronze chariot with four horses harnessed to it, part of the terracotta army of Qin Shi Huang. 210–209 BCE. © By Jean-Marie Hullot, CC BY 3.0, via Wikimedia Commons.



Figure 5. Jockey of Artemision, Greece. c. 140 BCE. Bronze. © Adeline Coe, Furman University. <https://scholarexchange.furman.edu/art231/4/>.



Figure 6. Roman mosaic of four charioteers with their horses. c. 300 BCE. © Carole Raddato, via World History Encyclopaedia. <https://www.worldhistory.org/image/3920/roman-mosaic-with-charioteers/>.

their legs moving forward. The halter, which the grooms use to lead the horses into Egypt, is rich in detail. These horses are foreign tributes from Syria on their way to the Egyptian pharaoh.

Figure 3 shows a wall panel depicting a lion hunt in relief from the Late Assyrian central palace in Nimrud. The location of these walls suggests a limited audience, but the king who commissioned these reliefs often had them placed in the part of the palace where he received his foreign audiences. That way, he could impress his visitors with his achievements. The reliefs show the king, or his son, in the chariot, hunting lions. The horses are leaping forward in a flying gallop, and are clearly stallions.

In the East, the most famous horses are without a doubt the horses of the terracotta army (Figure 4). These four horses are harnessed to a covered carriage mounted by a carriage driver. All four horses' forelocks are parted on their forehead, the rest of their manes are standing upright on their neck. They are fully equipped with the harness necessary to pull a chariot. These horses were part of the terracotta army interred into his tomb of King Qin Shi Huang (210–209 BCE), meaning they were never to be seen again, but meant to accompany the king into the afterlife. It therefore mattered less what they looked like as long as they worked, but since they were made for the king, they are naturally outstanding.



Figure 7. fr140: 'Illustration of four horsemen, each one with a sword and a hide shield, and each one carrying his shield on his horse's croup' from *A Mamluk manual on horsemanship, military arts and technology* by Muḥammad ibn 'Īsā ibn Ismā'īl al-Ḥanafī al-Aqṣarā'ī in Damascus. The image is part of 'Teaching 3: Swordsmanship' and shows four horsemen, each holding a sword and a shield. Since the manuscript is a manual on horsemanship, military arts and technology, the illustrations accompanying the text are a great source of information on Mamluk military practice. Due to its practical nature, both the text and the images can be used as a historical source on the subject matter. This is in contrast to trying to reconstruct an ancient Egyptian or Assyrian military chariot from the temple or palace reliefs, since those images served a different purpose, and were made to impress rather than educate.

Until then, depictions had mainly contained horses in front of a chariot, but depictions of ridden horses became more popular from the second century BCE onwards. The most famous example is quite possibly the Greek jockey of Artemision dating from c. 140 BCE (Figure 5). This life-size bronze statue shows a horse mounted by a small boy interpreted as a jockey. The horse's fast motion is strongly conveyed by the horse's posture: the flying gallop, his facial features and his ears pointing backwards; even his tail is flailing behind. This horse, too, has sex markers and can be identified as a stallion. The short mane is standing upright on the neck. Much like the horses in the Assyrian relief from Nimrud, the artist made the horses' muscles visible in the statue, again emphasising the speed and power of the horse. Considering the size of this statue, it undoubtedly was (and still is!) an impressive sight to behold.

A Roman mosaic from c. 300 CE from the Palazzo Massimo alle Terme in Rome shows four different charioteers with one of their race horses each (Figure 6). Each horse has a slightly different coat colour, without pattern; their heads are held high and one front leg is lifted. Although it is hard to see, all four horses appear to be stallions. Their manes are depicted flowing almost upright from their necks and their ears are all pointing backwards. The artist included details to show the muscles of the horses. The mosaic comes from a palace and, therefore, probably served a decorative purpose.

Figure 7 is a folio from a so-called 'Furusiyya' manuscript, a Mamluk manual on horsemanship, military arts and technology (1348 CE). This version is made by Muḥammad ibn 'Īsā ibn Ismā'īl al-Ḥanafī al-Aqṣarā'ī in Damascus. The image is part of 'Teaching 3: Swordsmanship' and shows four horsemen, each holding a sword and a shield. Since the manuscript is a manual on horsemanship, military arts and technology, the illustrations accompanying the text are a great source of information on Mamluk military practice. Due to its practical nature, both the text and the images can be used as a historical source on the subject matter. This is in contrast to trying to reconstruct an ancient Egyptian or Assyrian military chariot from the temple or palace reliefs, since those images served a different purpose, and were made to impress rather than educate.

In 1802, Napoleon commissioned one of his most famous portraits: mounted on horseback crossing the Alps; five editions of the portrait exist. This particular portrait (Figure 8) was meant for the library of Les Invalides, but is currently at the Palace of Versailles. Being part of a library suggests that there was an audience for the painting, i.e., as a means to impress, and, in a way, legitimise his rule. The painting depicts Napoleon mounted on a rearing horse, crossing Mount Saint-Bernard in the Alps. The artist made sure that we identify the mountains as the Alps, a crossing made before by Hannibal as well as Charlemagne, by including their names on rocks at the bottom of the painting. This served to make the painting extra impressive for onlookers. If we were to use this painting as a historical source, we would conclude that Napoleon bravely crossed the Alps on his noble steed. However, we know for a fact that the trip was extremely difficult, and that Napoleon actually crossed most of the Alps mounted on a donkey led by a peasant, as seen in Figure 9. Of course, this painting was not commissioned by Napoleon, but by the Brit Arthur George, who had seen a version of the famous portrait and commissioned Paul Delaroche to make a more realistic version. These two paintings have very different functions and are a great example of how the purpose of the image dictates its content and appearance, showing care must be taken when using these images as a source of information.

In 1878, Edward Muybridge published his photographs of a horse in motion under the general title *The Horse in*



Figure 8. Napoleon crossing the Alps (Mount Saint-Bernard), by Jacques-Louis David. 1802, Spain. © Château de Versailles, photo by Franck Raux. Inv. No. MV 1567.



Figure 9. Napoleon crossing the Alps, by Paul Delaroche, 1850. © Walker Art Gallery, Liverpool. Inv. no. WAG 2990.

Motion (Muybridge 1878) (Figure 10) and revolutionised the way horses are depicted. The photographs illustrate several equidistant consecutive phases of one complete stride of a horse while walking, trotting, galloping, etc. (see also Muybridge 1957:14). This is the first time that people were able to see in detail how horses move in each of the main gaits.

The what, the how and the who

The first thing to do when talking about art is to realise the different layers that make up an image: image content, image rendering and the image referent. As we will see, all three are dictated by the function of the image. First, there is image content, i.e., what we are meant to recognise (Pichler and Ubl 2016:435): Is it a horse? Is it a cow? A cat? We can take this even a step further and ask what kind of horse is it? Can we recognise a certain breed? Is it a mare, a stallion, a gelding? An adult horse, a yearling, or a foal? Is it a riding horse, a chariot horse, a breeding horse? All these factors are related to why the horse is depicted in the first place. If it is a ruler depicting himself on horseback, chances are that the horse he is depicted with is a stallion. Does this mean that rulers only rode stallions? Not at all, but they often use the display of a stallion to enhance their own masculinity, a trend already observed in ancient Egypt.

There is, therefore, an ulterior motive at play, which is why it is so important to identify the *function* of the image, i.e., its context and the role of the horse within the context, before analysing it.

Image rendering, something people have been fascinated with for centuries, is how the image content is made visible, i.e., the horse's form, space, proportions and details. Is the horse realised with just some simple brush strokes, or is the mane painted with individual lines? Is the shape of the horse based on what horses look like in real life or is it idealised or even abstract, and why? How does the medium influence the shape of the horse? For example, one can imagine that the shape of the horses depicted in the caves of Lascaux are heavily influenced by their medium, i.e., the stone walls. How is space used in the image? Is there any three-dimensionality present in the image? Is there overlap creating depth? Are colours used to indicate shadow, or space? If not, did the artist not know any better (this is rarely the case), or does it have to do, for example, with the materiality of the object? The rendering, or *how* things are depicted, is often the first thing that catches people's eye. It is therefore a crucial part of the image composition, and in most cases decides for the viewer how realistic the image is, disregarding the image content entirely (Delpeut and Willekes 2023).

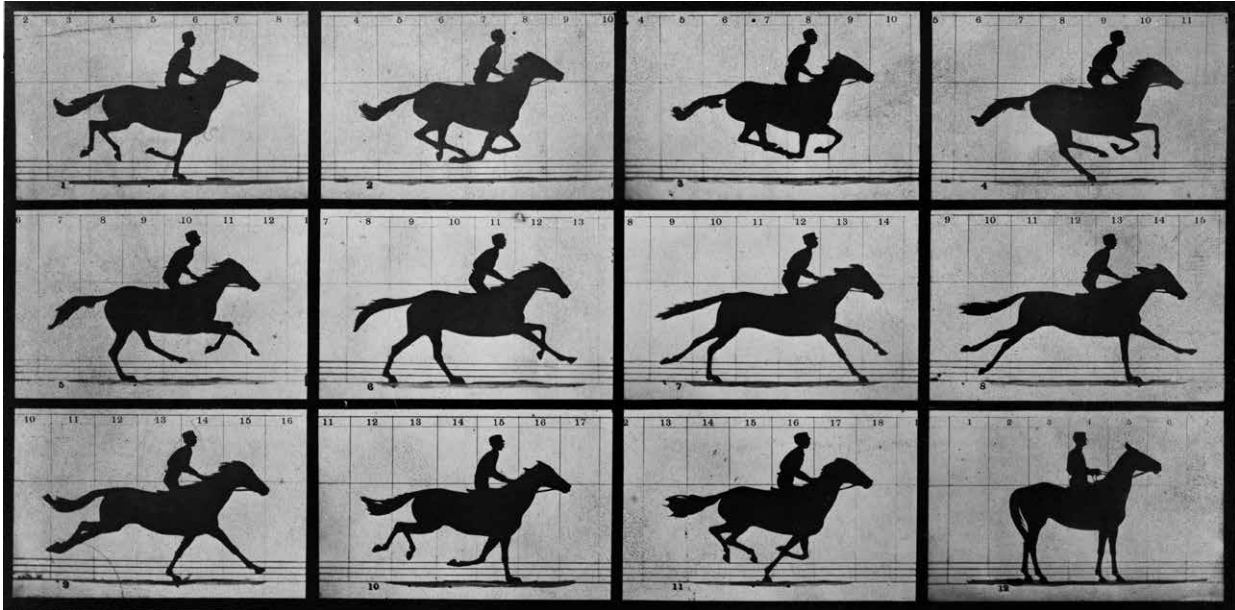


Figure 10. The Horse in Motion, illus. by Muybridge. "Sallie Gardner," owned by Leland Stanford, running at a 1:40 gait over the Palo Alto track, 19 June 1878: 2 frames showing diagram of foot movements. 1878. © By Eadweard Muybridge. Provided directly by Library of Congress Prints and Photographs Division, Public Domain. Reproduction number: LC-DIG-ppmsca-23778.



Figure 11. Hunting scene from Theban tomb 56, tomb of Userhat. Acc. no. 30.4.42. Photo by Alexis Den Doncker. © MANT-ULiège.MANT-ULiège.



Figure 12. Painting of a polo match in the tomb of Li Xián. 706 AD. © Tang Li Xian Mu Bi Hua, 1974. Wikimedia, public domain.

Lastly, there is the image referent, which is who is intended to be depicted in the image (Pichler and Ubl 2016:437). Many horses may look the same, as for example in ancient Egyptian art, but this does not mean that they all represent the same. In some cases, they are just ‘a’ horse, whereas in other cases they are specific, individual horses, e.g., those belonging to Ramses II, named Victory-in-Thebes and Mut-is-content. So even if the image content and image rendering might be rather generic, just a nonspecific horse with basic shapes and details, it might still *represent* a specific horse, though identification may be difficult. At the Cheltenham races in the UK, surely the target audience of the event is able to recognise Arkle, Dawn Run, Golden Miller and Best Mate in the statues of horses, even though they all look very similar depicted in bronze. In this case, it is the background knowledge of the audience that provides the identity of the horses, and of course the text on the labels.

These three factors are all influenced by *why* the image was made. This is why it is so important to be aware of the function of the image, often explained by its context, and the role of the horse in the specific context. The next part of this chapter will dive into why horses in illustrations look the way they look, taking their image content, rendering and referent into consideration.

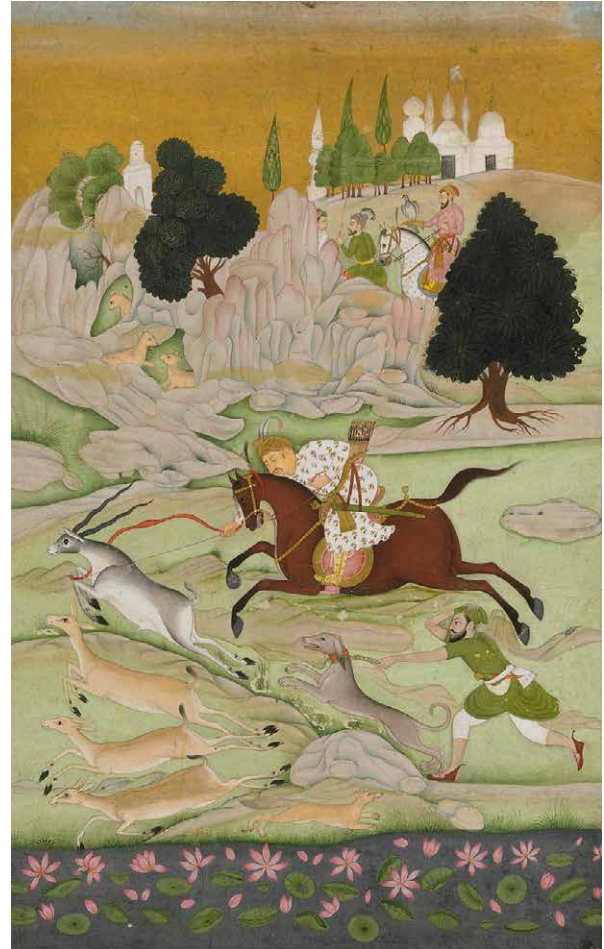


Figure 13. Akbar hunting. Painting on detached album folio. c. 1650-1750. Made in India. © Trustees of the British Museum. Inv. no. 1920,0917,0.316. CC BY-NC-SA 4.0.

Why are horses depicted the way they are?

Image content: what do we see, and why do we see it?

This section will focus on the image content, and why it depicts what it does. The image content is what the artist wants us to recognise in the image, in our case horses. Movement, sex markers and coat colours will be considered to show the different motivations for the execution of the images.

Movement

A very popular way of depicting fast movement is the so-called ‘flying gallop’, signifying a leaping movement from an animal, be it horses, hares, foxes, dogs, etc. The animals’ hind legs are stretched as well as the front legs, which are raised in the air, leaping forward. It slightly resembles a jumping motion, except that the front legs are stretched forward and not bent, as they would be if the



Figure 14. Flying horse of Gansu. Bronze, Eastern Han dynasty, 25–220 CE. Gansu Provincial Museum. © Michael Gunther, via Wikimedia Commons.

horse was indeed jumping. Additionally, a horse cannot jump like this while harnessed to a chariot. Examples for horses in flying gallop are plenty: from Assyria (Figure 3), Egypt (Figure 11), China (Figure 12), India (Figure 13) and England (Figure 23). There is no doubt that the artists knew very well that horses didn't move like this; but this way of depicting the horse, convincingly conveys that they are moving at a high speed. This is further confirmed by the setting of these scenes: hunts, sports, or engaged in battle, all high-energy activities which require fast movements. The space left underneath the horse's front legs in these images could also be used for other pictorial elements, such as fleeing and wounded animals (e.g., Figures 11, 13). The reason for depicting the horse this way can therefore also be connected to the use of space. In addition, the placement of the horses and chariot at a certain level and in this

posture makes for an impressive sight. We can, therefore, see that the posture of the horses did not necessarily aim to represent an anatomically correct version of galloping horses. Instead, the motivation for rendering the moving horses in a 'flying gallop' had a number of other reasons: in the case of the Egyptian and Assyrian horses especially, it was meant to draw the eye and impress. This is a very good example of how the purpose of the image dictates the posture of the horses.

Another example of showing a horse in motion is the flying horse of Gansu (c. 200 CE) (Figure 14). Here, fast movement is conveyed by extending both right legs forward, while its left legs are striding behind, akin to a pacing horse. There is no doubt however that instead, this statue simply depicts a horse going very fast, not conveying an ambling gait. The same can be said for the horses in



Figure 15. Three galloping horses from Iran. Single page painting mounted on detached album folio. © Trustees of the British Museum. Inv. no. 1930,0607,0.10. CC BY-NC-SA 4.0.

Figure 2 from the tomb of Rekhmire (c. 1504–1425 BCE). The horse was still fairly new in ancient Egypt, and had just made its way into their pictorial tradition. If we try to reconstruct the gait of these horses based only on their posture, we must conclude that these horses are performing an ambling gait: both their left and right legs are moving in the same direction at the same time. If we look further into the Egyptian way of depicting however, we soon find out that ‘one foot forward, one foot backward’ is the standard way of depicting motion for the ancient Egyptians, therefore not indicating a specific gait in this case. It is very likely that they took the human way of moving and ‘doubled’ it, so to say. The ancient Egyptians applied the concept ‘walking movement’ to a new animal in art, namely the horse, and just depicted them the way they would any other animal. To the ancient Egyptians, this conveys that the horses are in motion, walking. It does not mean that the ancient Egyptian horses (or Syrian horses, as these horses are foreign tribute) possessed an ambling gait. Considering these culturally specific ways of depicting motion, we should be very careful when we interpret movement of horses in two-dimensional images, and we should be aware of the fact that in many cases we cannot pinpoint a specific gait because that was *not* the purpose of the image.

Coat colour

We’ve seen an extraordinary variety in coat colours already. Pruvost and Bellone (2011) have shown that the genotypes of pre-domestic horses match the phenotypes painted in Palaeolithic works of cave art, i.e., the dappled horses in paintings actually existed, and that they likely served as inspiration for the artists. It is therefore apparent that the way the coat colour is shown, aims to a certain extent to represent what the artists saw. It is very likely that this is true for a lot of cultures: to draw within the realm of potential realism. The ancient Egyptians, too, coloured their horses within this principle, although the variation seen within their depictions are also based on other motives. The horses from the private tomb of Rekhmire in Figure 2 are a white and a red ochre coloured horse, which became the most common combination in ancient Egyptian private tombs. There is no way that the amount of white coloured horses on Egyptian tomb walls correspond with the number of greys in ancient Egypt: it was a compositional choice to paint the horse white and chestnut. One possible motivation for this is that of course grey horses are much less common than for example chestnuts, and that the depiction of a grey horse in association with the rider works as a (high) status marker. This however requires a much more



Figure 16. fr129: 'Illustration of a horseman with a small shield around his neck and a sword in his hand which he brandishes to left and right' from *A Mamluk manual on horsemanship, military arts and technology* by Muḥammad ibn ʿĪsā ibn Ismāʿīl al-Ḥanafī al-Aqṣarāʾī (الحنفى الأقصرائى محمد بن عيسى بن إسماعيل). 1348, Damascus. © The British Library: Oriental Manuscript (p. 270/602). Inv. no: Add MS 18866.

delicate analysis. It is much more likely that this colour combination is chosen because it creates a nice contrast between the two, which enables the viewer to clearly distinguish between the two horses.

Different coloured horses also make for an interesting composition, as for example in Figure 15. This painting depicts three galloping horses, a light chestnut, a black and a grey horse. There is no doubt that these kinds of horses existed in Iran around this time, and that they too are depicted with realistic potential. The variation and colour combination however make for a beautiful contrast, the horses easily distinguishable from each other, and a very interesting image to look at. The colours even match the brown-with-gold edge, something that is very likely not a coincidence. Considering this image is from a manuscript, there would have been a limited audience, and whoever commissioned this manuscript could have also had a say in the colour variation. The colour variation in the Roman mosaic (Figure 6) also operates within the realm of realistic potential: all these coat colours are possible. That the horses within these mosaics are based on horses that had exactly these colours is doubtful, or even that they existed: the artist is choosing from a range of possibilities that are acceptable within the culture's canonical tradition. The artist of course also had an interest in the execution

of the image: the more people who liked his work, the more likely he is hired by others. The variation within one mosaic can therefore also represent something like the artist's portfolio: they show the audience what they know, and what they can do.

Figure 16 from the *Furusiyya* manuscript by Muḥammad ibn ʿĪsā ibn Ismāʿīl al-Ḥanafī al-Aqṣarāʾī shows a very particular pink coloured horse with a white chest, a white blaze, and specks all over its coat. The great thing about these manuscripts is that we know exactly why they are made: they are instruction manuals on horsemanship, military arts and technology. The coat colour of the horse therefore has no function in the image, which is why the artist could in that case do what they wanted, within the Mamluk pictorial tradition. Although this colour and pattern might very well represent a particular coat that is unfamiliar, the pinkness of the horse immediately stands out as not naturalistic. The purpose of this image however was not to give a catalogued overview of all possible coat colours in the Mamluk period. The coat colour does not play a role within the image within what it is primarily made for. The artist of course still chose artistic elements to make the image interesting, such as this colour combination, or the variety of the coat colours shown in the horses in Figure 7 from the same manuscript.



Figure 17. Ramses III hunting in the desert. Medinat Habu, Egypt c. 1186–1155 BCE. From Breasted, J.H. *Medinet Habu - Volume II: Later Historical Records of Ramses III*. Oriental Institute Publications 9. The University of Chicago Press: Chicago, pl. 116. © Courtesy of the Institute for the Study of Ancient Cultures of the University of Chicago.

Sex markers

As we could see in the timeline, there are many horses depicted with sex markers that enable the viewer to identify the horse as a certain sex, often stallions. The sex markers vary, from none to udders, only a phallus sheath, and a phallus and testes. These sex markers did not find their way into the image by accident: the artist made a deliberate choice to include them in the image. All horses in Figure 17 (Egypt, c. 1186–1155 BCE), Figure 3 (Assyria, Figure 18, Iran, c. 1601–1606 CE), Figure 19 (Roman, c. 175 CE) and Figure 20 (Spain, c. 1640 CE) contain all the sex markers to recognise these horses as a stallion. Throughout time and space, rulers have often depicted themselves either on horseback, or on a chariot, with the horses being unmistakably stallions. There are many more examples throughout time, which means there is a likely correlation between male rulers, and male horses. It is quite possible that male rulers liked to depict themselves on stallions to enhance their masculinity. Whether that has to do with showing that they

have ‘a big, mighty stallion’ under control, or that simply the masculinity of the horse is already enough, is another question. In any case, the motivation to include the sex markers of a stallion is to enhance the rider’s masculinity.

This also happens in non-royal examples, such as in Figure 11 from the Egyptian tomb of Userhat, the Roman mosaics of racehorses in Figure 6, or the Medieval English horse in Figure 22. The best example that shows the role of the sex markers in the image is in Theban tomb 56, the above-mentioned tomb of Userhat, where in the hunting scene the horses are stallions, whereas on the wall across, the seemingly same horses are depicted without any sex markers at all. These horses are part of a scene depicting the funerary procession of the tomb owner, where the sex of the horses played no role. Just like the rest of the rulers mentioned above, Egyptian pharaohs liked to depict themselves in chariots pulled by stallions. The horse in ancient Egypt in royal imagery was mainly employed as their mode of transportation, in the midst of

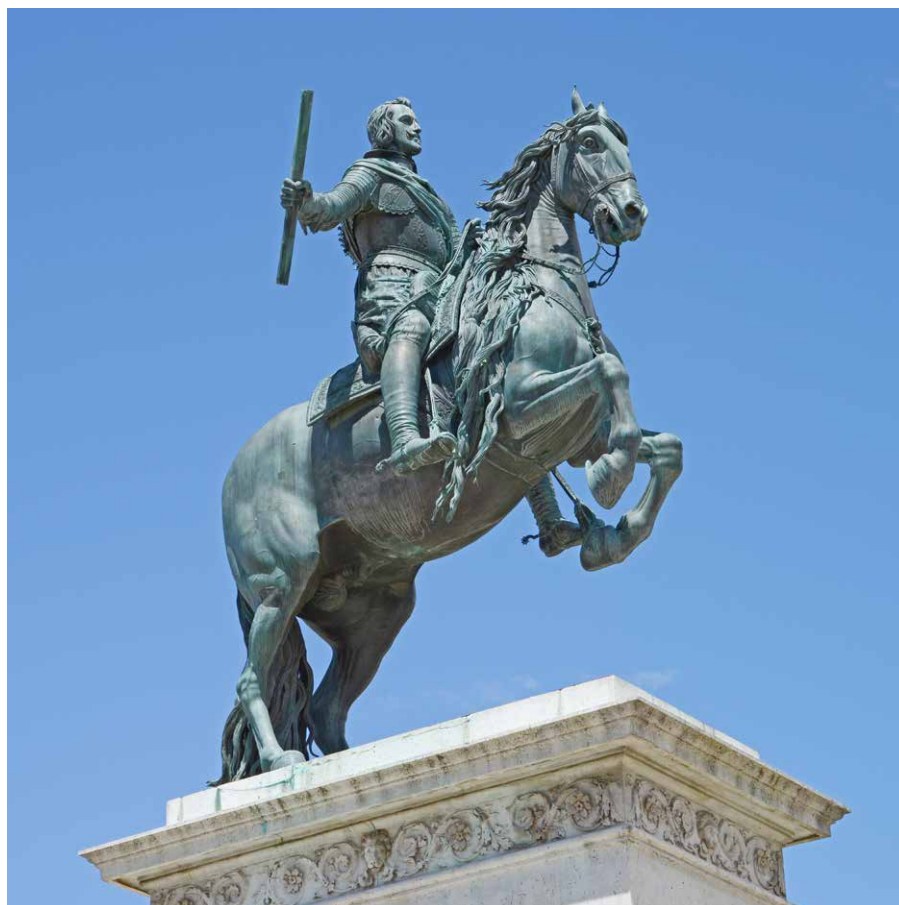


Figure 18. A stallion, painted by Habib Allah of Sava, from a codex. c. 1601–6, Herat, Afghanistan. © Metropolitan Museum of Art, New York. Inv. no. 1992.51.



Figure 19. Equestrian statue of Marcus Aurelius. Possibly from the Roman Forum or Piazza Colonna, Rome, Italy. c. 175 CE. © Wikimedia Commons.

Figure 20. Equestrian statue of Philip IV by Pietro Tacc. Plaza de Oriente in Madrid, Spain. 1640 CE. © Joaquim Alves Gaspar, via Wikimedia Commons.



battle. Since battle scenes had no place in private tombs, non-royal figures liked to equate themselves to the king by depicting themselves hunting in their spare time, such as in the tomb of Userhat. It is therefore no surprise that here too he chose to depict himself in a chariot pulled by stallions. Does this mean that all Egyptian war horses were stallions? Not at all. The most likely explanation for the use of horses in warfare in ancient Egypt is that they at least, if not exclusively, used mares and geldings, otherwise you would severely limit the horses available to you (see Delpeut and Matić 2025).

Image rendering: how are horses made visible, and why this way?

Shape and proportions

One of the most striking parts of the rendering of the horse is their shape and proportions. In some cases, the shape of the horse is attributed to a certain breed, or prototype thereof, even though some of the images where it happens are way older than the first official documented attestations of the breed. This is a process called 'retrojection', looking for and recognising modern concepts, ideas and customs in ancient depictions

(Webb 2014). Figure 18 shows the painting of a horse from a codex, which was probably commissioned by a member of the royal family. The Metropolitan Museum of Art, where the object resides, describes the animal as a "richly caparisoned royal horse of Arabian stock, with a small head and an elegant swan's neck, abound in fifteenth-, sixteenth-, and seventeenth-century Iranian, Turkish, and Indian paintings and drawings" (the Metropolitan Museum of Art object webpage). Whether or not this horse is a representation of an Arabian horse is up for debate, however, drawing the conclusion about a 400-year-old horse as representative of a certain breed is a fine example of retrojection. It completely ignores the pictorial tradition of a particular region, or culture: if depictions of horses all look similar to this one in the fifteenth-, sixteenth-, and seventeenth-century in Iran, Turkey and India, perhaps it is rather a pictorial tradition than a representation of a breed that did not exist yet. This is not saying that horses in that region did not resemble the characteristics that are so prevalent in this image: its small head and long neck could have well been present in the horses in that time period and place. Looking at this image however, in terms of shape and proportions, this is not what a horse looks like, or

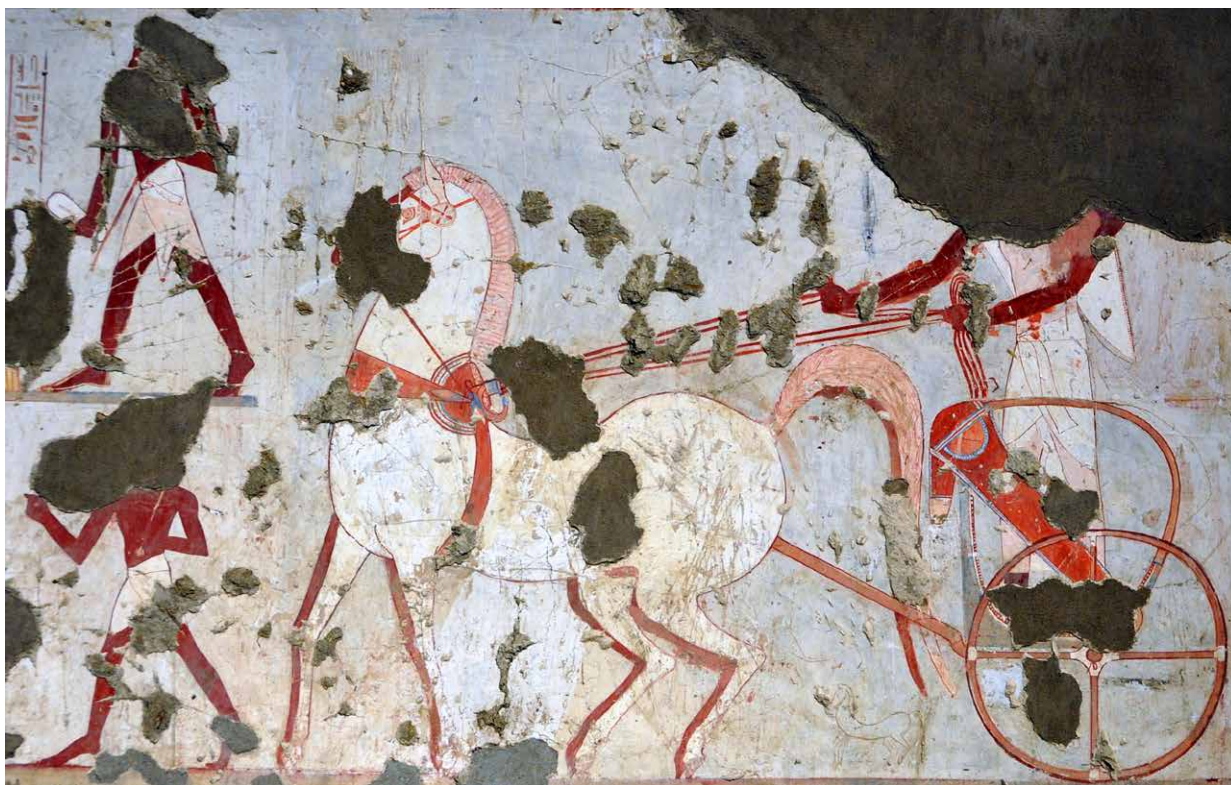


Figure 21. Amenhotep-Sise mounted on his chariot from Theban tomb 75. c. 1401–1391 BCE. Photo by Alexis Den Doncker. © MANT-ULiège.



Figure 22. Knight on horseback from L'Estoire del Saint Graal, France. 1316. © British Library. Inv. no. Add MS 10292, Folio no. 213r.



Figure 23. Fox Hunting: The Leap, by Charles Bentley. 1828. © Yale Center for British Art, Paul Mellon Collection. Inv. No. B1985.36.69.

moves, as we've seen above. If indeed this codex was commissioned by a member of the royal family, it is likely that the artist fashioned the horse exactly the way that the patron wanted within the pictorial tradition of their culture. It probably has more to do with the local canonical tradition than with the anatomically correct representation of a certain breed.

Just like the example above, the shape of the ancient Egyptian horse in Figure 21 also does not exactly resemble what a horse looks like. The hollowed back, the short, thick neck and the small head as well as the voluminous hind quarters are clearly rendered in a way that does not correspond to the anatomy of the horse. And just like the example mentioned above, the image still works: there is enough resemblance in terms of content and rendering for the viewer to recognise a horse in the image. The image of the horse in Figure 21 is located in the tomb of a rich ancient Egyptian elite nobleman, who depicts himself driving a chariot. The tomb owner, Amenhotep-Sise, chose to include this scene in his tomb to convey to the viewers (his peers, colleagues, family, as well as us, still today) that he drove a chariot to work, marking his high status. What the horse looks like exactly, is not important, as long as it: a) conveys the content that is important (status) and b) fulfils the criteria of the ancient Egyptian canonical tradition.

Another wonderful example of an interestingly shaped horse is the egg-shaped horse from the manuscript 'L'Estoire del Saint Graal' from France, c. 1316 (Figure 22). This depiction, from one of a three-part manuscript illustrates the story of the holy grail, Merlin and Lancelot, accompanying the texts. The horse on the left is depicted from the side and has the knight still mounted on his stallion, whereas on the right, the horse is depicted frontally and the knight lying on the ground. Clearly this shows the victory of the knight on the left over the one who is shown dismounted. The frontal horse raises some eyebrows: its face depicted this way gives it a sad, disappointed expression, the horse's legs are attached on the side and on the bottom part to the chest. It is unclear which are the front and hind legs. There is no distinguishable neck and the horse's manes are depicted falling to both sides of its body. The horse's egg-shaped body hardly contains the required visual clues to recognise this animal as a horse. We know for a fact that horses played a large role in society in the Middle Ages, (see for example Liddiard 2022:35–53, Ameen, et al. 2021:100–119; or the 'Rewriting Equestrian History' book series edited by Anastasija Ropa and Timothy Dawson). It is therefore safe to say that people in the Middle Ages knew very well what horses looked like. Even though the easy explanation is that the artists didn't know better, in many cases the rendering



Figure 24. Painted pottery jar from Khafajeh, Mesopotamia. c. 2,800-2,600 BCE. © Trustees of the British Museum. Inv. no. 123293. CC BY-NC-SA 4.0.

of the horse has more to do with the culture's pictorial tradition than with the artists' skillset. In a culture where profile renderings are much more common than frontal depictions, such as Medieval paintings, but also Egyptian or Assyrian ones, one can imagine that the artist is less familiar with frontal depictions, therefore explaining the remarkable rendering of this horse. Choosing to do so however could very well have to do with the superiority of the left horse over the right one. In any case, Eggy the horse will never cease to amaze us.

Space

An important part of how horses are made visible is how the horse is shown in the image space. There are all kinds of visual techniques an artist can use to format the spaciousness of the horse, such as overlap, the material, and lighting. For obvious reasons, three-dimensional

depictions of horses are more likely to conform to how we see the horse in real space. It is therefore no surprise that the horse and jockey from Artemision give such a lifelike impression. The culture most famous for their "flat", almost forced two-dimensionality is that of ancient Egypt, and for their depictions of horses, this is mainly true: both private tomb paintings in Figures 2 and 11 show horses that are only indicated as pairs by a thin extra line behind the first horse. Egyptologists call this "Stafflung", after the German 'to layer', as that seems what the artist is doing. It creates a sense of depth, which cannot be said for its surroundings: the rest of the scene shows no overlap or size differences to indicate depth whatsoever. The same can be said for the Assyrian horses in Figure 3.

Other cultures distribute their horses differently on the same wall, for example the Chinese horses in the polo scene in Figure 12, and the English horses in Figure 23.



Figure 25. Terracotta Panathenaic prize amphora from Greece. c. 520 BCE. © Metropolitan Museum of Art, inv. no. 56.171.4.

Here, depth is not created through overlap: each horse takes up its own space and is “flying” around on the surface. In the English painting however, depth is created by what we call linear perspective, meaning that objects in the distance are depicted smaller than objects in the front. The racehorses in Figure 6 from the Roman mosaic also show depth: the artist carefully chose darker and lighter tiles to create depth using a light effect. The horses’ ribcages are equipped with lighter tiles, as well as their necks, whereas the areas around their belly, the underside of their tail and the legs further away from us are made with darker tiles. This use of tiles creates the effect that some parts of the horse are lit differently than others, as one would see it in real space, which in turn creates a three-dimensional impression. As we can see, there are many different ways of creating this three-dimensionality, and different ways of using space.

Figure 24 shows one of the earliest examples of a two-dimensional depiction of horses in front of a chariot: a painted jar from Mesopotamia, c. 2,800–2,600 BCE. The chariot, or carriage, is pulled by a team of four horses, depicted “on top” of each other, spanning the height of the vase. A different way of depicting the same concept is seen on the terracotta Panathenaic prize amphora from Greece in Figure 25 (c. 520 BCE), where we see the horses more “stacked” just like we saw above. Despite their different rendering, the content is very similar: both these depictions show four horses strapped in front of a chariot. The rendering on the Greek vase creates more of a sense of depth and three-dimensionality than the rendering on the Mesopotamian vase, but it does not change the image content. The *how* is different, but the *what* stays the same.

Detail

Throughout time, we already see keen observation skills by the artists. The horse of the jockey of Artemision for example (Figure 5) shows an incredibly naturalistic display of the horses' muscles. The famous painting of Whistlejacket (Figure 26) by George Stubbs shows an incredible amount of detail in the horses' manes, coat and tail. Of course, Stubbs made a study of the anatomy of the horse, which explains part of this effort. Even the two Egyptian horses in Figure 2 show a lot of detail: their strands of their manes and tails are individually rendered by the stroke of a brush, and even their fetlocks are visible. Around the eyes we see the pink skin of the grey horse, as well as eye lashes. The chestnut horse is depicted with a blaze. These are all details that are not necessary to depict the image content: the horses would have still been horses without the emphasised muscles, detailed coat colour and all the individual strands of hairs indicated. It shows however that the aim of the artist was to go beyond the basic content of the image, and to show more than just the basic characteristics of a horse.

Some horses are rendered with less detail, such as the ones from the tomb of Li Xián (Figure 12). Their coat colour shows some variation and difference within a single horse, but there are no hairs visible. Broad brush strokes are responsible for the rendering of these horses. Another example of a horse with few details are the horses from the above-mentioned medieval manuscript (Figure 22). The shape and posture of the horse on the right are clearly the most noticeable parts of this image, but there are also very few details in the image. The shape of the horses is clearly indicated by a thick outline, and the coat colour is an even white. The manes and tail show a little detail, again with some broad-brush strokes. In contrast to the Egyptian horse mentioned above (Figure 2), an almost contemporary horse in the same necropolis shows a lot less detail (Figure 11). The manes and tail are painted by a broad-brush stroke, and although some detail is indicated, the manes and coat colour show no difference in colour and there are no eyelashes, blaze, or any skin colour visible, even in the white horse. The artist stuck to the minimal requirements and did not go beyond that. The same can be said of the horses on the Mesopotamian vase in Figure 24, who show only the absolute basic requirements of rendering the figure of a horse.

Image referent: who is the horse, and why?

The image referent has to do with who specifically is depicted, in our case that means in which cases can we attribute a specific identity to the depicted horse. The question is however how we can tell whether or not the image of a horse shows a specific horse. Among the sea of horses represented in the different visual cultures so far, only few are identifiable as specific horses, either by name, or belonging to someone. Think of Bucephalus, the noble



Figure 26. Whistlejacket, by George Stubbs. c. 1762. © The National Gallery. Inv. no. NG6569.

steed of Alexander the Great; Whistlejacket, the famous racehorse, or Marengo, Napoleon's favourite horse. There are many different ways of showing that the horse in the image represents a specific horse, and not just 'a' horse. We will see some below.

Most people in the horse world, academic or not, will immediately recognise the horse in Figure 26, that is Whistlejacket, painted by George Stubbs. The painting was commissioned by the horses' second owner because he thought Whistlejacket was a prime example of a pure-bred Arabian horse (The National Gallery). We know it is Whistlejacket because we are part of the world of horses, either professionally, academically, or in another way. We have learned this is Whistlejacket from books, colleagues, museum visits, photos, etc. This image to us is so iconic that we would recognise Whistlejacket on any website, poster, plushie, notebook, pencil, or whatever else souvenir he appears on. Museum visitors are able to tell this is not just any horse, but Whistlejacket, by reading the museum label in the National Gallery. George Stubbs, the artist, as well as Whistlejacket's first and second owners, Sir William Middleton and Lord Rockingham, were very likely able to recognise Whistlejacket in the painting because he resembled the real Whistlejacket. If we look at the painting in itself however, we can admit that there is nothing in the actual painting that gives away the identity of this horse. It is our background knowledge, or a textual label, that reveals the identity of Whistlejacket, and therefore creates



Figure 27. Four circus horses from Hadrumetum, Sousse, Tunisia. c. 300 CE. © Ad Meskens, via Wikimedia Commons.

a specific image referent. This painting was made to convey not just any horse, but specifically Whistlejacket. Even if originally the resemblance was what made it him, he has become so iconic that we will always know who this horse is. A fun fact to keep in mind when admiring the portrait of Whistlejacket is that the spaciousness of the horse is a little questionable: the point of view used to portray the posture of the horse is not how one would actually see the horse. Nonetheless, in terms of content and rendering, it makes a wonderfully realistic impression.

In the case of Whistlejacket we can assume that it resembled the actual horse, although as seen above, this resemblance is not necessarily the factor that helps us, and future audiences, to identify this horse. It is therefore not always what the horse looks like that creates a specific referent. In ancient Egypt, horses sometimes had names written next to their depictions (Eshmawy 2004). An example is the depiction of Ramses III hunting in the desert in the temple of Medinat Habu, with one of the horses named “Kenamun”, which translates to “Amun is Strong” (Figure 17). Other examples are “Destroyer of the people of the nine bows”, “Amun gives him the power”, “beloved of Amun”, “the strength in Thebes” and “Mut is satisfied” (Eshmawy 2004:670–672). These horses all *look* the same but clearly do not *represent* the same: the artist clearly intended to convey that this is “Kenamun” and not a) just any horse, or b) another specific horse, e.g., Meriamun (beloved of Amun). In this case it is the accompanying text, which is part of this

multi-modal composition, that creates the image referent, i.e., the specific identity of the horse. Some Roman mosaics depicting teams of racehorses also have the names of the horses inscribed next to the teams in the mosaic, letting us know which exact horses the image represents. A Roman mosaic in the archaeological museum of Sousse depicts four circus horses, named Pupillus, Amator, Cupido and Aura (Figure 27). The realistic impression of the content and rendering of the horse is therefore unrelated to whether or not it represents a specific horse in terms of the image referent.

In other cases, there is a referent, but not an actual horse. Many know Napoleon’s (supposed) favourite horse, Marengo. Jill Hamilton describes how Marengo becomes part of the Napoleon-hype after his exile to St. Helena, and even more so after his death, in the UK in particular (Hamilton 2001:135–147). Many aspects of Marengo’s life have been embellished, but Hamilton has *not* been able to find a horse named ‘Marengo’ in any of the primary sources in Paris, despite the archives containing a lot of named horses (Hamilton 2001:143). Marengo became emblematic of the many horses used by Napoleon, and when his remains were on display in London, he was thought to be the very mount in the accompanying illustrations, even though a number of horses were used as models. “Marengo, for many people, was Napoleon’s one and only horse” (Hamilton 2001:146). In conclusion, many horses are “Marengo” for the viewers, however there is no

evidence that there was a horse named Marengo that was particularly associated with Napoleon.

These examples of Whistlejacket, Bucephalus and Kenamun are exceptions: most horses in images go unidentified. This has very little to do with what the horse looks like, and everything to do with the visual elements employed by the artist. Is there a name? Can we tell who it is from the horses' iconic features, such as Whistlejacket? Or is there someone we know, such as Alexander the Great, mounted on a horse that therefore must be Bucephalus? Most horses follow the canon and decorum of the cultural pictorial tradition they are part of, and as we've seen, the function of the image dictates what the horse looks like in terms of content and rendering. In many cases, displaying the specific identity of a horse is irrelevant within the function of the image. The horses in the Chauvet cave, (Figure 1), the horses in the tomb of Rekhmire (Figure 2), or the ones on the Mesopotamian jar in Figure 24 all do not have a specific referent, as do most horses in this chapter. This is in most cases unrelated to the way they look: even if they are very detailed (Figure 8 or 23), or anatomically correct (Figure 5), they do not necessarily represent a specific horse. It is therefore important to separate the image content and rendering from the image referent, and realise that the appearance of the horse is rarely responsible for creating a specific identity. A specific identity, or referent, can be created in numerous ways: through text, (Kenamun), co-pictorial elements, such as association (Bucephalus), or being iconic (Whistlejacket). Although most horses are unidentified, we've also seen that understanding these different layers is key to understanding what the horse in the image represents.

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Conclusion

As we have been able to see above, the what, the how, and the who of the horse all depend on why the image was made, and on the role of the horse within the image. In terms of content, if the horse is part of a stately portrait, conveying the might of its ruler, chances are very likely that the inclusion of sex markers are present to enhance the masculinity of its rider. If they are part of an instruction manual, like for example a Furusiyya manuscript, the instructive content is much more important than the rendering of the horse. We have hopefully been able to see that the keen observation skills of the artists are reflected in the image already from prehistory onwards; and that it is rarely the artists' skillset that is responsible for unexpected shapes, proportions, spaciousness or details. It is much rather the cultural pictorial tradition that explains these visual elements instead of the inexperience of the artist. As long as the image works, i.e., one is able to recognise the horse in the image, the rendering of the horse is pretty free in terms of how much it has to resemble the shape, proportions, three-dimensionality and details of the horse in real space. Lastly, we've seen that most horses in images are not representations of horses with a specific identity. If it does, it plays a role in the image, and the artist (and patron!) want their viewers to see the identity of the horse in the image. Considering that through time, viewers often do not know what the specific horse looked like (e.g., Bucephalus) there are many other ways to convey that it is this specific horse, and not another, for example through a name tag, or by depicting him near their known rider. All these factors are strongly influenced by the function of the image. It is therefore very important to always ask why the image is made before one uses the image as a source of information.

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Methodologies in Classics

Carolyn Willekes

The field of Classics encompasses the study of the ancient Mediterranean world as well as its interactions with its neighbours from the Bronze Age to Late Antiquity. In general, Classicists engage with a range of resources, with the main pieces of primary source evidence falling under the categories of visual culture, textual evidence, and archaeological material. Within these categories one can find a wide array of types and materials. Familiarity with these categories is key for those who study equines and equine history within the context of Classics, as this topic necessitates the use of diverse sources to make use of the surviving materials. These include literary, artistic, and archaeological sources. In the case of literary evidence, many of the key works discussed below have been translated into numerous languages, but familiarity with ancient Greek and Latin may be useful for working with other textual source such epigraphy or fragments of works; it can also be helpful in allowing scholars to understand the technical equine terminology in these sources. Material culture can be found in museums around the world, an increasing number of which have online, searchable databases, but visiting the collections with pieces related to one's research can be invaluable for examining particular objects of significance to one's work. In this chapter, the key primary and secondary sources pertaining to horses are detailed to provide an overall introduction to the study of equines and equestrianism in Classics.

Literary Sources

References to horses are found throughout the literary record of the ancient Greek and Roman world. Although few texts focus specifically on equines, comments on the animal abound in different contexts and genres. Xenophon's *Art of Horsemanship* and *On the Cavalry Commander*, written in the 4th century BCE, deal exclusively with equines and equestrianism. The *Art of Horsemanship* is a detailed text which focuses on varied aspects of equestrianism in the Greek world. In this work, Xenophon begins by providing a thorough description of the ideal horse by focusing on key conformational features, as he advises his reader on the factors one should look for when purchasing a horse (1.2–1.17). It is interesting to note that Xenophon does not provide advice on breaking in a young horse, but rather recommends that the owner send the young horse to a reputable professional trainer (2.1). This is indicative of his target audience, the Athenian elites who own and ride horses as a reflection of their social status and wealth, rather than professional horsemen. Xenophon also provides recommendations on what one should look for when purchasing a trained horse, and here it is evident that he is focusing primarily on horses intended for cavalry work (3.7). He also seems to understand the importance of proper handling, housing, and general husbandry, and in these sections of his work we get a glimpse of the day-to-day logistics of horse care, and the social stratification it entails as he frequently refers to the grooms and their responsibilities (5.1–6.16, Figure 1)

Xenophon does suggest that the owner of the cavalry horse should engage in regular ridden work with the animal, and sections 7 and 8 of his text focus on exercises to



Figure 1. Red-figure kylix depicting a groom brushing a tethered horse. Greek, Attic, attributed to Onesimos c. 490 BCE. The Metropolitan Museum of Art, 1989.281.71, Gift of Norbert Schimmel Trust, 1989. Photo Credit: The Metropolitan Museum of Art.

be used both in the arena and across country. He has a particular interest in teaching the horse collection, as this is a topic that appears throughout the work. Xenophon's understanding of equine behaviour and the distinct personalities of individual horses is evident in section 9, where he discusses how to work with spirited, 'hot' horses, as well as those who are quieter and more laid back in terms of temperament and energy. The use of proper equipment is important to Xenophon, and he provides detailed instructions on the types of bits one should own (10.6–11), as well as the arms and armour of the cavalryman (12.1–13). Section 11 of the text shifts away from the war horse to the parade horse, a point that reiterates the role of the horse as a marker of status. The text highlights Xenophon's knowledge and experience with horses, with some comments and insights into equine behaviour and training that would sound familiar to many riders and trainers in the 21st century, as for example at 6.14–15 and 11.6 where he discusses the ways in which one should treat a horse during training, recommending the use of kindness rather than force. Xenophon's *Cavalry Commander* restates some of the key principles presented in his *Art of Horsemanship*, however its focus is preparing horses and men for war, and it is clear that this text is aimed at officers in the cavalry responsible for the training of the troops. Although this work deals more specifically with the logistics and practicalities of training, Xenophon's concern for the horse and its well-being is also evident throughout (see, for example, 1.13–14). A particularly useful component of this text is its description of the mounted displays performed by the Athenian cavalry and

where these took place in the city (3.1–14), as this reminds us of the role cavalry played in the civic identity of Athens (and other states as well). The remaining sections of this work serve as a sort of tactical and logistical handbook for cavalry on campaign. Xenophon's diverse range of works have received a good deal of scholarly interest (both his equestrian texts and others). Recent edited volumes on Xenophon in general include Gray (2010) and Flower (2017), while works focusing specifically on Xenophon's equestrian ideas include Flemingham-Cockburn (2020) and Rigg (2022).

An interest in horse breeding and care is evident in numerous texts, including Varro (*On Agriculture*), Virgil (*Georgics*), and Columella (*On Agriculture*), which all discuss the breeding and raising of horses,¹ as do parts of Aristotle's *On the Generation of Animals* and *History of Animals*. Varro's *On Agriculture* is split into three books which were written for an audience of wealthy gentleman farmers as is evident from the structure of the text, which is presented as a series of conversations between Varro and his peers. The importance of agriculture and animal husbandry to the ancient Mediterranean world is apparent through the extensive list of texts (few of which survive) that Varro cites in the opening pages of his work (1.1.8–11). Varro's text suggests that there was an ideal breeding season – between the vernal equinox and the

¹ For general works on agriculture in the Classical world see, Isager and Skydsgard, Hollander (2019). For works on Classical agricultural texts see, Gale (2000), Doody (2007), Diederich (2007), Volk (2008), Kronenberg (2009), Reitz (2013).

Figure 2. Bronze statuette of a mare nursing her foal. Greek, late 8th century BCE. The Metropolitan Museum of Art, 1999.526, Gift of Mrs. Frederick M. Stafford, in memory of Mr. Frederick M. Stafford, 1999. Photo Credit: The Metropolitan Museum of Art.



solstice (2.7.7) – and the preferred mode of breeding was in-hand under the supervision of a groom (2.7.8). Unlike Xenophon, Varro provides some recommendations about the breaking in of young horses, which he recommends begins at 3 years of age (2.7.13–14; also, Virgil 3.190 and Columella 6.29.4). He also, at 2.7.15, makes a point that Xenophon alludes to, and Virgil (3.72ff) and Columella (6.27.1–2) reiterate, that horses were bred for different jobs. Varro further discusses the practice of castrating male horses who are intended for particular jobs, as it makes them calmer and more tractable (2.7.15). Virgil's *Georgics* presents useful information about equine husbandry (and agricultural practices in general) in a rather different genre, as he writes in verse. Of particular use is his commentary on breeding, and the care of the stallions and mares (3.123–137). Both Varro (2.7.12) and Virgil (3.179–189) write about the importance of the importance of desensitizing the young horse as a means of preparing it for its future job.

Columella's *On Agriculture* is likewise a treatise directed towards the gentleman farmer and wealthy landowner. Split into 12 books, he provides a detailed and comprehensive set of instructions, recommendations, and directions about agriculture in the Roman world. Some of the points he mentions echo those found in Varro, but he also provides more explicit details about things like breeding, as at 6.27.3, where he points out how these vary between the different 'classes' of horses. He also describes the practice of using a 'teaser' stallion to encourage a mare to become receptive to breeding (6.27.10). Both Varro and Columella seem to suggest that

there was an interest in selective breeding, at least for the so-called 'noble' stock. Columella also states that stallions should not be used for breeding until they are three years of age, and that a mare should not be bred prior to two-years of age, so she would birth the foal when she was three (6.28.1). Of primary concern to Columella is the health of the horse, and several sections of his text deal with the diagnosing and treatment of different health-related issues. Although many of his recommendations may strike the modern reader as unsound, they nonetheless highlight an awareness of the importance of veterinary care and attempts to treat common ailments and injuries.

The themes of breeding practices and veterinary care also appear in Aristotle's animal-focused treatises.² His *History of Animals* contains details found also in Varro and Columella with regards to the ages at which horses can start breeding versus when they should start breeding (575b.20–576a.17). Unlike the Latin writers, Aristotle does not suggest different breeding practices for the various classes of horses, but he does seem to indicate that breeding in hand is sometimes used (576b.20–27). An interest in horse breeding is also evident in the visual record of the Classical world, with images of mares and foals appearing in different mediums, including bronze statuettes as can be seen with Figure 2.

2 For a good general overview of Aristotle and biology/natural science see, Leroi (2014). For detailed discussions of Aristotle's theories around nature see Falcon (2015), Connell (2016).

Several of the textual sources discuss elements of veterinary care. In his *History of Animals*, Aristotle differentiates between ailments that may affect a pastured versus a stabled horse and declares that the horses living at pasture are generally healthier and less prone to illness and injury (604a.22ff). Although some of Aristotle's comments may strike the modern reader as far-fetched, such as his statement that "...a pregnant mare miscarries at the smell of a lamp being extinguished" (604b.30–31), he also points out issues with abscesses, tetanus, and possibly colic that might sound more familiar to the modern horse person (604a.29–604b.6). Columella likewise provides an overview of injuries, ailments, and issues in the horse that may require treatment (6.30.1–6.35.2). In addition to listing off some of these points, he provides suggestions for treatment and remedies. What we see with Aristotle and Columella is part of a broader ancient literary tradition known as the *Hippiatrica*, which discusses elements of breeding and veterinary care. Many of these texts date to the 3rd–5th centuries CE, however, they are built on the foundation of a literary tradition that connects back to the earlier equestrian and agricultural texts of the Classical and Hellenistic periods (McCabe 2007:13). Central to this tradition was a now lost agricultural manual written by

Mago of Carthage in the 4th century BCE and translated into both Greek and Latin. Mago's work is cited in Varro, Columella, Pelagonius, and the *Mulomedicina Chironis*, and his text remained influential into the 10th century CE (Fischer 1988, 193). The main texts of the Greek *Hippiatrica* are Eumelus and Apsyrtus, dating to the 3rd century CE, as well as Theomnestus, Hierocles, and Anatolius from the 4th century CE. The Latin corpus of the *Hippiatrica* includes the 4th century CE veterinary texts of Pelagonius and the *Mulomedicina Chironis*, and the 5th century CE manual of Vegetius (Schäffer 1987:219). For a comprehensive analysis of the *Hippiatrica* and its textual tradition see McCabe (2007), while Adams (1995) focuses specifically on the veterinary manual of Pelagonius. Oder and Hoppe (1971) provide the surviving texts of the *Corpus Hippiatricorum Graecorum* in the original Greek.

Of interest to several of the sources is the ideal equine conformation. This goes beyond general aesthetics as it speaks to the importance of form in dictating function and soundness. For example, Xenophon, in his *Art of Horsemanship*, states a point that has echoed down through the millennia with the phrase 'no hoof, no horse' at 1.2. when he writes of the importance of sound feet as the basis of a horse's conformation and quality. There are a set of



Figure 3. Panathenaic Prize Amphora attributed to the Eucharides Painter c. 490 BCE. Greek, Attic. The Metropolitan Museum of Art, 56.171.3, Fletcher Fund, 1956. Photo Credit: The Metropolitan Museum of Art.

common features that can be found in Xenophon (1.1–17), Virgil (3.79–94), Varro (2.7.4–5), Columella (6.29.2–3), and Oppian's *On Hunting* (1.173–195). The ideal horse has hard hooves, good bone in the cannons with clean limbs and moderately sloping pasterns, a broad chest and shoulders, a good-sized barrel and broad back (what they term a 'double-back') and muscular haunches. They describe a horse that is close-coupled and muscular, with strong, clean legs, suggesting an animal that has a good degree of weight carrying ability and athleticism (Willekes 2016:34–44).

The prohibitive cost of horses is noted in a variety of contexts. The main character in Aristophanes' *Clouds*, Strepsiades, finds himself in crippling debt thanks to the horse-buying habits of his son who has paid 1200 drachma for a racehorse (*Clouds* 12–24). Although the *Clouds* is a comedy that follows the Aristophanic tradition of providing a cutting social commentary, the points made about the cost of horses and their association with the upper echelons of society are very valid. That the breeding and ownership of horses was the prerogative of the wealthy is made evident in other sources as well, including Isocrates' *On the Team of Horses* 16.33–34, which also makes the point that participation in equestrian sports provides a further means of declaring one's status. One of the most detailed sources for the price of horses in the Greek world are a series of lead tablets from Athens. These tablets, which date from the mid-4th to mid-3rd centuries BCE are likely the records of the *dokimasia* – an official evaluation of cavalymen and their mounts to determine whether they are fit to serve (Aristotle *Athenian Constitution* 49.1–3). The tablets record the colour of the horse, its brand (if it had one), and its value. Based on the tablets, the value ascribed to the cavalry mounts varied from 100 drachma to 1200 drachma, with the average price ranging from 500 to 600 drachma (Braun 1970; Kroll 1977; Spence 1995:274–280; Blaineau 2015, for detailed analysis of these tablets and their contexts). If one considers that the average daily wage for a skilled worker in Athens was 1–1.5 drachma, this makes a horse a very pricey commodity indeed! The symbolic association of the horse with wealth and status in the Classical world is also made evident in Aesop's *Fables*, where the horse serves as a semiotic reference to the wealthy, and often as a warning against hubris and the precarity of riches and good fortune; it is often contrasted with the donkey who represents the labourer (see Lefkowitz 2016 for an overview of animals in Classical fables).

The sport horse appears with some frequency in the literary record. This is certainly the case with the tradition of victory odes which celebrate the winners of major athletic festivals like the Olympic Games. The most renowned author of these victory poems is Pindar, and several of his *Odes* recount victories in the equestrian races. The poems are very formulaic in nature and serve to heroise the accomplishments of the victor by drawing on elements

of Greek mythology. It is important to note here that the owners of the horses received the accolades of victory. They would rarely have been the person holding the reins on the racetrack, thus adding another layer of social stratification of horse ownership, and creating a delineation between equestrian sport and athletics at these events (Golden 1997; Golden 2008:6–23). For example, *Olympian* 1 celebrates the victory of Hieron, tyrant of Syracuse, in the ridden horse race at the Olympics of 476 BCE. Hieron himself did not ride his victorious horse, however, he is the one who receives the glory. This separation can be seen in Figure 3, a Panathenaic Prize Amphora which depicts the ridden horse race. The imagery makes it clear that the jockeys are boys rather than the adult owners of the horses.

A set of Hellenistic-era poems known as the *Hippika* written by Posidippus celebrate the equestrian victories of the Ptolemaic royal family in Egypt (Kosmetatou 2004, Fantuzzi 2005). Victors in equestrian contests could also set up statues and inscriptions to commemorate their accomplishments. Several references to equestrian victories and monuments associated with them are found in Pausanias' *Description of Greece*, including that of the first female Olympic victor, Cynisca, whose horses won the 4-horse chariot race at Olympia in 396 and 392 BCE. He writes, "...at Olympia beside the statue of Troilus is a stone ledge with a chariot and team and a driver and a portrait of Cynisca herself by Apelles, and there are inscriptions about Cynisca" (6.1.6). Cynisca's accomplishments at Olympia and their meaning have been the topic of recent scholarship, including Kyle (2003), Fornis (2014), Paradiso (2015), and Willekes (2022).³ The dangers of equestrian sport, particularly chariot racing, are made evident in the literary record. Both Homer (*Iliad* 23.287–650) and Sophocles (*Electra* 699–761) provide vivid accounts of chariot races and the dangers associated with them, and Martial provides a commemorative ode to Scorpis, one of the most famous charioteers from the Roman circus (*Epigrams* 10.53). Indeed, in the Roman world, chariot racing took on a life of its own. It became a carefully organized and managed spectacle that exerted much influence over Roman politics and society, hence Juvenal's statement about the power of *panem et circenses* (bread and circuses):

Long ago, when they lost their votes, and the bribes;
the mob
that used to grant power, high office, the legions,
everything,
curtails its desires, and reveals its anxiety for two
things only,
bread and circuses (*Satires* 10. 78–81)

3 For detailed studies on horse racing in the Greek world in particular, see Canali De Rossi (2011, 2016), as well as Mann and Scharff (2022).

Central to the sport were the four factions – the Blues, the Greens, the Reds, and the Whites. By the imperial period, each team had become a professional organization, with workers fulfilling a wide array of jobs to ensure the teams and their drivers were ready to race (*CIL* 6.10046). Each faction was supported by intensely devoted fans, and even some of the emperors made their preference for a particular faction known. Pliny the Elder recounts the story of a Red supporter who allegedly threw himself on the funeral pyre of a Red charioteer (*Natural History* 7.54). The popularity of chariot racing in Rome is evident in the words of numerous Latin authors, including Martial, who speaks to the fierce devotion of fans for the factions when he writes of a dinner party at which,

Everything will be seasoned with pleasantry free from bitterness; there shall be no unchecked conversation that brings regret the next day, and nothing said that we should wish unsaid. But my guests may speak of the rival factions in the circus, and my drink shall make no man guilty (*Epigrams* 10.48)

The obsession with the track is also evident in the words of Ammianus Marcellinus, who states that racing and detailed knowledge about it is “the favourite among all amusements, from sunrise until evening, in sunshine and in rain, they stand open-mouthed, examining minutely the good points or the defects of charioteers and their horses” (1794: 14.6.25). The popularity of the sport can be seen through its presence on everyday objects such as terracotta lamps, like the 1st century CE example shown in Figure 4 which depicts a charioteer driving his team of four horses.

The *Corpus Inscriptionum Latinarum* (*CIL*) provides records of inscriptions for charioteers and their horses, providing valuable insights into the importance of the Roman circus (*CIL* 6.10044–100770). Some inscriptions record the names and ‘breeds’ of racehorses, indicating that they were shipped across the empire to meet the needs of the racetrack (*CIL* 6.10053). Certain charioteers and racehorses became celebrities, with their names celebrated by fans of the track. Martial recounts the fame and wealth of Scorpis the charioteer (*Epigrams* 10.74), while the commemorative inscription of Gaius Appuleius Diocles boasts of his many victories on the track (*CIL* 10048), and the epitaph for Lucius Avillius Dionysius, who worked as a groom for the Reds, includes a record of the accomplishments of famous racehorses: Aquilo and Hirpinus (*CIL* 6.10069). Bell (2022) provides a comprehensive analysis of the Roman circus and its significance to Roman identity, as well as the role that horses and charioteers played in creating this. For the spectator in particular, see Forichon (2020). Humphrey (1986) provides detailed scholarship on the physical spaces of the Roman circuses across the Empire, while Meijer (2010) speaks more generally about chariot racing in Roman



Figure 4. Terracotta lamp, Roman, 1st century CE. The Metropolitan Museum of Art, 74.51.1939, The Cesnola Collection, purchased by subscription, 1874–76. Photo Credit: The Metropolitan Museum of Art.

society. For the legacy of the factions and their influence on social structures and behaviours, see Cameron (1976). In addition to chariot racing, mounted spectacles were also performed in the Roman world. Virgil (*Aeneid* 5.705–777) and Arrian (*Art of Warfare* 32.3–44.1) provide details of two different mounted spectacles: the Troy Games and the *Hippika Gymnasia*. The *Hippika Gymnasia* has clear connections to military training, echoing some of the suggestions and manoeuvres discussed by Xenophon in his *Cavalry Commander* (Hyland 1993).

Hunting from horseback was practiced in both Greek and Roman society. It was an elite pastime, but also considered valuable training for warfare (for both the horse and rider). Commentaries on horses and hunting

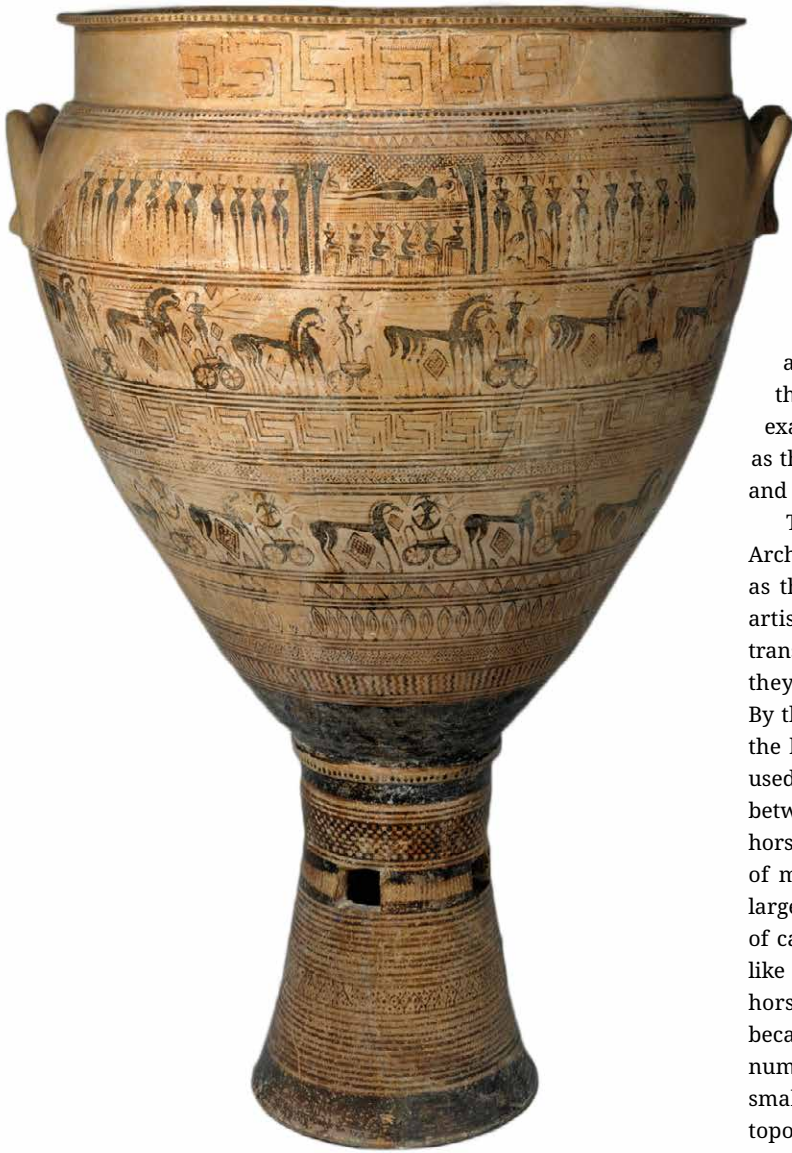


Figure 5. Krater attributed to the Trachones Workshop. Greek, Attic, c. 725 BCE. The Metropolitan Museum of Art 14.130.15, The Rogers Fund, 1914. Photo Credit: The Metropolitan Museum of Art.

include Xenophon (*On Hunting*), Arrian (*On Hunting*), and Oppian (*On Hunting*). For the social significance of hunting and its role in identity development, see Barringer (2001, especially chapter 1), while Hodiaumont (1995) looks specifically at Oppian's discussion of the hunting horse.

The military horse appears frequently in the literary record, particularly in the detailed battle accounts of the ancient historians. If one analyses the descriptions of combat and tactics, it is possible to find insightful references to equine behaviour on the battlefield (see, for example Herodotus *Histories* 1.80.3–5, Thucydides *History of the Peloponnesian War* 7.27.5, Arrian *Anabasis* 5.10.2, Livy *History of Rome* 44.40). References to war horses first appear in the Bronze Age, with the Mycenaean Linear B

tablets that record chariot equipment, indicating that the horses were primarily used in chariots on the battlefield, rather than cavalry. This is reinforced by accounts of battle in Homer's *Iliad*, which have elite warriors fighting from their chariots as, for example, at 8.97–260. Delebecque (1951) provides a very useful discussion and analysis of horses in the *Iliad*. The use of military chariotry is also evident from Mycenaean and Geometric art, as the warrior in his chariot is a popular subject, as for example in a number of 8th century BCE Attic kraters, such as the one in Figure 5 which depicts warriors in chariots and on foot.

The shift from chariotry to cavalry begins during the Archaic period, and here the primary evidence is visual, as the ridden horse becomes a frequent subject in the artistic record (see Greenhalgh 1973 for a study of this transition). Although chariotry scenes continue to appear, they are typically associated with mythological events. By the Classical period, cavalry had become a fixture on the battlefield, however, the degree to which they were used and the manner in which they were deployed varied between regions. The primary limiting factor in the use of horses was topography and cost. The mountainous nature of many parts of the Mediterranean was not ideal for large-scale horse breeding, which influenced the number of cavalry states or territories could field. Some regions like Thessaly, Macedonia, and Etruria were able to breed horses in comparatively large numbers, and they thus became known for their equestrian abilities, however, the number of cavalry available to most regions was relatively small. Aston and Kerr (2018) highlight the influences of topography, economics, and social structures in relation to equestrianism through the example of Thessaly. Thus, the primary uses of cavalry on the battlefield revolved around skirmishing and harassing enemy troops, as well as defending their own infantry against cavalry attacks (Willekes 2016:173–190). With that being said, cavalry could prove instrumental when deployed strategically against infantry, as discussed by Konijnendijk (2021), as well as Sears and Willekes (2016). For detailed studies on cavalry in the Greek and Roman worlds, see Bugh (1988), Hyland (1990:63–197), Spence (1993), Worley (1994), Spiedel (1994), Dixon and Southern (1997), Gaebel (2002), Sidnell (2006), Blaineau (2015), and Willekes (2021); see also Benkert and Bühler (this volume) for an overview of the horse in warfare, including in the Classical world.

Artistic sources

Horses are a popular subject in the art of the Classical world (in general see Markman 1969; Eaverly 1995; Simon 2006; Schertz and Stribling 2017; Neils and Dunn 2022). From the Bronze Age onwards, equines can



Figure 6. Geometric statuette of a horse. Greek, 8th century BCE. The Metropolitan Museum of Art 21.88.44, Rogers Fund 1921. Photo Credit: The Metropolitan Museum of Art.

be found both with and without human partners in every medium of classical art. Even when the horses are depicted in a more abstract or linear fashion, as with Geometric period art, they are still distinctly recognizable as horses and a set formula of features is emphasized within the iconography (Zimmerman 1989; Willekes 2016), as can be seen in Figure 6.

The presence of the horse on such a wide range of artistic media, from small votives to large-scale public monuments speaks to their symbolic and literal value within society. The horses of the visual record likewise highlight the primary roles performed by these animals – sport, warfare, and processional – mirroring the literary material. Thus, the art can be studied alongside the written record to build a more three-dimensional understanding of the semiotic and cultural significance of the horse in the classical world (Delpout and Willekes 2023). Some interesting examples of the richness of equine iconography include the black-figure vases of Exekias (Moore 1968, Figure 7), the equestrian coinage of Macedonia and Thessaly (Oliver 1986; Pendleton 2004), the Artemision Horse and Jockey (Hemingway 2004), Trajan's Column (Leander Touati 1987; Lepper and Frere 1988), and Roman 'Battle Sarcophagi' especially the Ludovisi and Portonaccio Sarcophagi (Francis 2000; Goette and Nagy 2013). The



Figure 7. Terracotta neck amphora attributed to Exekias. Greek, Attic c. 540 BCE. The Metropolitan Museum of Art, 17.230.14a,b, Rogers Fund 1917. Photo Credit: The Metropolitan Museum of Art.

horses of the Parthenon Frieze are undoubtedly the most iconic equines in Classical art, and countless volumes have been published on these equids and the reading of the friezes. Select works include Jenkins (1994), Neils (2001), Moore (2003), and Osada (2011).

Archaeological sources

Finally, one can also turn to the physical remains of equids and their accoutrements from the Classical world (in general see Azzaroli 1985; Kosmetatou 1993; Mrva-Montoya 2013). Although horse burials were not as common as in other parts of the ancient world, they nonetheless did occur with some frequency. These skeletal remains provide a wealth of information with regards to size, diet, health, age, sex, etc. The question of height in particular is one that has been of much vexation between specialists and non-specialists, especially with regards to the depiction of horses in art. The physical remains have served to prove the statement that the horses of the classical world were indeed smaller in size, thereby supporting the argument that the small size of the horses in the visual record was not an artistic convention, but a reflection of reality. For a recent overview on the uses of scientific methods in studying equid skeletal remains see Dibble (2022) and Kanne and Benkert, this volume. There are few extant remains of tack and other equestrian equipment



Figure 8. Bronze chariot inlaid with ivory. Etruscan, 2nd quarter of the 6th century BCE. The Metropolitan Museum of Art, 03.23.1, Rogers Fund, 1903. Photo Credit: The Metropolitan Museum of Art.



Figure 9. Bronze snaffle bit with horse-shaped cheekpieces. Villanovan, 8th–7th century BCE. The Metropolitan Museum of Art, 1972.118.50, Bequest of Walter C. Baker, 1971. Photo Credit: The Metropolitan Museum of Art.



Figure 10. Bronze curb bit. Thracian or Eastern Celtic, 1st century BCE–1st century CE. The Metropolitan Museum of Art, 42.50.497, Gift of Stephen V. Grancsay, 1942. Photo Credit: The Metropolitan Museum of Art.



Figure 11. Bronze *psalion*. Roman or Thracian, 1st–2nd century CE. The Metropolitan Museum of Art, 42.50.527, Gift of Stephen V. Grancsay, 1942. Photo Credit: The Metropolitan Museum of Art.

due to the organic nature of the material used to produce these products. For much of antiquity, riders rode bareback or on a saddlecloth. The earliest treed saddle is the so-called 'Roman' saddle (Connolly and van Driel-Murray 1991; Grakowski 2004). Stirrups were unknown in this period. Although chariots appeared in a variety of different styles to suit different roles – warfare, racing, processions – our knowledge of their appearance comes primarily from the artistic record (Littauer and Crouwel 2002; Crouwel 2012), although a rare surviving example of an Etruscan parade chariot from the 6th century BCE is housed in the Metropolitan Museum of Art (Figure 8).

Xenophon provides a detailed discussion of armour for the cavalry horse, and evidence for the use of horse armour can be found in art, with the 4th century BCE Çan sarcophagus (Sevinç et al. 2001) and 2nd century CE Trajan's Column (Leander Touati 1987; Lepper and Frere 1988) providing some detailed examples of this. Surviving examples of equine armour itself are rare. A lamellar horse blanket from Dura Europos provides a wonderful glimpse into the armament of a cataphract (James 2009), while several examples of shaffrons have been found at the sites of Newstead and Vindolanda (Curle 1911; van Driel-Murray 1989). By far the most extensive pieces of surviving tack are the bits. These range in style from jointed snaffles (Figure 9) to long-shanked, high-ported curbs (Figure 10) which could be combined with a leverage-type cavesson

known as a *psalion* (Figure 11). Some mouthpieces are smooth, while others have barbed rollers and/or sharp discs that could cause much damage to the mouth. The wide array of bit styles speaks to different uses and perceptions of the horse, as well as the varying skills of riders and drivers.

Muzzles were also used, and some examples of these survive. The presence of muzzles in both the material and artistic records provide some insight into horse-handling practices (see also Moore (2004) for a study of some horse care iconography). For bits and tack in general, see Anderson (1961), Azzaroli (1985), Hyland (1990), Dixon and Southern (1992) and Nicolay (2007).

Conclusions

Horses wove their way in the very fabric of life in the Classical world. The equine presence was felt both in a physical, tangible context, as well as through their role in shaping socio-cultural structures and identities via their frequent appearance in literary and visual records. Thus, an awareness of horses and their significance can provide valuable insights into Classical life and society. There is a growing interest in the study of equines (and other animals) in the field of Classics, and this reflects the importance of examining inter-species relationships through a scholarly lens as they have the potential to provide new perspectives on our understanding of life in the ancient Mediterranean world and its environs.

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Interdisciplinary Research Methods in History: The Example of Medieval Horses in Western Europe

Camille M.L. Vo Van Qui

The history of medieval horses in Western Europe generally relies on written sources, from financial accounts to encyclopaedia to chivalric romances, as well as on the texts specifically dedicated to them such as veterinary manuals. Those sources tell historians how horses were valued, treated, and perceived. However, a wealth of other primary sources can give additional information allowing for a more complex portrayal of horses: indeed, with the cultural and linguistic historiographical turns, in the 1980s, as well as the animal turn from the 2000s, which sought to study animals as agents of history, the discipline has opened itself to methodologies and sources coming from art history, archaeology, anthropology, and even biology, among others. Therefore, iconographic sources, such as manuscript miniatures, wall paintings and tapestries, are increasingly used, as well as equestrian equipment which is part of the material culture of the time and provides a wealth of information on the use made of equines and the symbolism ascribed to them. The use of all those sources enables the thorough historical study of horses, which can be further developed in a promising interdisciplinary perspective. Historical study itself has shifted from preoccupations centred on the usefulness of horses for humans to concerns about what the equine experience may have been. This shift further justifies the need to use new sources, as written ones are not enough on their own to demonstrate what the experience of the horses themselves would have been.

Edited textual sources

The history of the late Middle Ages (eleventh to fifteenth centuries) very often relies on textual sources. Editions and translations of medieval texts, when they exist, provide invaluable information. Editions are created by researchers striving to recreate a unified version of a medieval text. Indeed, there are often several manuscript versions of a single text, which can be incomplete or faulty, or present significant differences. To create a critical edition, researchers will pick a base manuscript – either the original manuscript by the author, if it still exists, or the oldest, or the most complete – and transcribe it, sometimes completing omissions with passages from an alternative manuscript, pointing out different versions of the text in the notes, and correcting obvious copying errors. Many editions of manuscripts were created in the nineteenth century due to a renewal of interest for the literature of the European Middle Ages at the time. Those editions can be problematic if the editorial choices are unclear – for instance the choices regarding the base manuscript

or the way errors have been corrected. Moreover, new manuscripts, that would provide a more reliable version of the text and, as such, be a better base manuscript for a critical edition, may be identified.

Different types of texts have been at the centre of critical editions, such as, for example, veterinary texts, which give essential insights into equine health and care and were extensively studied from the twentieth century onwards. Yvonne Poulle-Drieux was a pioneer in the discipline, listing all the different treatises and authors, analysing their sources and looking at the connections between them and at the evolution of medieval veterinary medicine (Poulle-Drieux 1966). This was also studied by Brigitte Prévot, who published a critical edition of the French translation of Jordanus Rufus's *De medicina equorum* (1991). The *De medicina equorum* is a veterinary treatise written around 1250, in Latin, by an Italian knight, Jordanus Rufus. It was so successful, it was translated into several vernacular languages, including Italian, French, German, Occitan, Hebrew, etc. from the thirteenth-century onwards. It is an important text for the history of the medieval horse as it not only deals with illnesses and their remedies but also gives original indications on how to keep and train horses. Prévot (1994) also published an edition of an anonymous veterinary treatise in a volume about the horse in medieval France. An edition of the Latin version of the *De medicina equorum* exists, made by Hieronymus Molin in 1818. Despite its early date and its faults, it is still being studied and sometimes used as the main source by historians working on Jordanus Rufus. The number of Latin manuscripts of the *De medicina equorum* in existence and the absence of the original text, as well as the potential existence of different versions of the text, makes the realisation of a new critical edition a massive endeavour that would no doubt necessitate a whole team of historians to study each individual manuscript, trace their provenance, compare them, and recreate a version of the text as close as possible to the original.

Veterinary treatises are an area of study in themselves. In the wider context of horse history, they give precious insights into the way horses were cared for and about. They also very often contain hippological chapters which give information on horse husbandry, breeding, and training, offering a glimpse into the daily treatment of horses; at least of horses in elite settings whose owners would have had access to the knowledge contained in those texts. The hippological chapters of the *De Medicina equorum* describe an original training method that became an inspiration for later authors, like the veterinarians Theodorico Borgognoni and Lorenzo Rusio or the agronomist Pietro di Crescenzi, and showcases how horses were handled and trained in medieval Western Europe. Prompted by the animal turn, new research continues to be done on veterinary texts, challenging what has been achieved

previously (Crane 2013; Fudge 2002). Comparisons are made with Arabic veterinary practices, many questions being raised on their influence on European veterinary medicine, with possible cultural exchanges in Spain, Sicily and Southern Italy (Lignereux 2005). Those comparisons are especially relevant given how developed Arabic equestrian culture and science was at the time, with authors such as Ibn al-'Awwâm in the twelfth century. A comparative approach is promising for historical equestrian studies, as it could show different links between cultures and reflect how our knowledge of the horse evolved through time and space.

The training method found in the *De medicina equorum* does not give many indications about the way the rider should behave. However, an equitation manual was written in the fifteenth century by the king of Portugal, Dom Duarte (1391–1438), the *Livro da ensinança de bem cavalgar toda sela* (Forgeng 2016). Carlos Pereira (2009) points out that this Portuguese treatise is influenced by both western European and Arabic traditions and should be seen as at the crossroads between the Middle Ages and the Renaissance. It is the oldest equitation treatise since Antiquity, making it the only one available for medieval Europe, albeit written towards the end of the period. Portuguese oral traditions are described for the first time, such as the *gyneta* equitation, which is the ancestor of bullfighting (Peirera 2009). The treatise gives information on different manners of riding in Portugal, with comparisons to the rest of Europe. It also contains elements of horse training, or at least regarding the expectations surrounding warhorses: the education of the rider and that of the horse are parallel and complementary processes.

Dom Duarte's text also describes jousting techniques. This discipline has elicited much interest amongst historians, since the art of jousting has been the subject of both medieval and Renaissance treatises (Barker 1986), such as those of Geoffroi de Charny, a French knight from the fourteenth century. The place of the horse in his treatises has been studied by Loïs Forster (2015) who highlights the importance, according to Geoffroi, of the knight being in possession of a well-trained horse, as a mediocre one would ruin his chances, and having impeccable riding skills to become one with his destrier. In *The Martial Arts of Renaissance Europe*, Sydney Anglo (2000) also points out the importance, according to the authors of treatises on jousting, of having a good horse and of riding in a correct manner. Though the treatises indicated how the jouster should ride and position himself in the saddle, little is said about the training of the horse. The destrier's skills are then taken for granted by historians who do not seek to ascertain how he was trained to acquire them, resulting in a gap in the historiography of medieval horses.

Encyclopaedias are yet another interesting type of textual source. They were conceived to summarise all the

knowledge of the time, often using antique authors as sources. Brunetto Latini and Albertus Magnus are among the thirteenth-century encyclopaedists who included a chapter on horses (Chabaille 1863; Stadler 1920). They portray the horse as an animal of exceptional intelligence, showing great loyalty towards his master, fighting alongside him, and crying tears of sorrow at his death. Though the origin of this is not necessarily medieval (most of their sources being Latin authors) those texts do show what kind of ideal portrayal of the horse was circulating among the elites at the time.

Other textual sources give useful insights into horses, their treatment, and the way they were perceived. That is the case with chivalric romances, for instance: they are partly responsible for the image of the knight and the destrier as an inseparable pair. They can provide information about horse names, coat colours, or the ideal origins of elite destriers, such as in *La chanson de Roland*, an epic poem from the eleventh-century. *Perceval ou le Conte du Graal* (c. 1190) by Chrétien de Troyes, contains a passage about the way a young man may be taught to ride a destrier, which was considered more complex than riding other types of horses, due to the use of the spurs, for instance. The twelfth or thirteenth century *Chanson des quatre fils Aymon* is a unique source, because it showcases an equine character with his own arc: Bayard, Renaut's horse, is a fairy horse with magical powers – such as the ability to lengthen his back in order to accommodate four riders or to run as fast as a falcon can fly – as well as outstanding intelligence. Though his loyalty towards his master is an important part of the plot, Bayard gains his own independent legend. Indeed, at the end of the romance, he is separated from Renaud, and becomes a wild horse, shunning all men, still haunting the forest. Yet another useful romance is that of Alexander, due to the way it showcases the bond between the hero and his destrier, whom he tamed, turning him from fearsome wild beast to faithful companion (Armstrong 1994). Though the story of Alexander the Great dates back to Antiquity, it was popular in medieval Europe. Many versions existed, which presented the Macedonian king as an ideal knight, who has adventures and meets fantastical creatures around the world, and makes his horse Bucephalus into a destrier. The classic story of their relationship is transformed in the twelfth-century version by Alexandre de Paris: instead of being a horse scared of his shadow, Bucephalus is a fearsome, part-bull, part-lion, part-horse, man-eating monster who only lets Alexander approach him. Though realistic observations cannot be expected from chivalric romances, they provide unique insights into the medieval human psyche, highlighting what was considered the ideal destrier and man-horse relationship. These texts can also provide a fascinating cultural background to the more practical treatment of horses, though it is rather limited to the elites.

On the other hand, the poem *Le debat dou cheval et dou levrier* by Jean Froissart (1337–1410) illuminates the treatment of non-elite horses. It features a conversation between a dog and a horse called Grisel, who is being ridden by the poet himself on his travels. Both animals are comparing their respective treatment by their master, which leads the dog to enviously describe how the horse is taken care of when they rest at inns for the night, fed, groomed, rugged, etc. This gives fascinating insights into the daily routine of rounceys used for travel, actions generally deemed too banal to be of interest. Here, the fact that they are described by a dog, justifies putting them into writing.

Commonplace actions also appear in another text, *Le Roman de Fauvel*. This satirical poem written in 1310–1314 by clerics (the main one being Gervais de Bus), uses an equine-like figure, called Fauvel, to denounce flattery through the metaphor of grooming. This leads to descriptions of what would otherwise be considered trivial actions, including picking the feet, combing and plaiting the mane and tail, and mucking out the stable. Though the context in which those are done is purely literal, with descriptions of kings and princes grooming this ungrateful, lame, hypocritical horse, the actions themselves are realistic and can give insights into how the most valuable horses of the elite were cared for. As for non-elite horses, they make an appearance in a fourteenth-century manual, *Le Mesnagier de Paris*, which includes routine veterinary treatments, magic spells to cure horses, and tricks to fatten horses up in order to sell them for more money.

Glimpses of real animals can be seen in other types of documents, such as financial records. Some of the European royal ones have been edited, making them easily accessible to researchers, for instance the records of the stables of Charles VI of France. They document the horses bought for and owned by the royal stables, as well as various pieces of equipment, the prices of horses and their colour. They also contain what the horses are fed and list the various people in charge of them (farriers, grooms, etc.), giving precious insights into the workings of a royal stud. These records are useful on many different levels, giving essential information on the trade and breeding of horses, and even though the descriptions of the horses are very sparse, unexpected information can sometimes be found. For example, the financial accounts of Charles VI contain a description of horses with wolf bites on their rumps, hinting at a management in feral conditions (Vo Van Qui 2023). Moreover, the use of different names for the categories of their horses and the overlap in some of the prices can inform about the way horses were hierarchised. Indeed, the varying prices of horses are often seen as proof of their different status, but the financial records show an overlap in the value of rounceys and that of coursers (horses for riding and war, but of lesser value than destriers), for instance. It could mean that the distinction between horses

was more defined by their use than by their financial value: a rouncey and a courser could have had the same value but they could have belonged to different people or would have been used in different contexts. It also seems that the word rouncey is a general denomination for horses rather than a specific appellation for a class of horses (Davis 1996). The destrier, palfrey, and rouncey are made into a “triad” around which much of the historiography is built (Prévo and Ribemont 1994). The different categories of horses are thought to echo the social distinctions between men. However, the reality was more complex.

Incunabula, the first printed books from the end of the Middle Ages, represent a specific type of source. They show which books were considered to be worth printing and circulating; in the case of horse history, they highlight what type of knowledge was privileged. There are, for instance, the fifteenth-century incunabula of Pietro de Crescenzi, *Opus ruralium commodorum*, considered to be practical books (Naïs 1957). As an agricultural treatise, this incunabulum explains how to manage an estate, based on antique authors such as Varro and Palladius, but also indirectly references Jordanus Rufus, who is not named but described as a knowledgeable man from Crescenzi’s own time, in a chapter on horses. This text was written in Latin but also translated into French. This French translation, known as *Le Rustican*, was printed as early as 1486, with new editions being produced throughout the first half of the sixteenth century. A modern, critical, Latin edition of the text, dating from 1998, also exists making the comparison and analysis easier. Critical editions of texts provide a good basis for research. However, due to the fluid nature of text making in the Middle Ages, with the number of compilations and the potential reinterpretations of copyists, manuscripts remain an essential source for historians.

Manuscripts

Modern editions and translations must be approached with caution, especially when several manuscripts containing the same text are available. Moreover, some documents have not been transcribed, making archival research a necessity. The importance of manuscripts is also highlighted when the texts they contain have not been the subject of a complete, modern, critical edition. Molin’s 1818 rendition of Rufus’s treatise is a good example of how editions can sometimes prove to be insufficient for in-depth research. It is based on a limited number of manuscripts, none of which are the lost original and it does not reflect the potential variations over time or adaptations of the text. Though an invaluable tool for comparison or, simply, for easy access to the text, depending on the nature of the study, this edition does not always provide enough information to study the evolution of the treatise over time, or the way it may have been adapted to different regions and time-periods.

Looking at the original manuscripts can provide interesting information, especially in the case of practical texts: the modifications made by the copyists can reflect the evolution of some practices, as shown, for example, in the translations of Jordanus Rufus’s *De medicina equorum* that were made across the centuries (Vo Van Qui 2024). In the case of its French translations, there is some evidence that some copyists adapted the training method described to be applied to non-elite contexts, or at least to horses who were not warhorses. Even manuscripts that do not showcase a good version of a text provide important information about the specific mindset at the time and place where the copy was made. In the case of the *De medicina equorum*, a complete list of the existing manuscripts was made by Antonio Montinaro (2015), listing their date, provenance (if known), location, description and size. It is an invaluable resource for researchers of Rufus, though of course there is always a possibility that hitherto unknown manuscripts will be identified as containing Rufus’s text in the future.

Online library catalogues are very useful to track down manuscripts. Today, a number of manuscripts are available digitally, which makes the research much more convenient and accessible. Analysing the place of manuscripts in collections or tracking down the libraries in which they have been kept can give further indications as to their intended readership – learned intellectuals or people who would have put them into practice. For instance, one of the manuscripts of the *De medicina equorum*, a fourteenth-century French translation kept in Reims (Reims, BM 991), has an introduction explaining that the original from which it was copied was a translation made by François du Tronchoy for Jehan de Luxembourg, and supposed to be for practical use in the stables. Another of those manuscripts (Vatican Reg. Lat. 1177), also dating from the fourteenth century, has very small dimensions (196 × 138 mm) and has also suffered from water damage. The fact that it is unadorned and easy to transport suggests a practical use. As for the damage, it is not known when it occurred, but it is tempting to think it may have been a result of the daily use of this manuscript.

Additionally, manuscripts can prove very interesting in the case of any paratextual elements such as, for instance, notes commenting on the text, which can further demonstrate if and how the texts were used. Some of the manuscripts comprising Jordanus Rufus’s manual contain additional paragraphs or even chapters with other remedies at the end of the treatise itself. For example, one of the French translations (Paris, BnF Fr. 25341), dating from the thirteenth century, was bound with veterinary recipes from the sixteenth century, written on paper (as opposed to vellum) and bearing the signature of Jehan Leblond, possibly the homonymous knight and poet from Normandy. Such additions can show what people

Figure 1. *Le Livre de la chasse*, Gaston Phébus. Paris, BnF Fr. 619, fol. 90v (detail).
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thought was important to add in order to “update” the text, as well as where the manuscript itself circulated. This is very helpful to track down cultural evolutions in the treatment and perception of horses in the medieval world and beyond.

Iconographic sources

Some manuscripts contain illustrations or miniatures. Those can sometimes give a better understanding of the text, or of the interpretation given in that specific manuscript. For instance, some manuscripts of the *De medicina equorum* contain illustrations that give insights into how the recommended remedies should be applied. Since the texts can be difficult to understand sometimes due to obscure language or translation or copying mistakes, illustrations can inform on how the instructions were interpreted by the illustrator, if not necessarily how the author intended them to be applied.

Moreover, horses commonly feature in medieval iconography, allowing scholars to assess their perception in society. Studies have used those depictions to analyse pieces of equipment, including that of agricultural horses who are often absent from the written sources. For instance, Floriana Bardoneschi (2017) focused on the representation of plough-horses in thirteenth-century stained glass windows in Chartres and Tours and also examined how these horses are represented pictorially in manuscripts (Bardoneschi 2015). She investigated the type of equipment used on horses in agricultural contexts and questioned how representative of the realities of daily life these sources are. Additionally, some manuscripts of the *Roman de Fauvel* illustrate the grooming of horses, while some manuscripts of Crescenzi’s *Opus ruralium commodorum* include depictions of stables.

Indirect evidence of the prevalence of horses in daily life can be found in non-equestrian texts, such as a late fourteenth-century manuscript of *Le Livre de la chasse* by Gaston Phébus for example (Paris, BnF fr.619). It showcases very detailed drawings of horses, which demonstrate the illustrator’s good anatomical knowledge

of equines. While hunting methods are discussed, horses are never mentioned, despite their omnipresence in the accompanying illustrations. Their equipment is realistic, and gives interesting insights into the shape of bridles, for instance. The horses’ facial expressions are also very detailed, with wrinkles on their noses that, in some cases, seem to be correlated to the dangerousness of the beast they are hunting – the more ferocious the beast, the more wrinkled the noses (Figure 1). This could be interpreted as showing an ideal of the horse participating in the hunt alongside his master and understanding what is at stake, harking back to the portrayal of the horse showcased by thirteenth-century encyclopaedists: the ideal destrier was supposed to be unfailingly loyal and to contribute to the battle by kicking and biting the enemies, as well as being aware of the need to win.

Manuscript miniatures are not the only iconographical sources. Equines are also represented in wall hangings and tapestries, for example the Bayeux tapestry. James Graham-Campbell (1992), in his study of Anglo-Scandinavian equestrian equipment, analysed the depiction of the saddles and the resulting position of the rider with the legs forward and the feet pointing downwards due to the way the stirrups (which the author also compares to available archaeological remains) are attached to the saddle. Additionally, wall paintings and carvings can be used in the same manner, giving insights into horse equipment as well as into the perception of equines by humans. Depictions of equipment made of organic material, such as hemp or leather, are especially precious since they do not often survive in the archaeological record. Depictions of halters, which are less common than those of bridles, can give fascinating insights into often overlooked pieces of equipment used on a daily basis by anyone working with horses, regardless of status (see Figure 2). Though the representation of horses in medieval iconographic sources cannot be assumed to always be accurate, they provide a valuable source of information on various aspects of horse husbandry, equestrianism and the horse-human relationship.



Figure 2. Bas relief from Exeter Cathedral (c. 1400) showing an equine wearing a rope halter. Photograph by C. Vo Van Qui.

Archaeological sources

The archaeology of the Western European medieval horse is a source of increasing interest, as is the archaeology of equines in general over different periods of human history. A 2002 edited volume by French archaeologists, *Archéologie du cheval*, gives an overview of the archaeology of medieval equines and discusses the size of horses during the Middle Ages, though it is mostly limited to France. It provides zooarchaeological evidence of variation in height over the centuries and of selective breeding to increase horse size (Arbogast et al. 2002). The question of size is also raised in *The Medieval Horse and its Equipment, c. 1150–c. 1450* (Clark 2004), a benchmark archaeological study on medieval horses – though limited to finds made in London – in which John Clark points out that great warhorses of giant stature are a myth: there is no archaeological evidence for such animals and horses bred for military purposes would have been in the region of fourteen or fifteen hands. Recent zooarchaeological studies have further confirmed this (Ameen et al. 2021; Benkert 2023). Yet the myth of the great warhorse continues to pervade popular and

scientific imagination, though it is increasingly derided by historians and archaeologists alike (Creighton et al. 2025; Prestwich 2018). There is a striking discrepancy between the image of the medieval warhorse that draws on literary texts and what destriers may have looked like. This is one of the problems linked to the historical study of medieval horses: despite the research that has been done, modern preconceptions about the destrier continue to colour our understanding; and the real horse, as glimpsed by (zoo) archaeologists can elude historians.

Material culture provides a wealth of sources to study the history of medieval horses, which are especially useful to researchers when used in combination with other sources. Often commented upon by equestrian historians, material culture is increasingly used from an interdisciplinary perspective, for example comparing it with the textual information and ascertaining the effect of different pieces of equipment on the horse. Remains of shoes, bits, spurs, stirrups, saddle fittings, etc. show what equipment was used on horses, and they often have both a practical and symbolic dimension. A good example of that

are spurs. They were a symbol of knighthood, but they were also an important implement in medieval equitation. They allowed the rider to give the horse cues even if the feet were too far below the horse's flanks – which was the case when the riding was done with very straight legs as seen in contemporary depictions. Spurs also allowed the rider to reach the horse even if barding (horse armour) was worn, which is reflected in the increase in the length of the shanks in the fifteenth century. The analysis of such material evidence can provide information on the different types of horses, how they were treated, and how they were used, for riding or other purposes. Thus, equestrian equipment presents an important link to the real horses who once wore or otherwise interacted with these objects.

Amongst this material, horse barding is very interesting, as it demonstrates attempts at protecting the horse, but also shows how the warhorse becomes a physical extension of the knight when they both wear armour, becoming a single metal creature. The horse's bard, the design of which evolved throughout the Middle Ages, mirrors the knight's armour (Pyrrh et al. 2005). The armoured horse ceases to be a simple animal, being turned instead into a fantastical creature. This is apparent through the use, especially in the late fifteenth to sixteenth centuries, of elaborate shaffrons (the part of the armour that protects the horse's head). Some could turn a horse into a dragon's snout or a unicorn's head. Other types of shaffrons, used for jousting, were "blind" as they covered the horse's eyes. Deprived of the sense of sight, the horse loses independence and has to rely on the rider for guidance.

In "Chivalry and the Pre/Postmodern", Susan Crane (2011) highlights the unique relationship between the knight and his steed, which is further complicated by the technology represented by the armour and apparel that adorn both, almost objectifying them: because of this association, the

knight is threatened with bestiality while the horse risks becoming a mere machine, though in the end neither happens as, instead, a unique relationship develops. The two separate beings become one, in life, in the sources, and in the historiography. Studying the elements that were essential parts of the identity of both knight and destrier, their armour being a particularly striking example, can help shed new light on their relationship and its cultural implications.

Many remains of equestrian equipment can be found in museum collections. Online databases, like the [Portable Antiquity Scheme](#) for the United Kingdom, can help give an idea of the variety of equestrian equipment. Remains of equestrian equipment can also prove very useful as references to be used when recreating them in the context of experimental archaeology. Experimental approaches are being increasingly used by researchers, including historians, to test training methods, military techniques and equitation as presented in historical and archaeological sources (Vo Van Qui 2024). They can give more insights into what the experience of the horse would have been, an important dimension to take into account given the development of historical animal studies.

Conclusion

Though textual sources remain of great importance to study the history of the European medieval horse, other sources are increasingly being used by historians as interdisciplinary perspectives become more common. From the iconography to the material culture to experimental investigations, a wide range of sources is available to further develop historical research and make use of new methods, often inspired by the growth of animal studies. Modern scientific studies on equine cognition will further transform the way the historical horse is studied.

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PART II

HORSES THROUGH TIME

Horse Domestication and Early Use

Katherine Kanne

Introduction

Because horses have had an extraordinary impact on the human past, and still enchant us today, the study of their domestication and early use has had a long, storied, and sometimes unduly contentious, history. However, in less than a decade, rapid advancements in theory and method have upended earlier ideas about prehistoric human-horse relationships, primarily because of a new consensus about how domestication works, and the advent of the archaeogenetics revolution (ancient DNA or aDNA analysis). When combined with other increasingly high-resolution scientific methods like mobility and dietary isotope analysis, lipid residue analysis, soil micromorphology, geometric morphometrics, and the bioarchaeology of equestrianism (see Kanne and Benkert, French this volume: 37-46, and Bühler, this volume), archaeologists have a comprehensive toolkit that has enabled a substantial review of our equestrian past.

This chapter presents an overview of the most current research of horse domestication and early use, beginning with our present understanding of domestication processes and the key takeaways of the major archaeogenetics papers. An outline of the chronologies of domestication and the spread of the modern domesticated horse lineage (DOM2) is assembled in order to examine how ancient people used and lived with horses and other equids. Ultimately a model is proposed to explain how horses, riding, and chariotry may have spread concurrently throughout Afro-Eurasia along different trajectories after 2,200 BC.

Domestication Processes

Recent theories of animal domestication have shifted to consider domestication as a process, rather than an event. Domestication was not something people inflicted upon animals with strict control and domination (Bökönyi 1989; Clutton-Brock 1992; Ingold 2000). Now viewed as a social contract or multispecies collaboration, domestication theory resists anthropocentrism, or the stance that envisions humans as the only parties instigating these relationships (Allentuck 2015; Anderson et al. 2017; Bogaard et al. 2021; Boyd 2017; Birch 2018; Cucchi and Arbuckle 2021; Fuller et al. 2022; Halperin 2017; Hussain 2020, 2023; Kanne et al. 2024; Losey et al. 2018; Mlekuž 2013; Oma 2010; Shipman 2010; Stépanoff and Vigne 2018; White and Fijn 2020; Zeder 2015). This view recognizes animals as dynamic participants in domestication, which provides mutual benefits and a shared dependency, even if such relationships are not necessarily equal or caring. This approach fits well within broader evolutionary theory under the Extended Evolutionary Synthesis (EES) and Niche Construction Theory (NCT) (Henry 2024; Larson et al. 2014; Spengler 2021; Zeder 2017a, 2016).

Broadly, people intentionally and unintentionally modified their environments, which resulted in *paleo-synanthropic niches*, inciting *synanthropy* in other species, which are, “behavioural innovations and adaptations in nonhuman animals as a result of human neighbourhoods and is attributed to animals who take advantage of such human presence and thrive in human-influenced environments” (Hussain and Baumann 2024:4). The regular, relatively stationary home ranges of wild horse herds were enticing to hunter-gatherers, attracting them to undertake repeat hunts, which are visible in the archaeological record (Hoffecker et al. 2018; Olsen 1989; Outram 2006; Pope et al. 2020; West 2006). Mobile hunter-gatherers sought out habitats with stable populations of animals, just as the animals that would eventually become domesticated became attracted to human settlements. People intentionally worked to solidify this close proximity, such as killing common predators, offering salt or supplementary feed, and lighting fires so smoke would deter biting insects. Along with water and preferred forage quality and availability, biting pests and predator dynamics affect the habitat choice of equids (Heddell-Stevens et al. 2024; Schoenecker et al. 2016). This relationality allowed hunters to observe herds and harvest them sustainably to ensure a regular source of meat and materials, and enabled horses to survive in increasingly fragmented environments. Individual animal and herd decision making towards or away from people are a crucial part of domestication processes, as were environmental dynamics, like the shrinking grasslands which caused a coeval decrease in horse populations prior to domestication (Figure 1).

Both people and horses modified their behaviours in order to live together in shared landscapes. As Stépanoff (2017) has argued for reindeer domestication, all parties must learn and adapt to live with each other. Horses were motivated by their need to survive, and chose to enter an association with humans to better their chances, whilst people balanced their needs with the needs of horses as the landscape transformed with these new relationships. Natural genetic mutations occurred and were selected for, increasing the sociality and curiosity of horses to humans, and decreasing agonistic behaviours. Horses that were less afraid of humans were more successful reproductively and evolutionarily. They became semi-managed herds, well before genetic changes of domestication can be seen, consistent with current research in cattle (Portillo et al. 2019), sheep (Yurtman et al. 2021), goats (Daly et al. 2024), pigs (Zeder and Lemoine 2022), and reindeer (Salmi 2023).

Built landscapes ensured easier access to the would-be and eventual livestock. The transition from ‘hunting architectures’ (Lemke 2021), such as kites or traps, to ‘domestication architectures’ (Anderson et al. 2017; Salmi 2023), like corrals, was not a terribly giant leap. The

ways in which these are constructed take effort from all parties. A ‘prey pathway’ to initial horse domestication occurred relatively late when compared to the other large livestock, and may have been more deliberate in the second instantiation, as a “directed pathway”, whereby animals are domesticated to fulfil a specific need, such as riding or draught, which requires prior familiarity with other domesticated animal economies (Zeder 2012). Outram’s (2023:2) elegant characterisation of horse domestication as a ‘multi-centred, multi-stage process’, rather than a singular event, offers the contemporary view of how horse domestication variously unfolded in different places at different times.

The Archaeogenetics Revolution for Equids

In the fifteen years since the genome sequence of a Thoroughbred mare called *Twilight* was published (Raudsepp et al. 2019; Wade et al. 2009), and the ensuing successful methods to extract and sequence ancient horse DNA were developed (Orlando et al. 2011), probably nothing has impacted our understanding of horse domestication as much as a series of landmark papers that reported the aDNA analysis from hundreds of ancient horses throughout Eurasia (Cieslak et al. 2016; Fages et al. 2019; Gaunitz et al. 2018; Guimaraes et al. 2020; Librado et al. 2015, 2016, 2017, 2021, 2024; Lippold et al. 2011; Lira Garrido et al. 2010; Ludwig et al. 2009, 2014; Makvandi-Nejad et al. 2010; Petersen et al. 2013; Pruvost et al. 2011; Schubert et al. 2014; Warmuth et al. 2009, 2011; Wutke et al. 2016, 2018) (see French this volume: 37-46). The ERC funded “PEGASUS” project, led by Ludovic Orlando and colleagues at the Centre for Anthropobiology and Genomics of Toulouse, CNRS / Université Toulouse III–Paul Sabatier, led the recent charge in uncovering the genetic prehistory of human–equid relations by collecting and sequencing ancient horse genomes from across Eurasia and the Americas, now numbering over 500, as well as genomes of ancient donkeys (Librado et al. 2024). Reviews from Orlando (2018, 2020), Perry and Makarewicz (2019), Librado and Orlando (2021), Outram (2023), Kyselý and Peške (2022), and Niskanen (2023), provide an excellent overview of all the genetic work thus far. This section summarises the main points from the principal archaeogenetics papers in order to outline the subsequent chronologies.

Key papers and points for horse domestication

In the initial efforts, Librado and colleagues (2017) obtained and examined the genome sequences of 14 Bronze and Iron Age horses to study the effects of domestication. Genes associated with multiple coat colours and skeletal robusticity were found in Iron Age Scythian horses, alongside a loss of genetic diversity and increase in deleterious mutations thought to be caused by breeding from a limited number

of stallions. Moreover, mitochondrial, or maternal, diversity was clear, as was selection for a suite of genes related to locomotion, physiology, development, and behaviour. Determining when these characteristics were introduced led to the next phase of analysis, sequencing the genomes of presumed ancient domesticated, non-, and pre-domesticated horses.

For many years, the ancestors of modern horses were thought to be those recovered from the settlement of Botai, Kazakhstan – a sedentary village almost wholly reliant on horses, dating to the Eneolithic, or Copper Age (c. 3,500 BC). A robust assemblage of archaeological evidence demonstrated that at least some of the Botai horses there were bitted and bridled, likely ridden, milked, and corralled, which strongly suggested they were domesticated (Olsen 2006; Outram et al. 2009). Sequencing 42 ancient horse genomes, Gauntiz et al. (2018) came to a surprising conclusion – that the Botai horses (or the DOM1 lineage) were not the ancestors of modern horses (the DOM2 lineage), but were the ancestors of modern Przewalski's Horses. After the Botai people were gone, their DOM1 horses subsequently became feral, and then were hunted to near extinction. The last few Przewalski's Horses remaining in the wild were rounded up in the early 20th century and put in zoos, setting in motion a program that has successfully conserved the species, allowing them to be reintroduced to their old habitats (Der Sarkissian et al. 2015). That the Botai horses were not the ancestors of our modern DOM2 horses revealed that there was another unrelated population that were their direct ancestors. Candidate areas for direct DOM2 ancestors were the Pontic-Caspian steppe, Eastern Europe, Eastern Anatolia, Iberia, Western Iran, and the Levant, based on environmental and zooarchaeological data, as well as the evolving ancient DNA results.

Analysing genome-scale data from 149 ancient horses, along with 129 ancient horse genomes, Fages et al. (2019) found two lineages of horses present during the early phases of domestication processes which are now extinct, one in Iberia (IBE) and another in Siberia (ELEN) (Figure 1a). The ancient Iberian horses are genetically distinct from DOM1 and DOM2 horses, effectively ruling out Iberia as the region that produced the ancestors of modern horses. Fages et al. (2019) were also able to link population changes in horses to human movement, such as the early medieval Viking expansion, which was evidenced in the relationship of modern Icelandic and Shetland ponies to pre-Viking Pictish horses in northern Britain (c. 500–700 AD) and to ancient Viking horses (c. 800–1100 AD) (Perry and Makarewicz 2019). Additionally, alleles associated with high speed in the present, the MSTN, or 'speed gene', became common in the last millennium. Breeding of the past 1,000 years reflects increased efforts to mate to particular stallions, as well as the outsized effect of Persian stallions, as shown by the steady decline of the

genetic diversity in Y (male) chromosomes and the rising dominance of Arabian type stallions in Europe and Asia after the 7th–9th centuries AD. Most modern breeds cluster with this Arabian-type group. Though horse breeders in the past worked to preserve genetic diversity, the past 200 years have seen its massive decline and a parallel rise in deleterious mutations. Probably a result of the advent of Thoroughbred racing in the 17th century, race and sports or performance horse breeders heavily 'line-breed' (inbreed), or cross partially related mares with stallions that either were elite performers or are capable of producing elite performance horses.

In an effort to winnow the possible geographic origins of DOM2 horses, Guimaraes et al. (2020) discovered that Anatolia was not the answer. There was a near complete population turnover from the late 3rd millennium BC, in agreement with the iconography and texts that clearly show domesticated horses in Anatolia and Mesopotamia after 2,200 BC. Librado et al. (2021) soon pinpointed the geographical origins of DOM2 to the Pontic-Caspian, or Western Eurasian, steppes (Figures 1d-h, 3, and 4). Horses that were genetically closest to DOM2 horses were found in the southwestern Don-Volga region, dating to 3,500–2,600 BC in Maikop (Aygurisky), Yamnaya (Repin), and Poltavka (Sosnovka) cultural contexts, called the CPONT lineage (Figures 1d, e, 3 and 4). Additional genetic continuity for DOM2 was found in two Yamnaya horses at Turganik from 2,900–2,600 BC, the TURG lineage (Figures 1e and 4).

Genetic signatures were discovered that documented enhanced docility and a strengthened back in DOM2 horses (Librado et al. 2021). This demonstrated that riding was important for the origins and spread of the modern horse lineages, as well as its eventual dominance. The earliest examples of DOM2 horses were identified from Acemhöyük, Türkiye (2200–2044 calBC), Holubice, Czech Republic (2137–1936 calBC), and Gordinești II, Moldavia (2140–1985 calBC), far west of the ancestral homeland, and predating the first chariots. Moreover, Librado and colleagues (2021) suggested that the Yamnaya, or steppe people who spread throughout Europe in the 4th–3rd millennium BC and instigated a dramatic population turnover in humans, could not have been responsible for the spread of DOM2 horses because the bulk of their migrations took place largely *before* the spread of DOM2 horses. The Yamnaya had long been candidates for the spread of DOM2 horses because of their pastoral lifestyle, high mobility, proto-Indo-European language, association with horses on the steppes, and internment of horses in their burial kurgans in eastern Europe (Anthony 2023, 2010). The Yamnaya people had a strong effect on the genetic makeup of Europe; the horses they may have ridden on the journey seemingly did not.

With the addition of crucial datasets from the Carpathian and Transylvanian Basins, and a sample com-

Lineage(s)	Earliest Date calBC	Latest Date calBC	Number	Midpoint BC
URAL	44426	13330	14	22685
ELEN	41180	2935	8	17984
LP (NFR, SFR, WSIB)	21909	12090	21	16439
IBE	5299	1900	5	2901
NEOANA, NEOCAS, NEOPOL	6396	3991	11	5122
ENEO/FB (ENEOROM, ENEOCZE, FBPOL)	4494	3102	8	3824
DOM1 (NEOBOR, Botai, Botai related, KrasnyiYar, BORL, Novolinka; Tersek)	4721	2632	60	3343
C-PONT	3526	2631	3	3096
Repin	3074	2916	1	2995
TURG	2897	2636	4	2772
CWC	2860	2502	6	2686
HUNG	3371	1945	13	2294
DOM2 (to year -1)	2205	148	189	1101

Table 1. Major Ancient Horse Lineages after Librado et al. (2024: SI, Table S1).

prising 475 ancient and 77 modern horse genomes, Librado et al. (2024) further narrowed the genetic turnover to DOM2 horses at c. 2,200 BC, as well as the geographic homeland of DOM2 horses in the western Eurasian steppes. Within several centuries, all other existing lineages were replaced by DOM2 horses, ostensibly stemming from the desire for tractable animals that could provide fast mobility, ridden and driven. This alludes to the presence of significant differences in the behavioural and locomotory capacities of the other lineages as they pertain to human mobility. Critically, this does not mean that people did not ride any horses prior to DOM2 horses, only that they were not responsible for the spread of this lineage. The further implication is that the earlier lineages were perhaps fine for herding and shorter-distance travel, but not as well suited for speedy, long-distance travel, based on the established genetic changes in the DOM2 lineage for back strength and docility. Furthermore, Librado and colleagues (2024) were able to identify that both Botai DOM1 horses, and later DOM2 horses, had markedly shortened generational times, indicating that controlled breeding occurred. This effectively relinquished doubts that the Botai horses were domesticated, as well as demonstrated that the desired temperament and performance capabilities of DOM2 horses were quickly recognised and selected for, which secured their rapid dominance.

Domestication Chronologies

Equus before 10,000 BC

Integrating advancements in theory and method allows a new outline of the chronology of the long-term co-evolution of human/horse relationships. Critical to each genus's evolution, various *Equus* and *Homo* species have known

each other for 1.7 million years (Olsen 2016). Research on human/equid relations prior to discernible domestication processes have contributed to better understanding the species, lineages, and distribution of wild horses (Leonardi et al. 2018, 2022; Sommer et al. 2018; Vershinina et al. 2021). Diverging from their ancestors in North America, the earliest 'true' or *cabaloid* horses, arrived in Eurasia in the Pleistocene (Ice Age), and expanded widely between 875,000–625,000 BP (Before Present) (Orlando et al. 2013; Vershinina et al. 2018). They were small and robust in colder periods, larger and gracile in warmer climates, likely a uniform bay-dun in colour (Cieslak 2011; Ludwig et al. 2009; van Asperen 2010). Hunting equids was vital to human evolution, as demonstrated by our hominin ancestors at sites like Boxgrove, England and Schöningen, Germany, then later by *Homo sapiens* in the Upper Palaeolithic at sites like Solutré in France, (Hoffecker et al. 2018; Olsen 1989; Outram 2006; Pope et al. 2020; West 2006).

Horses were of paramount importance to Upper Palaeolithic peoples (50,000–12,000 BP), indicated by the evocative cave and portable art of Europe, where people painted realistically coloured bay-dun, bay, black, and leopard spotted horses, in natural states of rest, agitation, contentment, and sleep (Pruvost et al. 2011). In caves like Lascaux, France, and Altamira, Spain, they painted horses more often than other species, and in more prominent locations (Sauvet 2019). After the cooling during the Last Glacial Maximum (27,000–18,000 BP), the preferred open grassland habitat of horses became fragmented with forests, pushing horse populations into smaller refugia (Leonardi et al. 2018). Black coat colours appeared as camouflage for these increasingly forested environments (Sandoval-Castellanos et al. 2017). The Siberian and European Pleistocene wild horses were bay and bay-dun, a result of

adaptation to the steppe. Between the Pleistocene-Holocene transition, the grasslands shrunk and were replaced by forests, causing horse populations to shrink drastically. By the Early Holocene (c. 11,700–6,000 BP), in the open forests of Iberia and eastern Europe, 76% of horses were bay and 24% were black (Sandoval-Castellanos et al. 2017).

During this time, a number of distinct lineages of wild horses, *Equus ferus*, were present, represented by now extinct lineages in Siberia (*Equus lenensis*, or ELEN), Iberia (IBE), and the north-western steppes (URAL) (Figure 1a) (Fages et al. 2019). Wild Late Palaeolithic horses in France were also recognised (the LPNFR, LPSFR lineages, Figure 1a), as well as the parent stock for all modern horses (DOM2), including the Przewalski's horse (DOM1) (Librado et al. 2024; Kvist and Niskanen 2021). Horses in continental Europe ranged from 126–141 cm, averaging at 133 cm, or 13 hands high around 13,000–7,000 BC (Kagan 2000). The modern Przewalski's Horse is about the same height at the withers but is less robust than these fossil wild horses.

Distribution Downturn and Horse Distribution in Neolithic

In the Early Holocene (c. 9,700–4,000 BC), environments in Eurasia became even more wooded (Leonardi et al. 2018). Between 10,000–5,000 BC (Figure 1b), in addition to the Iberian lineage (IBE), wild horses were identified in Anatolia (NEOANA), Poland (NEOPOL), the northern Caucasus mountains (NEONCAS), and Romania (ENEOROM) (Librado et al. 2024). At the onset of the Neolithic, c. 8,000 BC, the number of horses declined further, becoming nearly absent in Europe by 5,500 BC (Figure 1c) (Bendrey 2012; Sommer et al. 2011). Grasslands shrunk exponentially and horse populations did too, surviving in pockets on the Eurasian steppe, as well as on the plains in North and Central Europe, and in Iberia (Benecke 1994; Bendrey 2012).

Equids in the 5th millennium BC (5,000–4,000 BC)

Forest clearing to create pasture for the already domesticated livestock (cattle, sheep, goats) likely encouraged horses to reoccupy grasslands in Europe by the 5th millennium BC (Figure 1c) (Leonardi et al. 2022; Sommer et al. 2011). Along with the population uptick, the parent stock for DOM1 and DOM2 remained, and the lineages NEOBOR, NEOANA, NEONCAS, and ENEOROM were present in the European plains and the steppe (Librado et al. 2024).

Anthony (2023, 2010) and colleagues (Anthony and Brown 2011; Anthony et al. 2006, 2022) have made a solid case that domestication processes were underway in the 5th millennium BC (5,000–4,000 BC) on the western Eurasian steppe. Peoples excavated from the Khvalynsk cemetery (4,500–4,000 BC), and related sites like S'yezzhee, who were fisher-hunter-herders with domesticated cattle, sheep, and goats, are suggested to have treated horses like

the other domesticated livestock, and unlike wild animals, in their mortuary practices. This supports the involvement of these settlements in this region in domestication processes. Horse bones were included in human graves akin to cattle, sheep, and goats at Khvalynsk, while at S'yezzhee, horses were arranged in head-and-hoof deposits above human graves, like the other domesticates. Stone maces were carved to resemble horse heads, and placed in some of these burials, especially those of high-ranking chieftains (Anthony et al. 2022). Moreover, the aDNA of horses analysed from contemporary late fifth millennium BC sites, including horses from the site of Oroschaemoe (NEONCAS, 4586 BC), and Semenovka I (Ukr11, 4185 BC), demonstrates intermediate genetic ancestry between the wild steppe horses and several later Yamnaya CPONT horses that are known to be the direct ancestors of DOM2 horses (Figures 1c and 2) (Anthony 2023: 21).

Surprising skeletal evidence for riding in a human was found in a solitary burial in Csongrád-Kettőshalom (present day Hungary), dating between 4442–4243 calBC, or to the Early Copper Age (ECA, or Eneolithic, Tiszapolgár culture) (Figure 2) (Dani and Hajdu 2023; Trautmann et al. 2023). The burial was similar to those found further east on the steppes, that is on his back with the knees drawn up, arms along the body, hands on thighs, covered with red ochre. The 35–45-year-old man had an obsidian blade, copper, spondylus shell, and stone beads with him. The Tiszapolgár peoples were agropastoralists, and while horses are present at ECA sites in the region (Gál 2017; Kanne 2018:80, Figure 6), their genetic ancestry is not yet known.

The evidence for this very early riding is cautious, given the date and context, but it is possible. At least some indications of very early riding could be expected for the long, complex, multi-stage processes of horse domestication and eventual equestrianism. To arrive at a suitable mount, people had to know what traits would be important for riding prior to the emergence of DOM2, which implies that they were riding *before* the DOM2 lineage emerged. This would have been an experimental and uneven process, which also required building a system of reproducible knowledge and language intelligible by both species. This must have undergone countless attempts to master, in both the act of riding itself, as well as the ability to produce animals that could be ridden or driven.

For animals to be herded, the population needs to be domesticated. Horses are not migratory, but prefer local ranges with water, sufficient graze, and shelter (Schoenecker et al. 2016). Isotopic data has shown that wild horses stayed mostly stationary compared to mammoth and reindeer (Heddell-Stevens et al. 2024). Unless the entire population was domesticated, and therefore amenable to being herded by humans, moving them in any human migratory events would not have been easily achieved. Horses needed to be well attuned to humans, and relatively

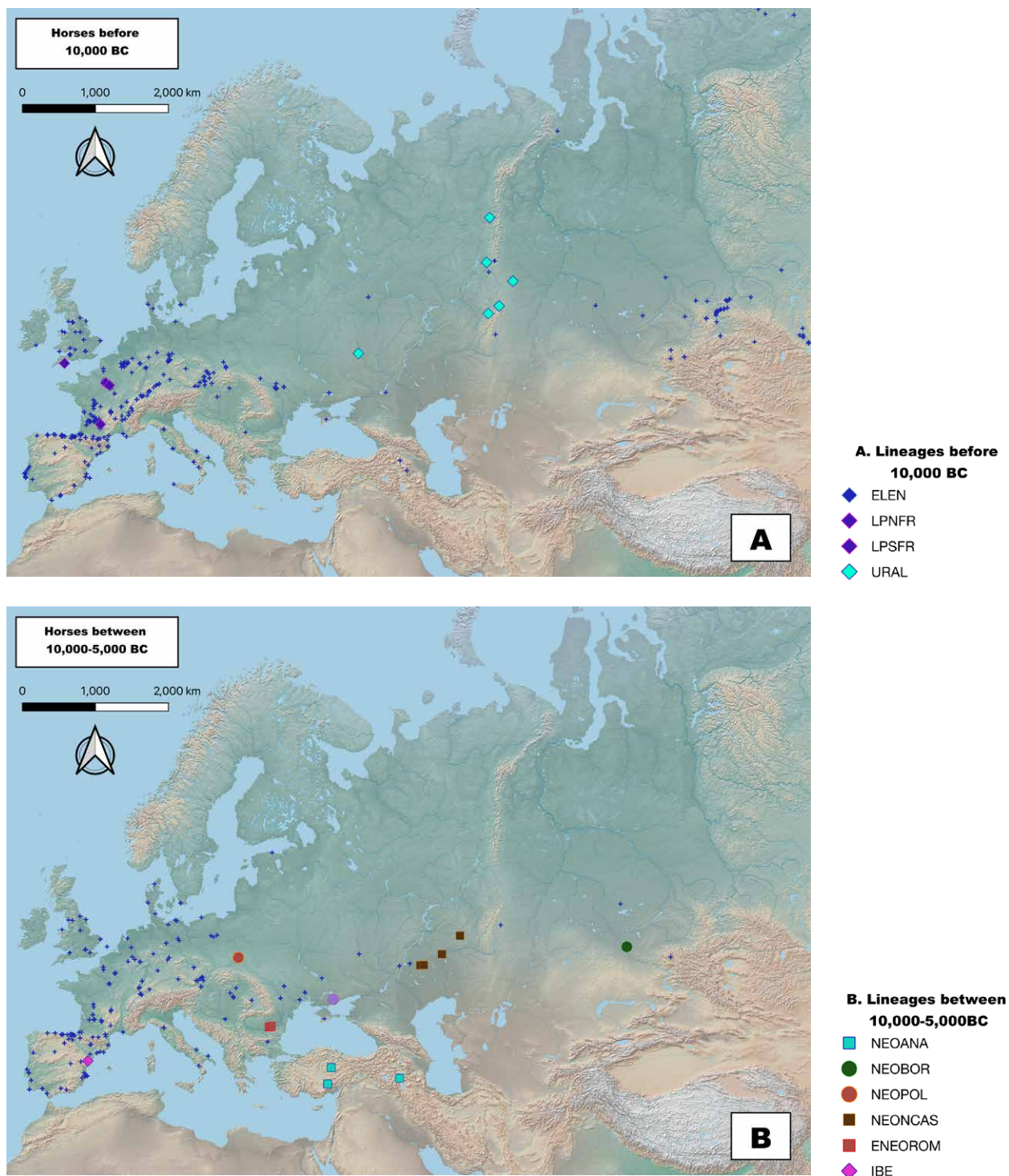
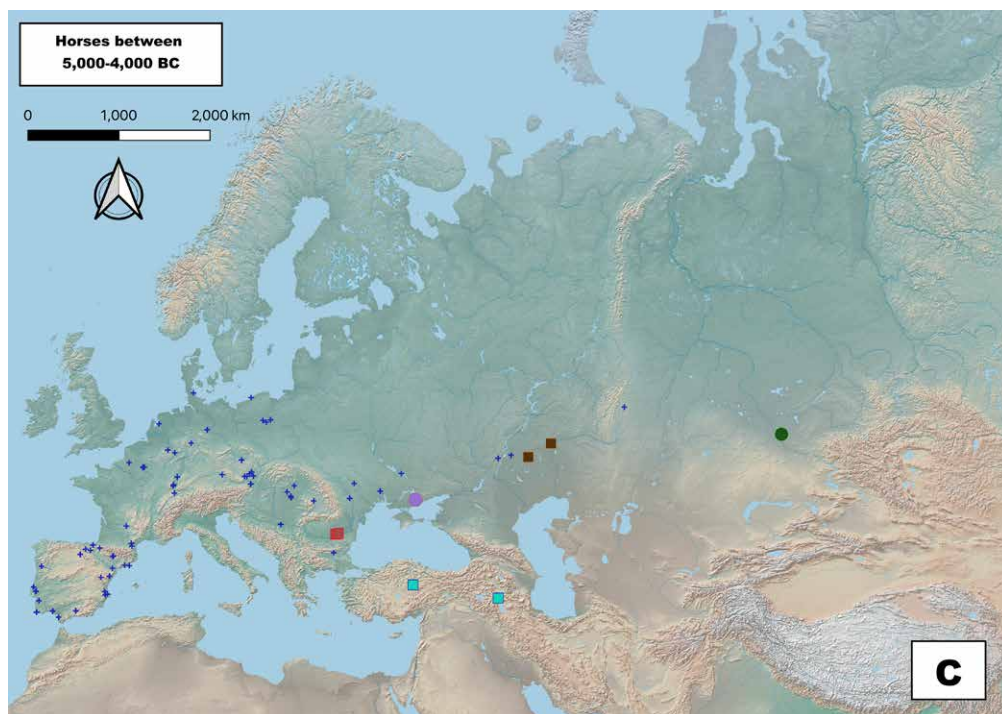


Figure 1. Horse distribution sequence based on the current archaeogenetics. Lineage data are from Librado et al. (2024: Table S1). Blue crosses are radiocarbon dated horse remains, lineages not yet known (Guimaraes et al. 2020: Table S1; Leonardi et al. 2018: Table S1; Gál 2015: 370; Kveiborg 2018: 233, Table 3).

- C. Lineages between 5,000-4,000 BC**
- ENEOROM
 - NEOANA
 - NEOBOR (Botai-related)
 - NEONCAS
 - Ukr11



- D. Lineages between 4,000-3,000 BC**
- BOTAI
 - Botai-related
 - ✱ CPONT
 - ◆ HUNG
 - ENEOCZE
 - ENEOROM
 - FBPOL
 - FBPWC

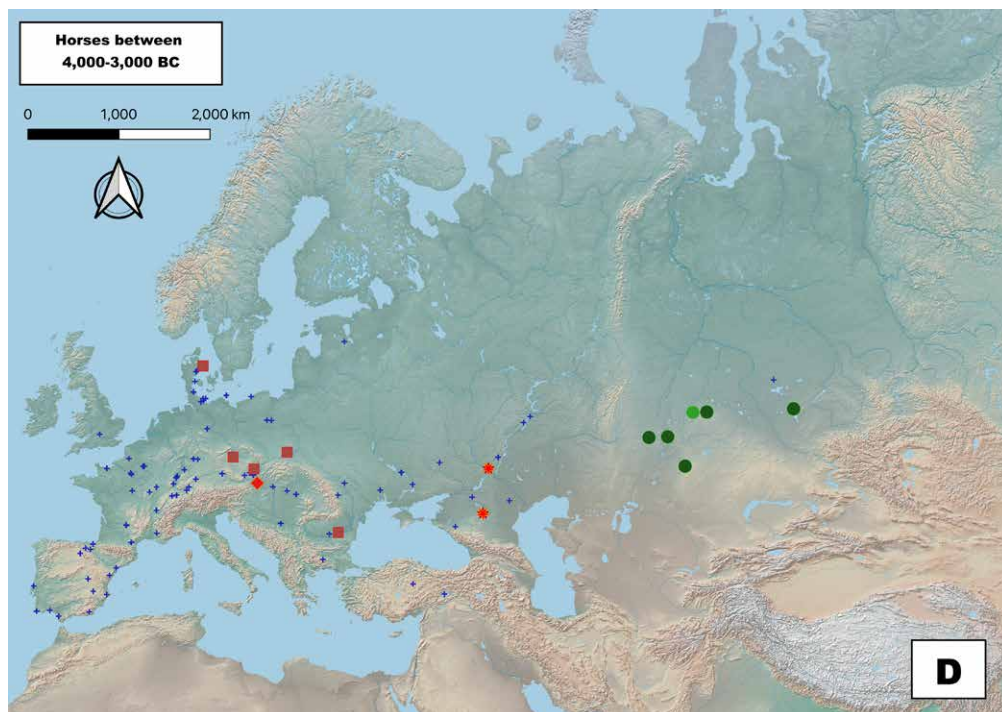


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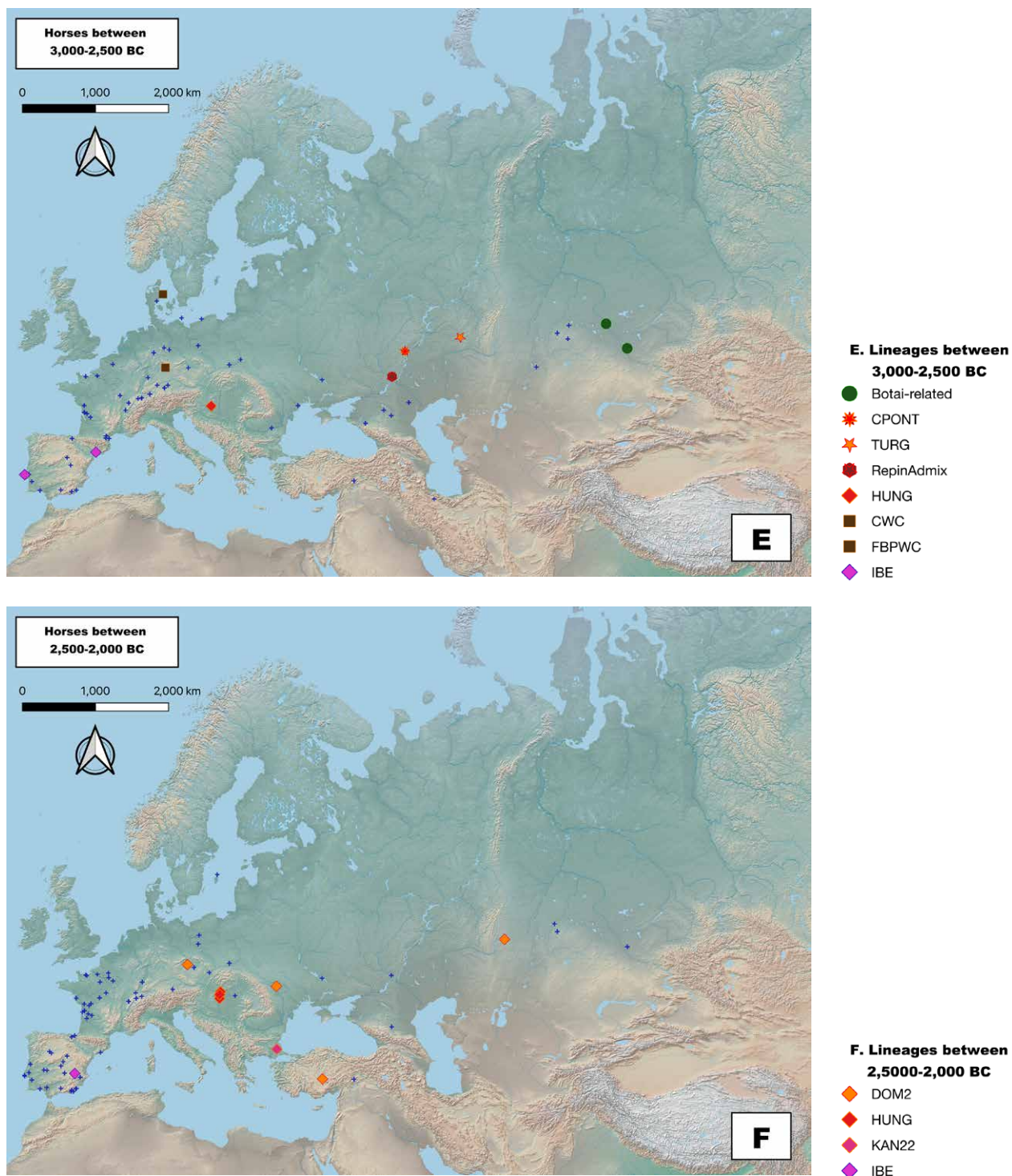


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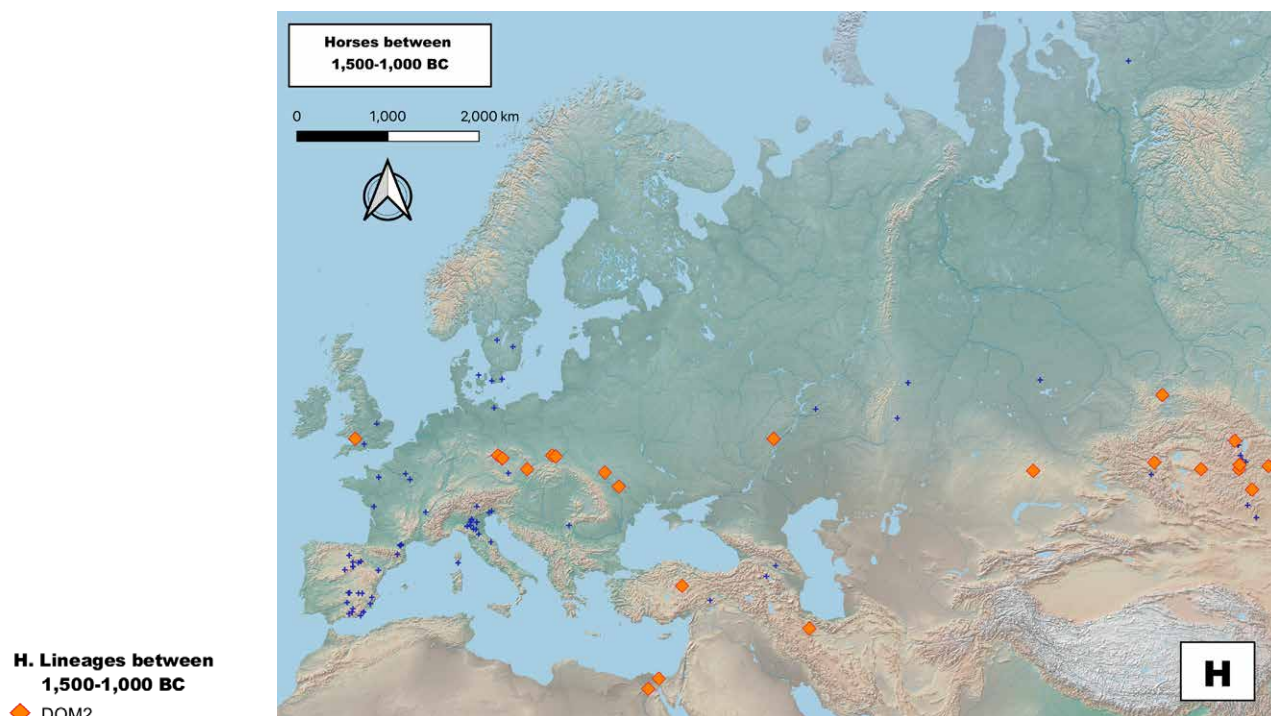
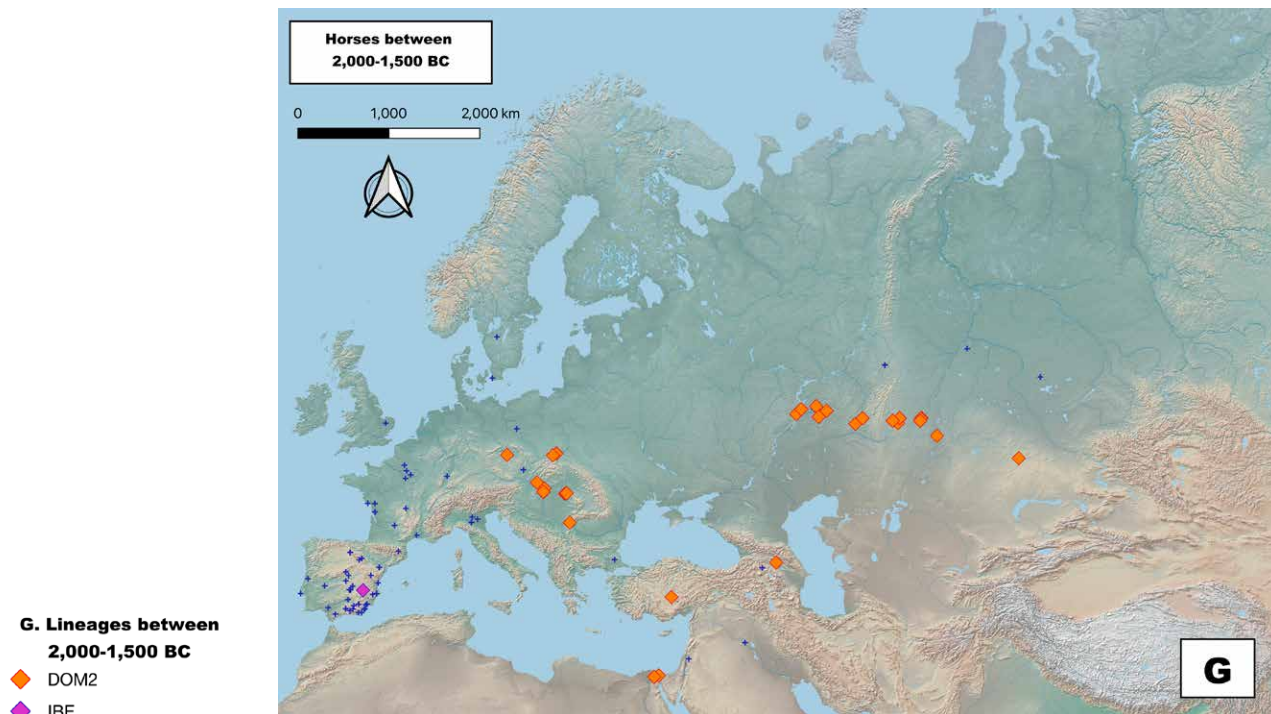


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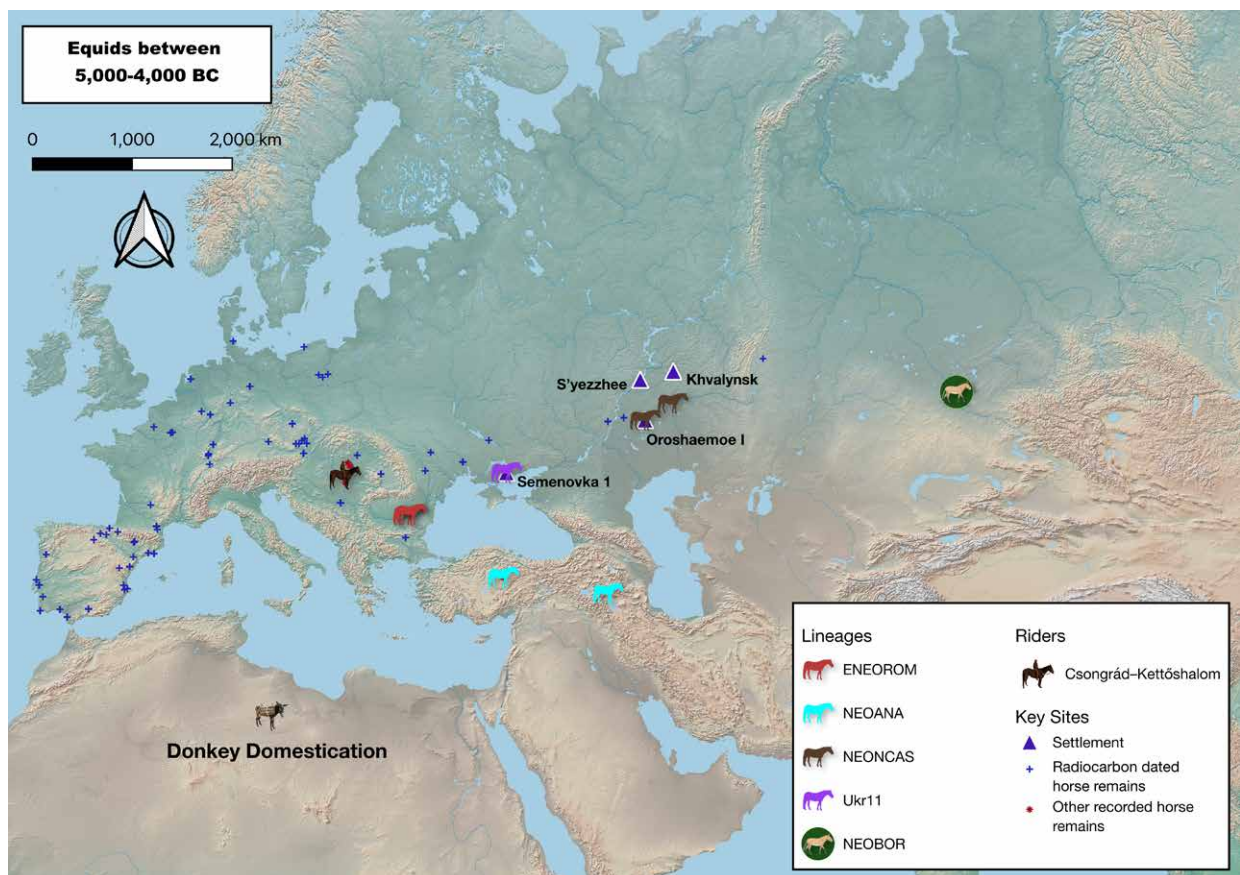


Figure 2. Equids in the 5th millennium BC.

dependent upon them, in order for them to respond to herding outside of their established habitats. For the other livestock, there were lags of *millennia* before people were able to herd and move with them on the hoof (Daly et al. 2024; Scheu et al. 2015; Yurtman et al. 2021). Individual horses may have transported these 5th millennium people, and later Yamnaya, even with small family bands in tow, but shifting large herds would be unlikely at this point in time, if not impossible.

Meanwhile, donkeys were domesticated in the 5th millennium BC (Figure 2). Donkeys are important to understand how horses, and their wheeled vehicles, were received and integrated into societies that already had domesticated equids. Sequencing 207 modern and 31 ancient donkeys, Todd et al. (2022) discovered evidence of an eastern African origin c. 5000 BC, with a subsequent division and later expansion of lineages in Asia (Iran and the Indus Valley) and then into Europe in the mid-to-late third millennium BC, a point returned to later.

Equids in the 4th millennium BC

During the 4th millennium BC, the number of lineages increased, reflecting Botai domestication processes (BOTAI,

BOTAI-Related), as well as the bottleneck preceding the advent of DOM2 horses, and horses of their direct ancestry, as shown by CPONT (Figure 1d). The additional European lineages identified (ENEOROM, FBPOL, FBPMC, HUNG) likely received steppe ancestry from wild populations before ~14,646 BC, but not after this date, suggesting they seemingly remained reproductively isolated from the eastern populations (Librado et al. 2024), and attached to more local habitats.

As discussed, in the mid-4th millennium BC, people from Botai became almost wholly dependent on horses (Outram et al. 2009; Outram 2023). The evidence for the domestication of these horses is overwhelming, and now revealed genetically by evidence for controlled breeding in shortened generational times, just like DOM2 horses (Librado et al. 2024). Further complementary evidence is seen with horse milk residue in pots, distinctive wear from bits on the teeth of nineteen horses (Anthony et al. 2006, 2022), atypical coat colours, including leopard spotting (Wutke et al. 2016), geophysical and geochemical evidence for corrals and horse dung used in house construction (French and Kousoulakou 2006; Olsen et al. 2006), and pole-axing, which is a method of controlled slaughter and

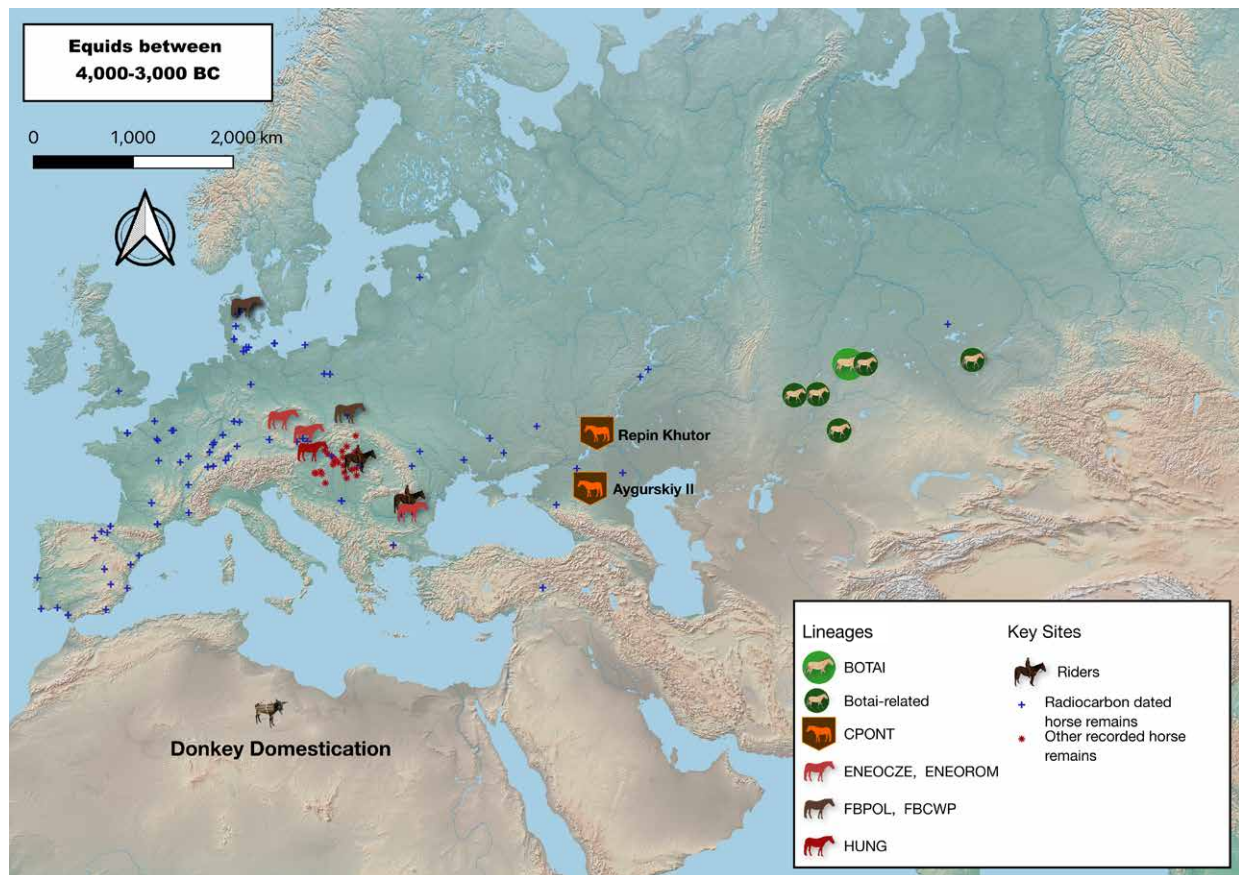


Figure 3. Equids in the 4th millennium BC.

not a death by hunting (Olsen 2006). Contemporaneously occupied settlements in Kazakhstan, like Borly, Sredni Stog and the Tersek site of Kozhai II, also demonstrate relatively high reliance on horses. The samples from these sites all have direct and related Botai (DOM1) ancestry (Gaunitz et al. 2018; Librado et al. 2021, 2024).

Dating to 3526–3373 calBC, and contemporaneous to the Botai culture, the oldest identified ancestor to DOM2 was buried in a rich, nearly 40m large Maikop culture barrow at Aygurisky, north of the Caucasus mountains (Figure 1d, CPONT) (Librado et al. 2021). Along with bones from a donkey and sheep, the lower leg bones of this horse accompanied a two-to three-year-old child who also had a clay pot and mother-of-pearl and stone beads on his right leg (Hansen et al. 2021). From another wildly wealthy Maikop barrow, a silver cup was recovered with a horse incised on it – one that strongly resembles modern Przewalski's Horses with its upright mane and sturdy conformation. Moreover, pairs of looped copper artifacts found on Maikop-culture oxen, dating to approximately 3,200 BC, suggest efforts at animal control using some form of bit, and may be the cheek pieces of such bits (Anthony and Heyd 2023 in Trautmann et al. 2023:102).

Two horses excavated from the Yamnaya settlement of Repin Khutor (Russia), present another CPONT example, dating to 3265–2913 calBC (Figure 1d), along with a slightly later admixed horse (RepinAdmix, 3074–2916 calBC) (Figure 1e). Anthony and Heyd (2023) report that the evidence presented in Librado et al. (2021) indicates that the genetic admixture in the CPONT Repin horse was closer to DOM2 than to NEONCAS wild horses dated to 5500 BC. Domesticated horses at the Yamnaya settlement of Krivyanski 9 are attested to by horse milk peptides in human dental calculus (Wilkin et al. 2021), dating from the middle of the 4th or the beginning of the 3rd millennium BC, depending on the way the radiocarbon dates are calculated (Outram 2023). Like the Botai horses, milking mares, and handling foals in the process, strongly suggests docile, domesticated horses.

More early riders were found, either pre- or very early Yamnaya, from Blejoi in Romania, and Balmazújváros–Kettőshalom in present-day Hungary (3331–2927 calBC and 3338–2939 calBC respectively) (Figure 3) (Trautmann et al. 2023). From the contemporaneous Late Copper Age (LCA) Kittsee settlement, Austria (transition of the Boleráz Baden Culture to Ossarn Baden Culture), the first

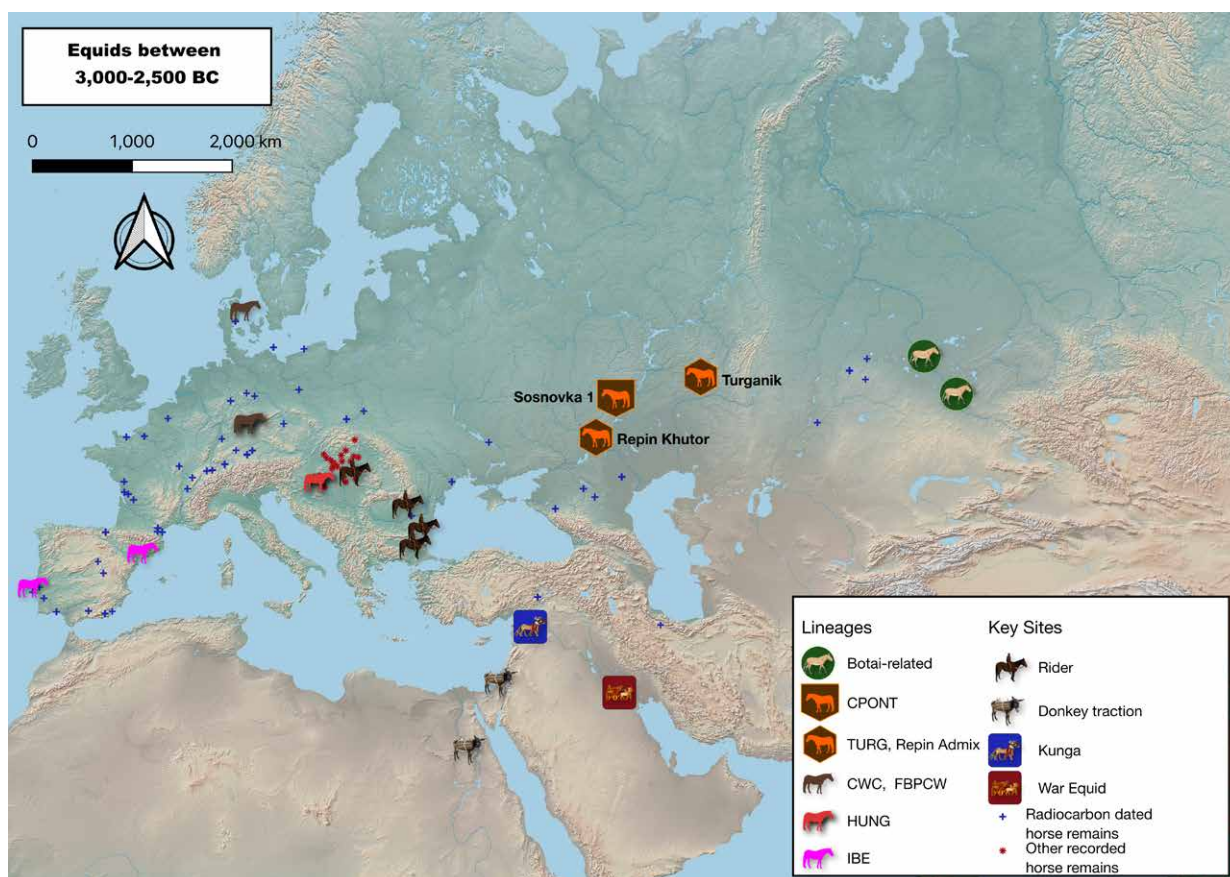


Figure 4. Equids in the first half of the 3rd millennium BC, between 3,000–2,500 BC.

horse representing the HUNG lineage was discovered (3371–3109 calBC). In LCA Hungary, horses were found in burials and settlements, some in appreciable numbers (Figure 3) (Gál 2015). Attribution of their domestication status has been mixed. None of the genomes of these horses have yet been analysed.

Equids in the 3rd Millennium BC

In the first half of the 3rd millennium BC (3,000–2,500 BC), additional horses that have genetic continuity with DOM2 were identified, including four horses of the TURG lineage, from the Yamnaya settlement of Turganik, Russia (2897–2636 BC) (Figures 1e and 4) (Librado et al. 2024: SI Table 1). Another CPONT horse from Sosnovka 1, Russia was also recorded. Dating coevally, three Yamnaya individuals excavated from kurgans near Malomirovo, Bulgaria (3018–2884 calBC), Strejnic, Romania (2869–2501 calBC), and Vetrino, Bulgaria (2873–2623 calBC) were determined to have skeletal pathologies consistent with ‘rider’s syndrome’ (Figure 4) (Trautmann et al. 2021, Table 2). This corresponds to the timing of a strong domestication bottleneck, seen through demographic reconstructions about 2,700 BC (3,064–2,564 calBC) (Librado et al. 2024).

Meanwhile, the use of other equids in travel, transport, ceremony, and war was well underway. From Abydos, Egypt, ten articulated donkey (*Equus asinus*) skeletons were discovered entombed in brick crypts adjacent to the royal mortuary complex of an early Egyptian king (c. 3,000 BC), exhibiting significant arthropathies (joint disease) from heavy use as pack, driving, and riding animals (Rousel et al. 2008). These donkeys were initially considered domesticated because of the contexts and use-related pathologies on the bones, supporting the inference that early domestication occurred in Africa, then expanded after 5,200 BC. Recent aDNA analysis models dispersal into Europe around 2,800 BC and Asia about 2,600 BC (Figure 4).

Donkeys were important for traction and transport of people and goods, to signify wealth and identity, and to secure diplomatic relations. They were frequently sacrificed and also placed in tombs in elite, and wealthy non-elite, public and household contexts (like merchant caravaners) in the southern Levant and Near East, from at least Chalcolithic and Early Dynastic periods in Mesopotamia, to the Old Kingdom in Egypt (Greenfield et al. 2022). From Tall aş-Şāfi/Gath in the southern Levant, bit wear was identified on a donkey, the earliest among domestic equids

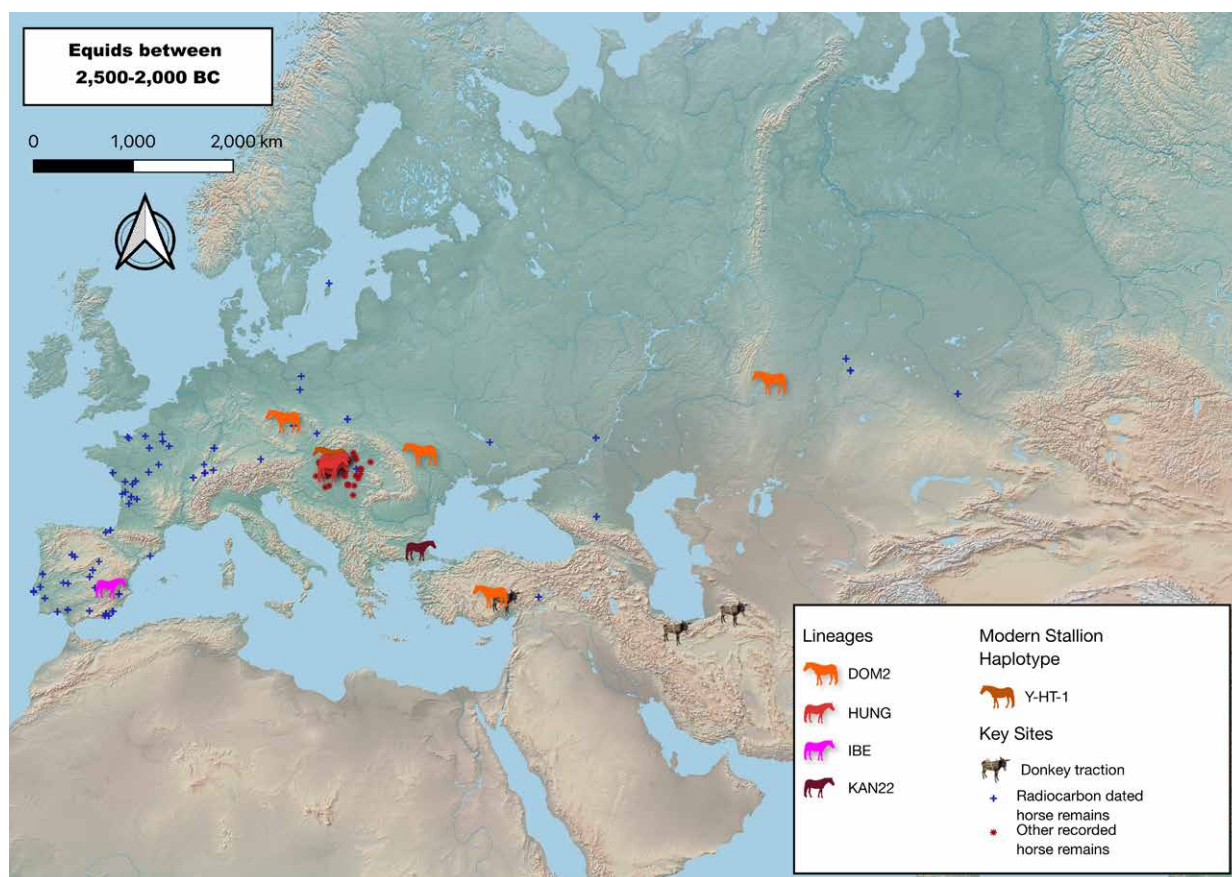


Figure 5. Equids in the second half of the 3rd millennium BC: 2,500–2,000 BC.

(c. 2,800–2,600 BC) (Figure 4) (Greenfield et al. 2018). One of the four co-buried donkeys at Tall aş-Şāfi/Gath likely originated in the Nile Valley, Egypt, indicating a flourishing trade in equids in the third millennium BC (Arnold et al. 2016), which is supported by text and images (Recht 2018).

Another equid featured prominently in the texts and images of the Near East, a hybrid, given in royal dowries and diplomatic gifts between states in the 3rd millennium BC (Dolce 2014:55). In an extremely wealthy elite burial complex at Umm el-Marra, Syria, 25 of these hybrid equids were sacrificed, now known to be *kungas*, the cross of Syrian wild ass (*Equus hemionus hemippus* or hemippe) stallions and domestic donkey jennies, with evidence for bit wear and foddering (Bennett et al. 2022). People captured wild asses and bred them with domesticated donkeys. Kungas were extremely expensive and purpose-bred at Nagar (Tell Brak, Syria), where the centrality of the kunga trade to regional economies and their ostentatious depictions on official art speak of their significance. Kungas are thought to be the equids depicted on royal seals, as the figure topping a rein ring in a royal grave at Ur, and, importantly, on the standard of Ur (c. 2,600 BC) pulling four-wheeled war wagons, one of the first depictions of a

military expedition (Bennett et al. 2022; Dolce 2014), as well as the earliest depiction of equids in battle (Figure 4). The importance of donkeys and kungas in war and royal life was only superseded by horses in the 2nd millennium. However, the experience of husbanding donkeys and kungas, their uses in war and transport, as well as the physical and political-economic infrastructures of their utilisation were all of critical importance for how horses and chariots were received. The earliest documented donkeys based on aDNA are from Acemhöyük, Türkiye (2564–2039 calBC) (Todd et al. 2022), also where the earliest DOM2 horse was identified (2205–2044 calBC) (Figure 5) (Librado et al. 2021).

Returning to Europe, in the 2nd half of the 1st millennium BC, Bell Beakers (c. 2,600–2,100) living around what is now Budapest had exceptionally high numbers of horses, from 45% to over 60% of the faunal assemblage, which suggests specialised husbandry (Figures 1f and 5) (Bökönyi 1978; Endrődi and Reményi 2016:101). Long suspected to be domesticated, these horses show a decrease in size and an increase in variability, often representative of domesticated populations (Bökönyi 1978; Kysely and Peške 2016), as is a diversity in coat colours (Ludwig et al. 2009; Wutke et al. 2016). Because it also comes with

a disorder called congenital stationary night blindness, the leopard spotting complex, first seen at Botai, may be a possible sign of domestication. This assumes that light coloured horses and horses with white patches on their coats would be more visible to predators, and selected against in wild populations. Leopard spotting was also found on four black and two bay horses recovered from Kırklareli-Kanlıgeçit, Turkey (2,700–2,200 BC) (Kan22, Figure 5) and a bay stallion from the Bell-Beaker site of Albertfalva in Hungary (2,450–1,950 calBC) (Wutke et al. 2016). Given their temporal and geographical proximity to other EBA sites where HUNG has been found (5 from Budapest-Királyok Útja 293 dating to 2,458–2,138 calBC, and 2 from Dunakeszi-Székesdűlő dating to 2,341–2,149 calBC), Bell Beaker horses are likely to largely be of the HUNG lineage. Their mortality profiles skew to younger horses, suggesting use for meat and carcass products, but the presence of neonates to animals over twenty, and the fact that the Bell Beakers are sedentary agropastoralists, local husbandry of these horses is quite possible, and is not excluded by Librado and colleagues (2024).

Humans analysed from the Bell Beaker sites have variable steppe ancestry (0–75%) indicating regular contacts (Olalde et al. 2017). Knowledge of horses and/or horse husbandry may have travelled trade networks *independently* from horses themselves too. Subsequently, this may have allowed DOM2 horses to move rapidly on existing routes, one reason replacement of extant lineages was so fast in the region. Indeed, two of the earliest examples of DOM2 horses were identified in Europe at Holubice, Czech Republic (2137–1936 calBC) and Gordinești II, Moldavia (2140–1985 calBC) (Librado et al. 2021), alongside the first example of the modern stallion haplotype (Y-HT-1), from a horse at Malé-Kosihy (MKO2) just north into Slovakia (Wutke et al. 2018). Since their direct ancestors could not be the local HUNG horses, they *had* to be imported into the region. However, there is little to no evidence for the arrival of foreign people, either through material culture or human aDNA, at the end of the 2nd millennium BC here. This suggests that the new DOM2 horses moved on existing routes, through existing interpersonal or trade relations, and that people knew horses already to some degree.

DOM2 horses expanded the most rapidly to places that already had familiarity with horses and other lineages (like HUNG), or into regions with other equids, as in the Near East, Levant, and Egypt. In the Carpathian Basin, the HUNG lineage was quickly replaced by DOM2 horses, with the transition occurring between half a century to a few hundred years, from HUNG (2,571–1,945 BC) to DOM2 (1,895–1,749 BC), possibly within a single human lifetime, or a few generations – a timeframe well within community memory. This inference is strengthened because this transition overlapped at several nearby sites, including

Budapest-Királyok Útja 293 and Százhalombatta-Földvár, where HUNG horses were replaced by DOM2 horses, which were found in the same archaeological contexts (Librado et al. 2024:SI).

Given the very high numbers of horses at EBA Bell Beaker sites, as well as finds of horse throughout the Carpathian Basin in the Copper Age, and evidence for riding, people, in all likelihood, were already familiar with horses, and were involved in their local husbandry. However, these horses never achieved the shortened generational times like Botai and DOM2 horses, meaning their breeding was not tightly controlled (Librado et al. 2024). The speed of the transition from HUNG horses to DOM2 is a scenario not seen in any other of the livestock species. Alongside a familiarity with local horses, DOM2 horses must have had a different enough appearance, and behaved and moved differently enough, so people could readily differentiate them from the other lineages, incorporating DOM2 horses into their herds, then preferentially breeding them. Images from the period speak to this – DOM1 horses, and horses illustrated from the earliest discovery of the direct ancestors to horses, the CPONT at Maikop Aygurisky had stiff, erect manes and a thick, sturdy conformation (see Hansen et al. 2021: Figure 5). Images that appear after 2,200 BC in Anatolia and the near East, clearly show horses with a relaxed, fallen mane, and more gracile conformation (see Niskanen 2023:58, Figure 3; 67, Figure 9).

Equids between 2,000–1,000 BC

By 2,000 BC, aside from an early, small refugia of IBE horses in Spain, DOM2 became the only remaining lineage in Eurasia (Figures 1g, 1h, and 6). In several Bronze Age populations in the first half of the 2nd millennium BC, skeletal indicators of riding were identified in both women and men (Hyrchała and Lorkiewicz-Muszyńska 2024; Kanne 2022a; Trautmann et al. 2023). In the Carpathian Basin, riders were found less than 5 km from Százhalombatta-Földvár, at Érd-Hosszúföldek (2020–1740 calBC, 1980–1740 calBC) (Kanne 2022a), dating precisely with the genetic turnover to DOM2 in the Carpathian Basin (2033–1945 calBC) (Librado et al. 2024). In southeast Poland, people recovered from several settlements of the Strzyżów culture (c. 2,000–1,600 BC) also displayed skeletal evidence of rider's syndrome (Hyrchała and Lorkiewicz-Muszyńska 2024). Additional Bronze Age riders were identified in Medgidia, Romania (1750–1540 calBC, and 1611–1446 calBC) (Trautmann et al. 2023).

In the Carpathian Basin, evidence for tandem movements by people and horses is attested by the strontium isotope analysis, consistent with regular movements to obtain and exchange horses, alongside isotopic signatures of herds that were reared locally (Kanne 2022a). Bit wear was identified on two of the DOM2 horses within the Carpathian Basin, a 12–18-year-old mare from Gáborján-Csapszékpart, raised

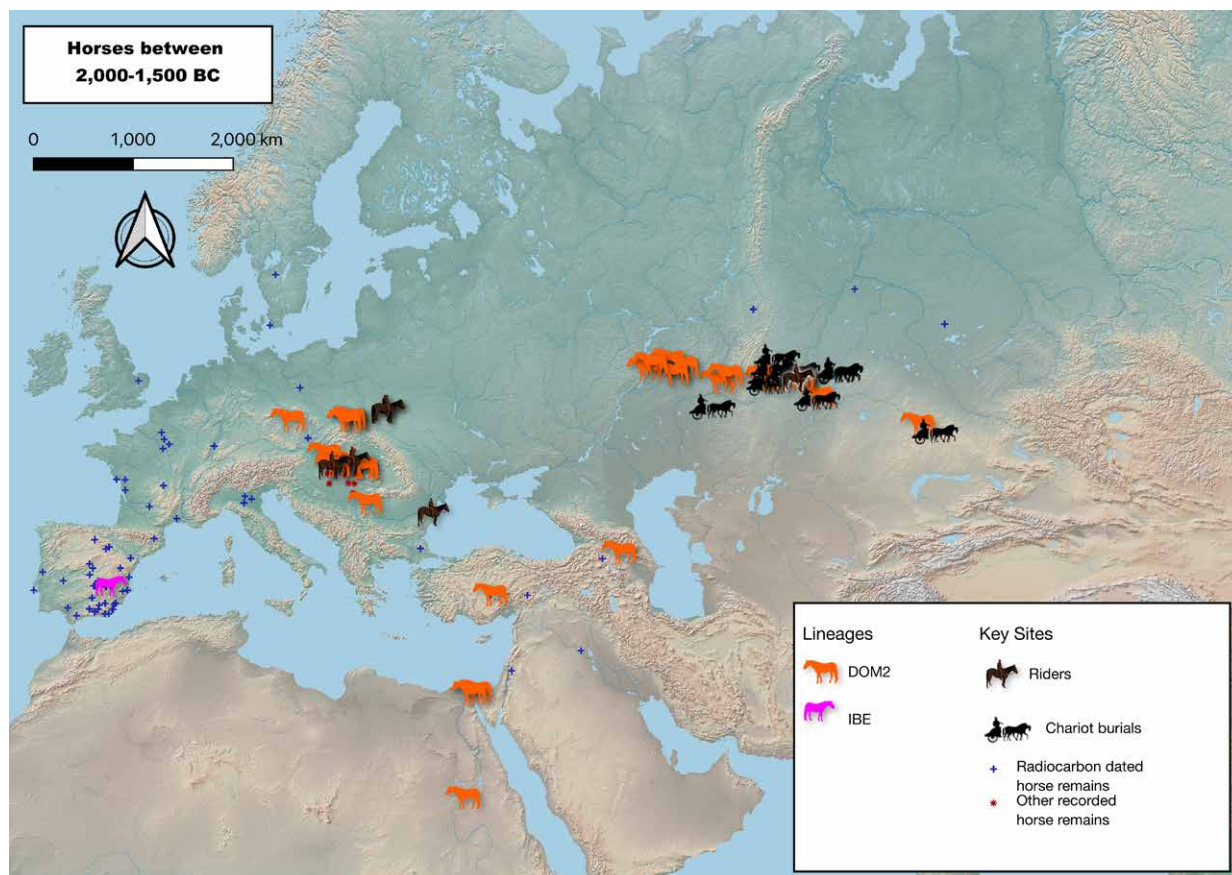


Figure 6. Equids in the first half of the 2nd millennium BC: 2000–1500 BC.

locally or in a nearby region, and two other horses from Budapest-Királyok Útja 293, not analysed genetically. One of the HUNG horses from the latter site probably originated in the Füzesabony micro-region or the Great Hungarian Plain dating to 2289–2146 calBC. This is supportive of regional horse husbandry and extra-regional horse trade, just predating or coincident with the arrival of DOM2 (Librado et al. 2024:SI). Aside from local horse husbandry, evident from a full breeding population of neonates to horses over twenty, three DOM2 horses from Százhalombatta-Földvár (a 6–7-year-old male horse, 7–8-year-old mare, and 15–16-year-old male horse) were imported from another region, probably the Füzesabony area. At Füzesabony-Öregdomb, a large tell site, there was a high concentration of horses, twenty rod-shaped cheekpieces, and two strap distributors. Another tell, Tiszafüred-Majoroshalom, produced fourteen rod-shaped cheekpieces, one contamination form, five strap distributors and probable riders in the associated cemetery at Tiszafüred-Ásotthalom (Kanne 2022a). Százhalombatta-Földvár has produced thirteen rod-shaped cheekpieces from house floors and general fill on the site, and two horses with bit wear (10–11y, 11–12y) that were not examined genetically.

Bridle bits have been at the centre of the study of early horse use. There are two ‘bridle circles’ or *Trensenkreise*, that were identified by Hüttel (1981) – one in the Carpathian Basin with rod-shaped cheekpieces, and one in the Don-Volga-Urals, largely represented by disc or shield-shaped cheek pieces with studs on their interface, that seemingly correspond to different traditions of riding or chariotry respectively (Figure 8). Ultimately, by the end of the Bronze Age, all cheekpieces were rod-shaped, for both riding and chariots. The region along the eastern ridge of the Carpathian Mountains was a probable contact zone, where some steppe studded disc bits (Popescu et al. 2024) and single, double, and multiple burials of horses with rod-shaped bits have recently been discovered (Makarowicz et al. 2022; Metzner-Nebelsick 2021; Przybyła 2020), implying a mix of local and steppe equestrian traditions. Even with several paired horse burials, the inventory of steppe chariot burials was not included. For example, there were not any people in them, wheel impressions, disc-shaped bits, or chariot weapons. The symbolism associated with chariotry may have played a role in mortuary practices, even if they were not much used in the area

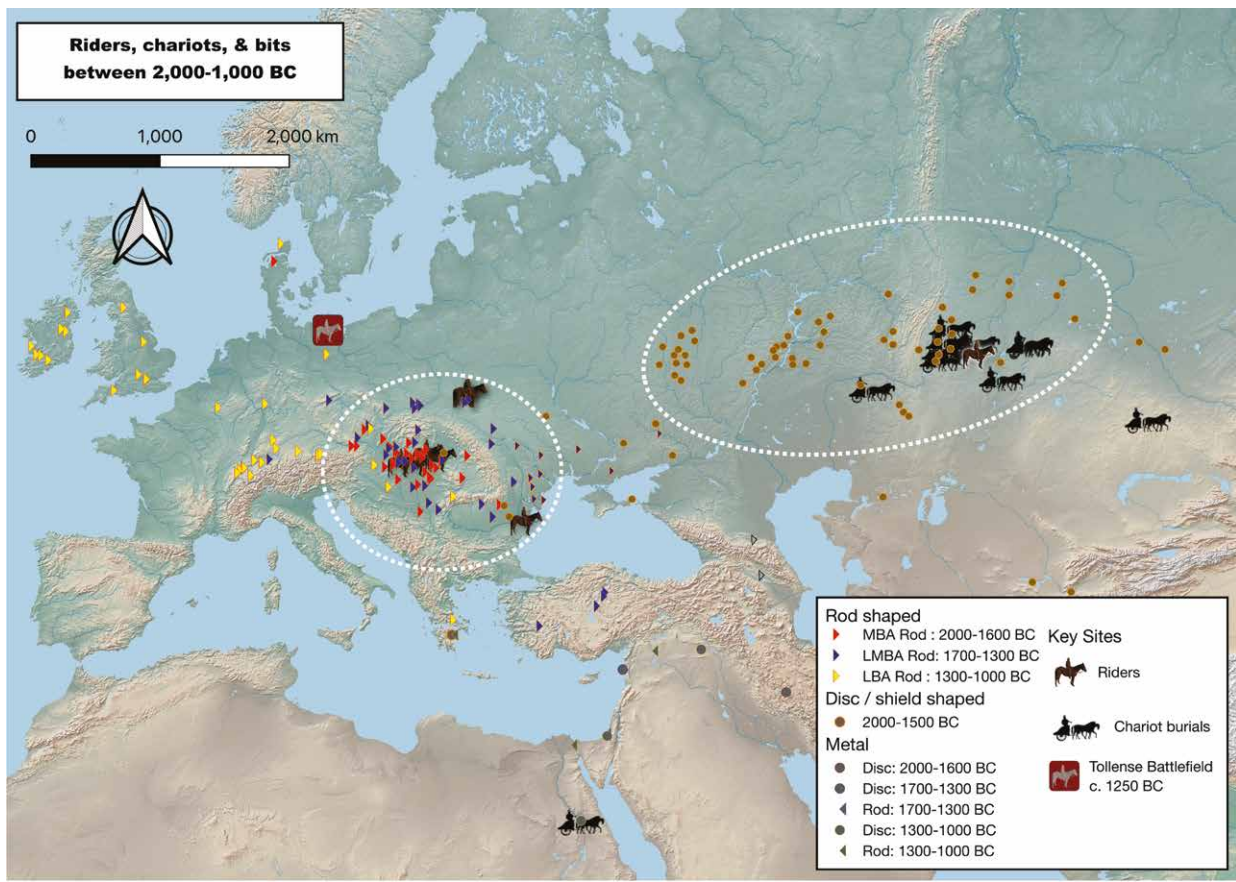


Figure 7. Bits and Bridle Circles, Riders, and Chariot Burials 2,000–1,000 BC.

(Maran 2020). Chariots were probably known in the Carpathian Basin, perhaps traded in on the peripheries with foreign DOM2 horses (Popescu et al. 2024), but their use in transport and warfare is not typical for the region for pragmatic reasons (Maran 2020). The rugged terrain, as well as the lack of evidence for regular warfare until the Late Bronze Age, and the traditional use of cattle for traction and horses for riding to herd and travel, meant that chariots were received in a different manner than in the Near East, Egypt, and southern Europe (Kanne 2022a).

The earliest spoke-wheeled chariots are considered to be a Sintashta-Petrovka development, which were stratified, metal producing societies on the western steppes, between 2050–1760 calBC, or more conservatively at 1970–1770 calBC (Lindner 2020). These communities had concurrent evidence for riding and chariotry (Chechushkov et al. 2018), and only DOM2 horses (Librado et al. 2024). Chariotry may have developed out of ‘tournaments of value’ (Appadurai 1994), where ostentatious vehicles drawn by DOM2 horses were used to differentiate status and identity in societies that were already steeped in equestrian traditions. Chariotry was most visible in, and suitable for highly stratified, state-

level societies, reaching its full potential in warfare only when integrated into polities that had appropriate physical, political, and military infrastructures developed from long-term use of equids and wheeled vehicles in warfare (Maran 2020). In contrast, the smaller, less hierarchical, MBA societies in the Carpathian Basin may have been aware of chariots, but did not incorporate them into their equestrian or mortuary traditions in the same way (Kanne 2022b). However, from the mid-2nd millennium BC, interesting chariot models are known from Dupljaja, Serbia in the southern Pannonian plain, and one vase has an image of a chariot from Vel’ké Raškovce, c. 14th century BC (Molloy et al. 2023).

An elite bias may be at work here (cf. Outram 2022 in Kanne 2022a). DOM2 horses arrived into the Carpathian Basin with no evidence of a concurrent human population turnover, nor any chariot weapons, parts, or bits for chariot horses. Riding is harder to detect than the ostentatious chariot burials, and these societies left behind no textual or artistic traditions that depict horses. MBA societies of the Carpathian Basin were relatively small-scale societies in population and complexity, compared to the contemporaneous kingdoms or states of

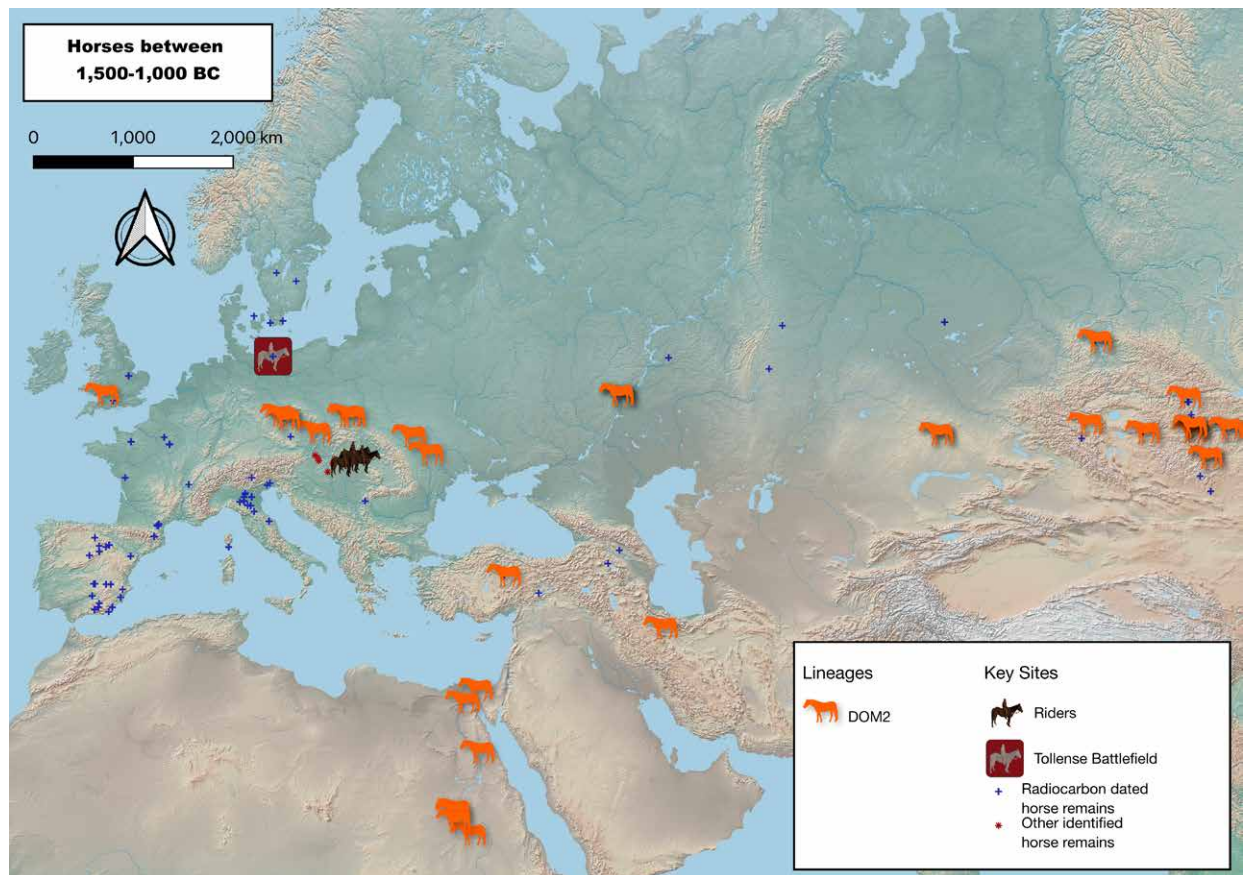


Figure 8. Horses in the second half of the 2nd millennium BC: 1500–1000 BC.

the 2nd millennium BC – Egypt, Mesopotamia, Mycenae, and later Assyria – all of which adopted chariotry. These regions already had equids used for transport (donkeys) and in war (donkeys and kungas), which were strongly associated with wealthy elites and royal rulers, while horses were considered unsuitable equids for kings to ride, with donkeys or mules given much greater prestige (Dolce 2014; Maran 2020).

All of this suggests that while DOM2 horses moved rapidly into regions that had existing lineages of horses or other equids, chariots and the DOM2 horses pulling them, moved on elite, state-level, luxury trade networks. Chariots were an ideal platform to display status, an effective transport vehicle for public parades, as well as to the battlefield, where they may have been used as mobile firing platforms for archers. While there is good evidence for horses ridden in the Bronze Age by messengers and scouts in the state level societies (Kelder 2012), horses were not initially associated with rulership. A long tradition of using equids and wheeled vehicles in war was already established in these kingdoms or states when chariots became incorporated. Donkeys and kungas pulling four-wheeled chariots were eventually replaced

with the fast DOM2 horses, pulling the newer, lightweight, spoke-wheeled chariots.

The transition to using horses in battle (Benkert and Bühler, this volume), was predicated on the major political-economic, cultural, and environmental changes towards the end of the 1st millennium BC, especially transformations in warfare (Figures 8 and 9) (Molloy and Horn 2020). Field systems and enclosures signalled a shift in property rights in Europe (Løvschal 2020), which needed defence. Declining agropastoral productivity, population increases and property disputes, as well as the rise of mounted archers on the steppes, necessitated the integration of horses into warfare everywhere (Kanne 2022a). This largely corresponds with ‘the fall’ of 1,200 BC, where major disruptions of Bronze Age societies occurred in the face of climate change (Molloy 2023). The first clear evidence of mounted warfare at Tollense, Germany (Jantzen et al. 2011), aligns chronologically with ‘the fall’, which occurred alongside increasing archaeological and historical evidence for more formalised cavalries in states and less centralised societies throughout Eurasia. By 1,000 BC, DOM2 horses had spread from Ireland to China, India to Scandinavia (Figures 1h, 8, and 9).

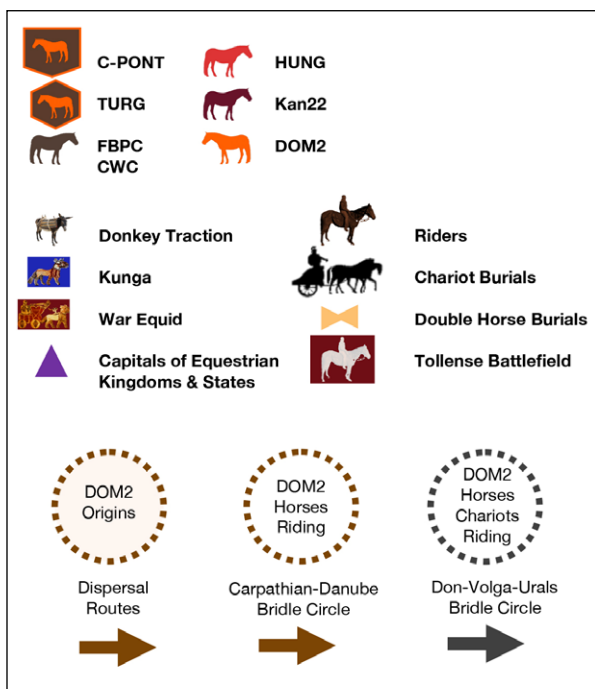
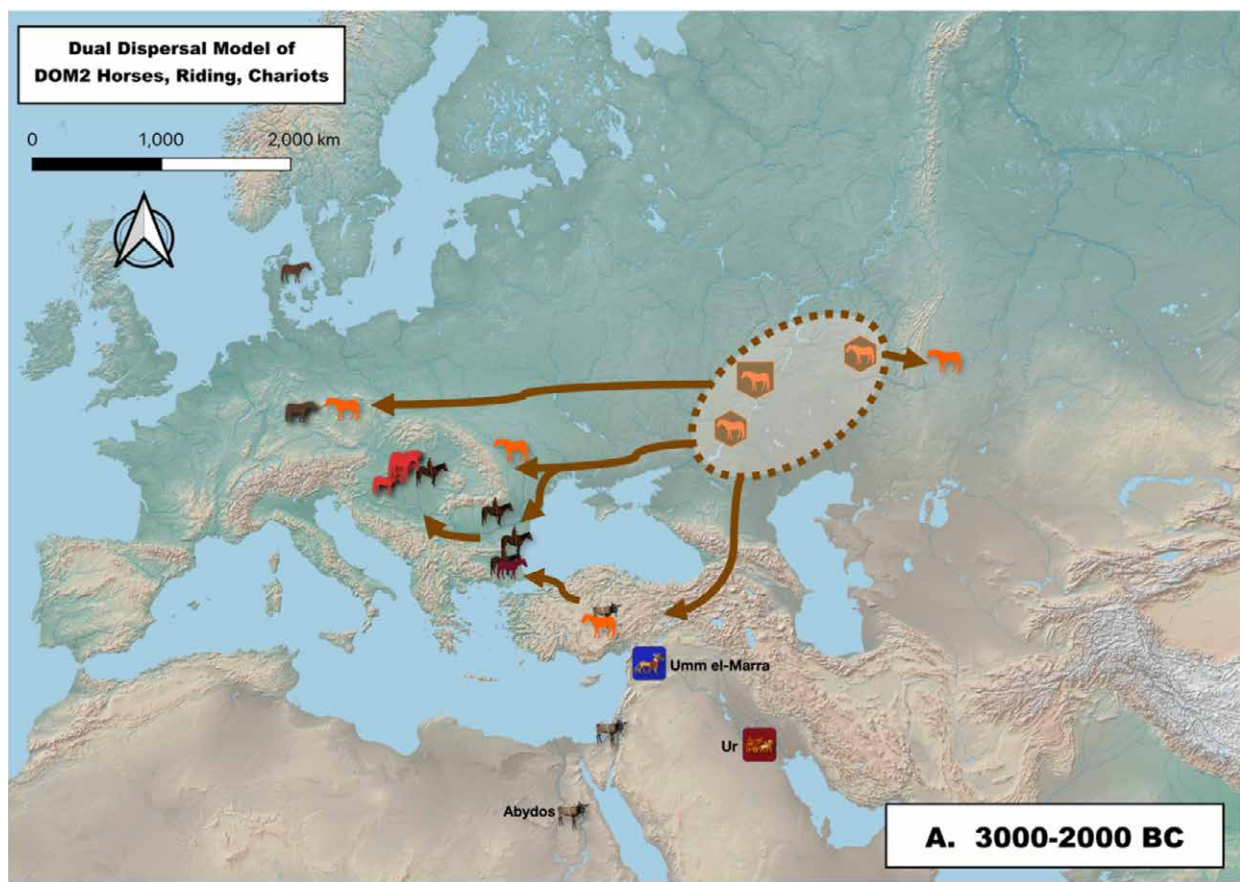


Figure 9. Dual-dispersal model for DOM2 Horses, Riding, and Charioty, 3,000–2,000 BC: A. 3,000–1,000 BC, B. 2,000–1,000 BC.

Conclusions

The study of horse domestication and early use has had a recent period of breakthroughs, with interpretations chivvied by new theory and advanced methods, leading to novel, increasingly fine narratives of human-horse, and human-equid, relations in the ancient and recent past. Horse domestication was a multi-centred, multi-phase process (Outram 2023), which has been documented genetically and archaeologically independently on at least two occasions – Botai (DOM1) in the fourth millennium BC (Gaunitz et al. 2018), and on the western steppes (DOM2) in the latter third millennium BC (Librado et al. 2021, 2024). Whilst the DOM1 horses fell out of use, and became feral, the DOM2 horses eventually replaced all other lineages of existing horses after 2,200 BC. The Yamnaya or their ancestors may have been instrumental in early horse domestication processes on the western steppe, riding and milking horses, and sacrificing them, as well as selecting for 95% of the genetic traits important in DOM2 horses (Anthony 2023). However, they were apparently not directly responsible for the spread of DOM2 horses (Librado et al. 2021, 2024).

Within a few centuries, DOM2 horses became dominant in places where there were previously existing lineages of

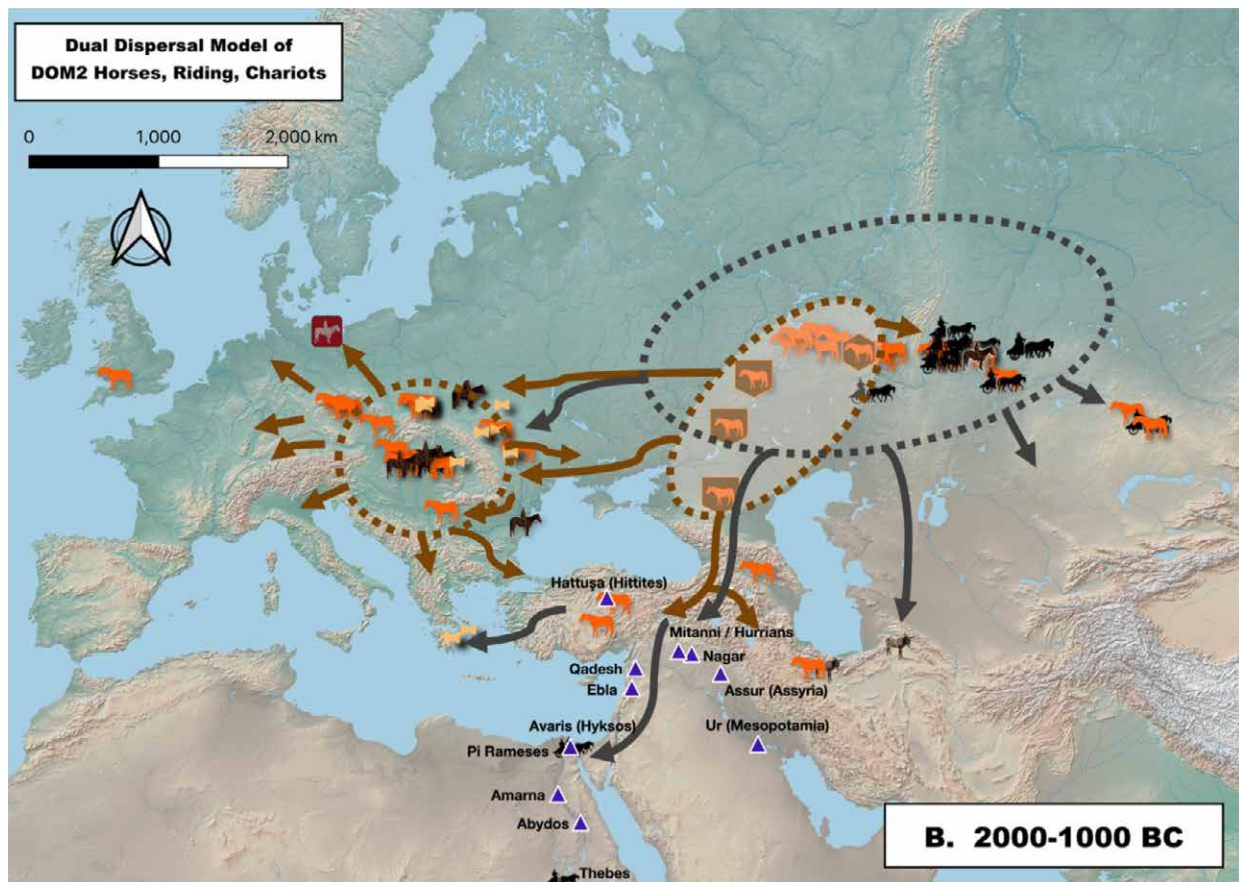


Figure 9 continued.

horses, as well as in places that already had domesticated equids. Donkey domestication, as well as the kunga hybrids, and their uses in transport, travel, and war, plus their crucial importance in trade relations between early kingdoms and states, impacted the way that horses and chariots were integrated into societies that previously had equids. DOM2 horses and riding swiftly spread along existing trade networks in non-state societies to places familiar with horses, with other lineages of horses present, as in the Carpathian Basin. DOM2 horses moved with chariots to places that had other equids used with wheeled vehicles and in warfare, as well as part of luxury trade networks. Though not elaborated here, the eastward expansion of DOM2 with Sintashta peoples and chariots, took a different, longer track, reaching places unfamiliar with any recent equids, through Mongolia and into China. Horses made no less of an impression and were quickly co-opted locally.

Critical to the success of DOM2 horses was the selection for two major genetic loci, including increased sociality and docility towards humans, which extended to their ability to be herded outside of their home ranges, as well as a stronger back anatomy for equestrian use. The DOM2 horses must

have had a distinct enough appearance, suggested here to include a lank mane and more gracile conformation, as well as a temperament that allowed them to be amenable to riding and driving singly and in groups, in order for this genetic turnover to be so fast and utterly complete. With the successful genetic mix, DOM2 horses had expanded throughout all of Eurasia, and eventually, the world.

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The Horse in Ancient Egypt

Lonneke Delpout and Heidi Köpp-Junk

Introduction

There is no other animal which had such an influence on people's mobility and warfare as the horse. This was also true in ancient Egypt. Despite being late to the party, it did not take the Egyptians long to make this exciting new animal their own. Soon after its introduction, it finds its way into the Egyptian military and becomes a staple part of Egyptian warfare. The many two-dimensional depictions show the different kinds of use of the horse: from private transportation to warfare and royal processions. This chapter will give an introduction of the sources we have in ancient Egypt considering human-horse relations, discuss the different uses of the horse, and explore how two-dimensional depictions of horses were used to signal power, wealth and status among the ruling class. We examine pictorial, osteological, material and textual evidence in order to provide a summary of the state of knowledge regarding horses in ancient Egypt.

The horse found its way into Egypt in the so-called Second Intermediate Period (1759 to c. 1539 BC). During this time, the country was governed by several rulers simultaneously, instead of one pharaoh who would normally rule upper and lower Egypt together. It has long been speculated that the Hyksos, one of the dynasties ruling a part of Egypt, possessed horses, while the Egyptians did not, and that this advantage caused a military advancement for the Hyksos people big enough to take over power in Egypt. This theory has been refuted in the meantime (Stantis et al. 2020). The exact timing of the introduction of the horse to Egypt is difficult to determine as there is not a lot of information available about this time period. Plenty of theories have been discussed in Egyptology, of which Bibby's (2001) article is the most comprehensive. As for all-encompassing monographs about the horse in ancient Egypt, the most extensive works are those by Turner (2022) and Hoffman (1989). The Amarna-letters, cuneiform tablets which document the communication among rulers in the region, show that horses were a highly valued commodity traded between rulers (Moran 2000; see below). It is certain that by the seventh century BC horses were a valuable economic asset of the Kushites, exported as far as Assyria (Näser and Mazzetti 2020:127).

Pictorial evidence

The most common sources for horse iconography in ancient Egypt are two-dimensional depictions appearing on tomb and temple walls. Images of horses usually convey a culturally defined category, meaning they convey the idea of a 'horse' rather than a pictorial reality. This is why the images should always be interpreted cautiously (Delpout and Willekes 2023; Delpout and Hettema 2021). The first two-dimensional evidence for the presence of horses in ancient Egypt is a relief which once was part of the pyramid-temple of pharaoh Ahmose (c. 1560 BC) in Abydos (Harvey 199:4). Ahmose was the first pharaoh of the Eighteenth dynasty (c. 1550 BC) and is partly responsible for reuniting Egypt into one country. This indicates that by the time the Egyptians beat the 'foreign rulers' (the Hyksos) they also had acquired the horse and even used it in a military context.



Figure 1. Stallion scratching his leg. © Metropolitan Museum of Art, inv. no. 1985.328.18.



Figure 2. Two pairs of horses in front of chariots. Groom is leaning over the horse(s). Photo: N. Dell'Aquila.

This is confirmed by other reliefs found in the same area (Spalinger 2005:20–22). Since the appearance of the horse in ancient Egypt revolutionised warfare, the image of the horse quickly made its way into battle scenes. Reliefs as early as the pyramid temple of Ahmose (c. 1550–1525 BC) show the role of the horse in battle and this trend continues throughout the New Kingdom temple reliefs. Horses appear

in front of chariots (cf. Kuentz 1928: Plate XXX), being ridden, as well as unharnessed in military camps. The purpose of these depictions is two-fold: on one hand it reflects the changing nature of the battlefield to accommodate this new technology, and on the other it meant to overawe the people and tell the story of how glorious the pharaoh was through his victories over his many enemies (Delpout and



Figure 3. Whip handle from the reign of Amenhotep III. © Metropolitan Museum of Art, inv. no. 26.7.1293.

Willekes 2023:6). Horses also appear on talatat-blocks from Amarna, such as a pair of stallions harnessed in front of a chariot, with one of them scratching his leg (Figure 1).

Private tombs

The image of the horse makes its way into private tombs at the beginning of the Eighteenth dynasty, shortly after its introduction, but only becomes a common feature during the reign of Thutmose III (c. 1479–1425 BC). The booty list of the battle of Megiddo suggests a large influx of horses during this time period, which might be related to the animal appearing more frequently in civil contexts. Horses appear in private tombs in different contexts, such as scenes showing the tomb owner hunting from a chariot, tomb owners as well as royals using the horse and chariot as a mode of transportation, the horse being brought in as tribute from abroad as a gift to the king, and horses as part of procession scenes on their way to the tomb of their owner. Very rarely do horses also appear in military scenes, such as in the tomb of Horemheb (Figure 2), and even more rarely do we see a horse in domestic context, eating or drinking from a trough in their stable (de Garis-Davies 1903: Plate XXXII). There are four private tomb depictions in which a different equid is shown in front of a chariot. The type of equid indicated in these depictions is discussed by Hansen (1997:219–226). Dent (1972:35–37) is the first one to identify them as onagers. In ancient Egypt, chariots were never pulled by donkeys, but (almost) always by horses. A single occurrence in Theban Tomb 40, tomb of Huy, shows two oxen as draught animals of a chariot (Köpp-Junk 2015a: Figure 86). This chariot appears in a tribute scene, transporting a Nubian princess as part of the procession of gifts for the Egyptian pharaoh.

Objects

Horses also appear on smaller objects with a mainly decorative function, such as tablets (Metropolitan Museum of Art, inv. no. 17.194.2297; Hayes 1959: 169–169, Figure 93), bows (e.g., Cairo Museum, Carter No.: 596q), bridle pieces (e.g., Cairo Museum, Carter No.: 122cc, 122ff, 122dd, 122hh, 122ww) and dog collars (Cairo Museum, inv. no. 24076). The openwork blade of an axe, which is now in the British Museum London, shows a rider on horseback wearing a collar or necklace and a wig, while clothing is not recognisable (inv.-no. 36766; Köpp-Junk 2015a: Plate 11b; Köpp-Junk 2022: Figure 9). The dating of this object is controversial and ranges from the reign of Ahmose, the first pharaoh of the Eighteenth dynasty (1550 BC), to the end of the Eighteenth dynasty (c. 1290 BC; Turner 2021:153–154). Another unusual piece is a wig curler with the handle rendered as a horse and rider, who again is naked except for a wig (British Museum London, inv.-no. 36314; Schulmann 1957: Plate 3). Finally, a large group of figurative ostraca (potsherds and limestone fragments) were found in Deir el Medina, several of which show depictions of horses (e.g., Vandier-D'Abbadie 1936: cat. 3120–24, 2157–95). Since ostraca do not comply with the standard Egyptian canon and decorum, these depictions give a wonderful glimpse into artistic craftsmanship, such as a stallion scratching his hind leg (Vandier-D'Abbadie 1936: Plate XIX; Delpeut and Willekes 2023: Figure 21).

Not only two-dimensional equestrian representations survive. One of the most spectacular three-dimensional depictions of a horse from ancient Egypt is a whip handle, belonging to Amenhotep III (c. 1387–1351 BC), in the shape of a horse (Figure 3). Another example are



Figure 4. Faience rider statuette from the Third Intermediate Period or the Late Period, © Musées de Langres, inv.-no. ST 290-78; with kind permission.

two statuettes, one made of wood and one of terracotta, showing an unarmed horseman (Schulmann 1957: Plates 2, 6). In contrast to, for example, Roman culture, there are no large statues of horses dating from ancient Egypt. There are however toys in the form of horses being ridden, for example the wooden rider on disc wheels in the Ägyptisches Museum und Papyrussammlung Berlin (ÄM 12654; Brunner-Traut 1956:30, Figure 6), and others in the Roemer- und Pelizaeus Museum in Hildesheim (inv.-no. 4730; Köpp-Junk 2015a:157, Plate 11b). A rider statuette made of faience is now in the Musées de Langres in France (Figure 4) (Köpp-Junk 2015a: Plate 11e; Köpp-Junk 2023: Plate 9): a rider sits astride the horse, holding onto the animal's mane. In relation to the size of the horse, the rider seems small, the height of his head does not reach that of the horse. Moreover, his head also appears to be disproportionately large, which is possibly due to a very large wig. A similar example is currently in the British Museum, London (EA34901; Köpp-Junk 2023:120–121). It is dated to the Third Intermediate Period (1075–664 BC) or the Late Period (664–332 BC). A similar dating can be assumed for the aforementioned statuette from Langres as well.

Textual evidence

The first textual evidence for horses in Ancient Egypt is a little older than the pictorial evidence, and comes from a royal stela from the time of Kamose (c. 1555–1550 BC), who was Ahmose's father. Kamose played a key role in beating the Hyksos, and the Kamose-stela mentions the word “*ḥtr*”, which means “chariot-team” or “chariot” and strongly suggests the use of horses (Kelly Simpson 2003:346;

Habachi 1972:36). Many other horse-related words can be found, including “*ssm.t*” for ‘horse’, “*msy.t n.t ssm.t*” for ‘foal’, and “*ibr*” for ‘stallion’ (Vernus 2009:1–46), although these translations have been up for debate lately (Delpet and Matić 2025). The Egyptian word for horse is very likely imported into Egypt with the animal itself. There are three different words for the Egyptian light-weight, two-wheeled vehicle, namely “*wrry.t*”, translated as ‘chariot, wagon’; “*mrkb.t*”, translated as ‘chariot’; and “*tpri*”, translated as ‘cart, wagon’ (Herslund 2018:169–177). ‘*wrry.t*’ is mostly encountered in monumental inscriptions written in hieroglyphs but is also known from some instances in hieratic (Herslund 2018:171). ‘*mrkb.t*’ is a semitic word; it becomes the more common word for chariot in the Ramesside period (1189–1077 BC) and is mostly used in hieratic (Herslund 2018, 173). Lastly, ‘*tpri*’ is much rarer than the other two, only appearing twice in the extant sources (Herslund 2018:173). The first substantial evidence where the horse and chariot enter the hieroglyphic writing system is found in the tomb of Ahmose, son of Ebana, in el Kab (16th century BC–1501 BC). Here the very first hieroglyph of a chariot is visible as well as the hieroglyph of a horse (Delpet 2021c:20); both of which are clearly made by a scribe who was not yet trained on these particular two hieroglyphs.

The text in the tomb of Ahmose, son of Ebana, tells the account of the Syrian campaign of King Thutmose I. It describes how he brought a chariot and a horse to king Thutmose I (1506–1493 BC) and was rewarded with gold (Lichtheim 2006:14). In the list of the spoils of war of Thutmose III (1479–1425 BC) in Megiddo, the text mentions the capture of “2041 horses, 191 foals, 6 stallions, X colts and 892 chariots” (Lichtheim 2006:33), a number that undoubtedly had an influence on the horse becoming a more frequent sight in Egypt. Considering what an important role the horse played in warfare, it comes as no surprise that they most often occur in texts with a military character. Ramses II (1279–1213 BC) even mentions the names of his horses in the Egyptian account of the Battle of Qadesh: “I crushed a million countries by myself on Victory-in-Thebes, Mut-is-content, my great horses; it is they whom I found supporting me, when I alone fought many lands. They shall henceforth be fed in my presence, whenever I reside in my palace” (Lichtheim 2006:70). This account clearly glorifies the pharaoh, who is supposedly fighting all by himself, but it also shows how the king uses this text to signal the great relationship he has with his horses, and how important they are to him. The Chester Beatty Medical Papyrus I (British Museum, inv. no. EA10686) contains three love poems, one of which goes:

Oh that you came to <your sister swiftly>! Like a horse of the king; Picked from a thousand steeds of all kinds, the choicest of the stables. It is singled out in its feed,

its master knows its paces; When it hears the sound of the whip, there's no holding it back. There's no chief of charioteers who could overtake it. Sister's heart is aware: He is not far from her!' (Lichtheim 2006:186–7).

The so-called Amarna-letters also show that the horse was traded between the Egyptian king and his neighbours. The Amarna-letters are correspondence between the Egyptian king and the neighbouring rulers in the form of clay tablets, written in Akkadian, the lingua franca at the time. They all start with a similar greeting, wishing well for the king, his spouse, children, and his horses, suggesting they were highly valued, and generally show the gifting or exchange of horses. Some mention horses being sent to the Egyptian king (EA7: Moran 2000:13), or exchanged for 5 wooden chariots (EA 9: Moran 200:18). Amarna letter #15 shows an Assyrian king sending the Egyptian pharaoh 'a beautiful chariot and 2 horses' (Moran 2000:38) and #16 talks about two white horses being sent to the pharaoh. Letter #17 sends the pharaoh two horses as spoils from Hatti and five teams of horses from the king of Mitanni himself (Moran 2000:42). In Amarna letter #19, king Tušratta sends the Egyptian king ten teams of horses (Moran 2000:45) as well as in letter #22, sending the king four horses (Moran 2000: 51). The request to send horses abroad can be seen in letter #34, where the king of Alashiya asks the king of Egypt for two horses (Moran 2000:106). The same king of Alashiya has sent the Egyptian king five teams of horses in EA37 (Moran 2000:110). These letters illustrate the practice of gift giving between kings in the Near East, something that we also see depicted in the aforementioned elite private tombs. The horses are always traded in pairs or even numbers since most chariots in this region were pulled by two horses.

Osteological evidence

Horse burials are rare in Egypt and can be counted on two hands (Figure 5) (Naser and Mazetti 2020: Figure 1). The earliest archaeological evidence for the horse in Egypt consists of bones and teeth unearthed at Tell el-Daba, Buhen, and Tell el-Maskhuta, dating to Dynasty 13 (1794–1648 BC). The earliest complete horse skeleton dates to the Second Intermediate Period (1794–1550 BC) and was found in a burial in the Hyksos capital Avaris in Northern Egypt (Bietak 2010:973–990). The careful positioning of the horse and its burial location suggest some care went into the burial. The most famous horse found in ancient Egypt is probably the so-called 'Buhen horse', found in 1958 and comprehensively published by Clutton-Brock and Raulwing in their article "The Buhen Horse: Fifty Years after Its Discovery (1958–2008)" (Clutton-Brock and Raulwing 2009:1–106). It probably dates from the early New Kingdom (c. 1550 BC) and appears to have been an occasional burial. Another horse burial from the first half of

Sites	Specimens	Suggested dates
Tell Heboua	1 (partial skeleton)	~1786-1552 BCE
Tell el-Dab'a	5 (complete and almost complete skeletons)	~1750-1512 BCE
Buhen	1 (almost complete skeleton)	~1675-1570 BCE
Sai	1 (almost complete skeleton)	~after 1500 BCE
Thebes	1 (complete skeleton)	~1494-1468 BCE
Soleb	1 (partial skeleton)	~1410-1372 BCE
Tell el-Borg	1 (partial skeleton)	~after 1300 BCE
Saqqara	1 (complete and partial skeletons)	~1300-1200 BCE
Hillat el-Arab	1 (partial skeleton)	~1250-750 BCE
Tombos	1 (complete skeleton)	~1005-893 BCE
el-Kurru	2 (partial skeletons) + 2 reported in this article	~705-690 BCE

Figure 5. List of published horse specimens from Egypt and Nubia. © Näser and Mazetti 2020, table 1. Reproduced with kind permission from the authors.

the Eighteenth Dynasty was found in the Theban Necropolis (Lansing and Hayes 1937:4–39) in the forecourt of Theban Tomb 71, which belongs to Senenmut, an official who lived during the time of Hatshepsut (1507–1458 BC). None of these horses were mummified or treated at all with an eye on preservation, they were simply deposited into the ground (Avaris, Buhen) or put into a wooden coffin (in the case of Senenmut's horse). All these complete horses date from the time just after the introduction of the horse in ancient Egypt.

Some further equid remains are found in Sudan in Ballana, Qustul, Tombos and el-Kurru, among others. In 2011, a team of archaeologists found a well-preserved horse skeleton in Tombos, Sudan, dating from 949±55 BC (Schrader et al. 2018). It was found in the shaft of a pyramid tomb that was originally constructed during the New Kingdom (Schrader et al. 2018:338). It is in excellent condition and the most complete horse skeleton found in the pre-Graeco-Roman Nile Valley. The horse was probably female, 12–15 years of age, and its bones show that the horse engaged in regular and somewhat strenuous physical activity (Schrader et al. 2018:391), most likely the result of chariotry based on the nature and location of the skeletal pathologies (Kanne, personal communication). In 1919, George Reisner discovered an area of 24 horse burials in El-Kurru, Sudan, where the horses were interred in a standing position (Dunham 1950). Two of these eight chariot horses belonging to King Shebitku were studied and published by Bökönyi (1993). Their heads were smashed to pieces, supposedly by grave robbers, since the funerary objects were concentrated at their heads and necks (Bökönyi 1993, 303). The bones show signs of healed fracture

and of old age; the limb bones were long and showed strong muscle insertions (Bökönyi 1993:303). Both horses were most probably stallions with withers of about 152–155 cm (14.3–15 hh) high and represented a unique, outstanding quality at that time, horses which could only be the result of conscious breeding (Bökönyi 1993:305–309). Kush seems to have been the original breeding ground for the ‘Kusaya’ horses which were imported from Egypt through trade or as spoils as mentioned in the Nineveh Horse Reports (Näser and Mazzetti 2020:129).

One of the largest remaining unsolved mysteries concerning equine history in ancient Egypt is: where are all the horses? The lack of equid remains shows a strong discrepancy with the textual and pictorial records, which show horses used in all different kinds of contexts. According to Kanne et al. (2025), there are two primary reasons to explain archaeological horse numbers. First, less horses are needed than other domesticates because they rarely provide primary subsistence but are used in smaller numbers for other purposes. Secondly, as horses are not usually eaten, their bones are not often present in middens. Additional reasons include their life, the cultural, practical, and taphonomic factors that affect how people deal with horse remains, the different ways horses are used, and the breeding or production goals of their human communities (Kanne et al. 2025). Most excavations in Egypt have taken place in areas where capital cities and necropolises were located, which might not be typical areas to find these animals in, considering their use and size. Horses, like donkeys, were usually not eaten by the Egyptians (Prévost and Lesur 2021:219) which might very well explain why they are not found in these types of contexts. Knowing how fond the Egyptians were of preserving their human and animal remains for eternity, however, it might come as a surprise how few horse remains are found in ancient Egyptian tombs. Ikram (2005:1) has identified four different types of animal mummies: beloved pets, buried with their owners; victual mummies, consisting of funerary food offerings for humans; sacred animals, worshipped during their lifetime and mummified with pomp upon their death; and votive mummies, dedicated as offerings at the shrines of specific gods to whom these animals were sacred. Since horses were never deified or eaten, they only fall into the category ‘pet’. If pets died before their owner, they were buried with the tomb owner; if they died at a later time, they might have been buried in the tomb’s forecourt (Ikram 2005:2), as was likely the case with Senenmut’s horse. Considering their size, it is understandable that horse owners would not mummify the animal before their own passing and keep them until they are ready to be interred into their own tomb. Mummifying an animal of this size would have been a physically and financially demanding business, which might explain why we do not

find many horses in private tombs at all. Lastly, one may wonder to what extent horses were seen as pets, and to what extent they were seen as a military tool.

Material evidence

The dry Egyptian climate has allowed for some pieces of horse-related equipment to survive, such as chariots, quivers, wrist guards and parts of bridles, including bits, blinkers, etc. The earliest chariot is that of Thutmose IV (c. 1400 BC), found in his royal tomb and of which the body survives (for a 3D-model, see: <https://skfb.ly/oqGL8>). It currently resides in the National Museum of Egyptian Civilisation. A chariot owned by an Egyptian soldier dating to the 18th dynasty found in a Theban tomb by Ippolito Rossellini, shows a wonderfully preserved (and restored) four-spoked chariot (Guidotti 2002). It is currently in the Museo Egizio di Firenze. The royal tomb of king Tutankhamun has proven to be a treasure for horse-related equipment: six wooden chariots (Littauer and Crouwel 1985), as well as numerous golden pieces from their bridles (Bertsch et al. 2017), were found in the royal tomb of king Tutankhamun. Sadly, the leather parts have withered completely. Two of the six chariots show traces of wear and were clearly used, three others are lavishly decorated with gold and inlay, suggesting they were restricted for parades and ceremonial use (Crouwel 2013:85). The Egyptian chariot, including its harness, has been extensively researched by Veldmeijer and Ikram (2013, 2018). In 2018, they published the results of the study of the so-called Tano-chariot, the body examined by Veldmeijer and Ikram (2018:22–69), the leather remains studied by Skinner (2018:72–95) and Veldmeijer and Ikram (2018:97–108), the chariot’s iconography deciphered by Sabbahy (2018:120–149), and their linguistic aspects detailed by Herslund (2018:150–199).

The ancient Egyptian bridle (Table 1 and Figure 6) always consisted of a crown piece (A, F or K), a browband (B), a bridle boss (C), a throat latch (E), one or two cheek pieces (G), a nose band (H), reins (J) and in most cases a bit (I). The rosette (C) and blinker (D) could be made from gold, wood, ivory or rawhide (Veldmeijer and Ikram 2018:56), and in some cases the bit was accompanied by a cheek ring (L). A potential cheek strap was found among the remains of the so-called Tano-chariot, as well as a blinker from the tomb of Amenhotep II (Cairo Museum, inv. no. JE 32506), a rosette from the same tomb (Cairo Museum, inv. no. JE 32525) and one from the tomb of Thutmose IV (Cairo Museum, inv. no. JE 97801) (Veldmeijer and Ikram 2018:59, Figure II.25). Some leather chariot equipment remains have been found in private and royal tombs, of which the aforementioned Tano-chariot is the best preserved. Veldmeijer, Ikram and their colleagues were able to identify the chariot body, its accessories such as bow-cases and quivers, pouches and holders, the neckstrap, girth, yoke saddle pad and headstall

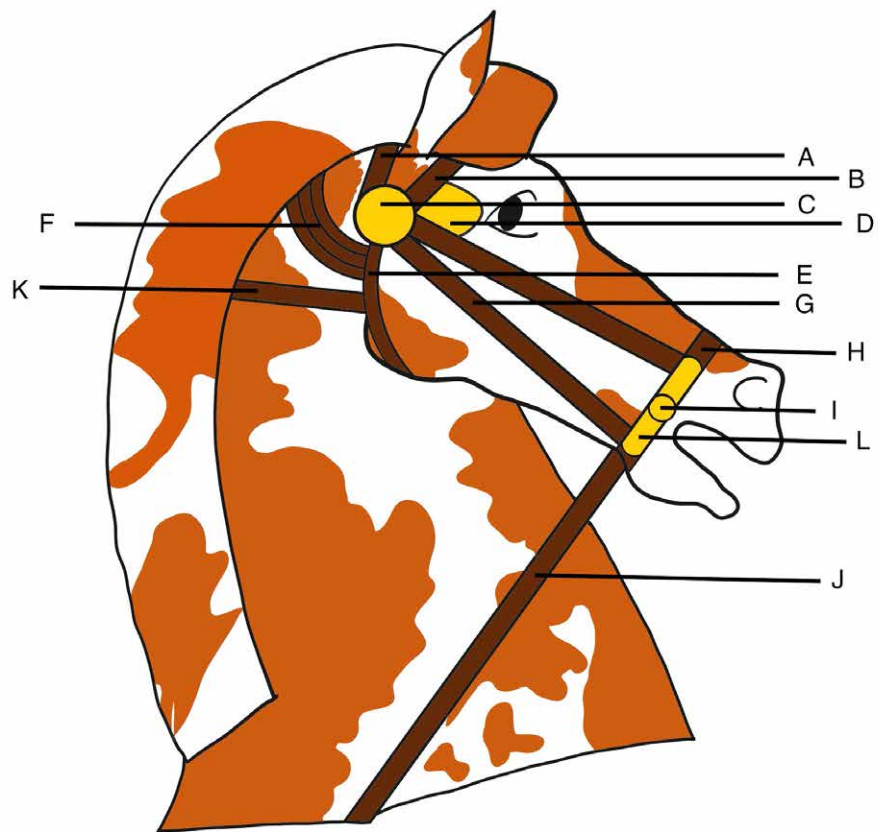


Figure 6. Parts of an Egyptian bridle. Reconstruction based on images by L.P.P. Delpeut.

Letter	Piece	Letter	Piece
A	Crown piece	G	Cheek piece
B	Brow band	H	Nose band
C	Rosette	I	Bit
D	Blinker	J	Reins
E	Throat latch	K	Extra crown piece pt. II
F	Extra crown piece	L	Cheek ring

Table 1. Parts of an Egyptian bridle.

including a blinker and a bridle boss from the harness, as well as the charioteer's accessories (Veldmeijer and Ikram 2018:22–69).

The aforementioned horse found in the forecourt of the tomb of Senenmut in Thebes was buried wrapped in a linen shroud (Lansing and Hayes 1937: Figure 17). A rectangular piece of linen and leather placed at the horse's withers with a projection towards the rear reaching halfway down to its back might be the very first saddle blanket known from Egypt (Figure 7). It shows straps on two sides, two in the front to tie around the horse's neck, and one more on each side to use as a girth. The underside of the blanket is reinforced with a coloured ribbon, intricately woven in a coloured pattern (Lansing and Hayes 1937:10). This

strongly supports that riding occurred in ancient Egypt. The horse found in Tombos dating from the 25th dynasty (728–657 BC) was found with the decayed remains of an iron cheekpiece, one of the earliest pieces of iron found in Nubia (Schrader et al.2018:390, Figure 6).

The use of the horse in ancient Egypt

Since the primary use of the horse was as mode of transportation, it played an important role in personal (Köpp-Junk 2015, 2021, 2019) and royal transport (Köpp-Junk 2020), as well as in warfare (Spalinger 2005; Schulman 1964). The horse and the chariot are inextricably linked in ancient Egypt (Littauer and Crouwel 2002, 1985, Veldmeijer and Ikram 2018, 2013). Interestingly, horses



Figure 7. Saddle blanket found in the forecourt of Theban tomb 71, tomb of Senenmut. Cairo Museum. Photo by L. Delpeut.

are rarely depicted in front of transport wagons and never in front of carts or sleds, which are always pulled by oxen. Occasionally, they were used for horseback riding (Schulman 1957; Köpp-Junk 2022). Since horses are much more flexible without a chariot, horses as mounts were mainly used by military scouts, and only depicted rarely (Martin 1989:43, Plate 32; Schulman 1957:264–265, Figure 1; Heinz 2001:289, Plate IV.4.). By the end of the Eighteenth dynasty, the horse was an integral part of the military and many horse-related military and professional titles can be found (Gnirs 1996:17–18). Numerous reliefs show the importance of the horse in military contexts (cf. Heinz 2001). Depictions from private tombs belonging to the ancient Egyptian elite show the horse also being used in hunting, suggesting the horse and chariot employed in this manner were used in a leisurely activity. In this case, the horse also functions as a status symbol since not everyone had access to a horse, and it signals that the few tomb owners with such hunting scenes were wealthier than people who were depicted hunting only on foot (Delpeut 2022).

Private use

The use of horses as a mode of transportation is most commonly seen in combination with a chariot. Chariots were the prestigious means of transportation for the pharaoh, the royal family and the higher social class, while riders were primarily scouts, messengers and soldiers, respectively. The main sources for these observations are private tombs from the 18th dynasty (1550–1292 BC) in Saqqara, Akhmim, Amarna, Thebes and el Kab. Tombs from Saqqara, el Kab and Thebes show horses used as transportation in private context, such as moving the tomb owner from A to B. Sometimes the chariot is mounted, such as in Figure 8, and sometimes it is unmounted. In any case, the tomb owner is signalling he had the means to afford two horses and a chariot and use them as his main mode of transportation. This in turn suggests the high status of the tomb owner, since it shows direct access to wealth and resources. The private tombs in Amarna illustrate the royal use of the horse and chariot, as they all consistently depict King Akhenaten and Queen Nefertiti mounted in their chariots as part of a royal procession.



Figure 8. Amenhotep Sise (Theban Tomb 71) depicted on his chariot, from the time of Amenhotep II. Photo by Alexis Den Doncker © MANT-ULiège.



Figure 9. Userhat mounted on his chariot, hunting in the desert. Photo by Alexis Den Doncker © MANT-ULiège.

Both men and women are mentioned in texts or depicted in representations mounted on chariots (Köpp 2008:34–44; Köpp-Junk 2015a:198–199; Köpp-Junk 2015b:102–149). On the whole, the horse is used, on the one hand, primarily for fast movement, such as for messengers, and on the other hand, for prestigious locomotion.

Beyond its use as a mode of transportation, the horse was also used in hunting and sports (Köpp-Junk 2013:123–134). Several private tombs from the 18th dynasty, such as the tomb of Userhat shown in Figure 9, depict the tomb owner in his chariot, mid-hunt. The scenes always look very similar: the tomb owner is mounted on his chariot, his bow in his left hand, and the accompanying arrow in the right, ready to shoot. On the other side, we see two horses in front of the chariot in the so-called “flying gallop” posture, clearly conveying fast motion.

The horse and chariot were an addition to a scene that had been in existence since the Old Kingdom: tomb owners liked to depict themselves doing leisurely activities. The image composition of the hunted animals is therefore an old one, and, in many tombs, is visibly more archaic than the dynamic, fast-moving horses on the left side of the scene. The desert animals depicted on the right are in chaos: running, and “flying” everywhere, some already pierced by a successfully-shot arrow. The execution of the scene sticks to the well-known Egyptian canon, showing register lines separating the animals from each other, creating some sort of order in what would have been a very chaotic picture. The register lines are an excellent use of Egyptian pictorial composition, meaning to convey a large desert plain where the scene would have taken place, using the pictorial space to its full potential.

Warfare

The introduction of the horse into Egypt drastically changed the way war was waged (Spalinger 2005). The horse and chariot became an intricate part of the military, the chariot being one of the most important and pivotal weapons of its time. Intensive training was necessary for the horse team to be able to pull the chariot, and of course for the charioteer as well. Detailed Egyptian textual evidence for the training program of horses is scarce, but some references exist (Hofmann 1982:53–56; Leitz 1999, 90–91). For combat, special training was needed in order to quickly reduce the speed or change direction (Hansen 1992:173–179). Moreover, the innate timidity of horses had to be mitigated and the animals had to be trained and prepared to be able to withstand the fight. An example of a two-dimensional depiction of ancient Egyptian horse training can be found in the temple of Medinet Habu, belonging to Ramses III (1186–1155 BC); it depicts a group of horses undergoing habituation training as preparation for war (Delpout and Rogner 2022). This scene is the earliest two-dimensional depiction of horse training in history. Even if the number of Egyptian texts relating to training is very small and not very informative. The Hittite text of the horse trainer Kikkuli from Mitanni from the 14th century BC describes the

training of horses as draught animals for chariots in particular detail (Horn 1995:38; Starke 1995).

In battle, the crew on an Egyptian chariot consisted of a charioteer and an archer (Littauer and Crouwel 1979:77; Köpp-Junk 2015a:195). The fighting was done with long range weapons. Even though the king is usually depicted alone in the chariot during the battle, the name of the king's shield-bearer is explicitly mentioned in the Qadesh battle texts: “now when Menena my shield-bearer saw that a large number of chariots surrounded me, he became weak and faint-hearted” (Poem, § 205–219; Kitchen 1979:66–70; Lichtheim 2006:68). The Egyptian depictions show the horses in front of chariots to be stallions. Whereas this is a predominant scene, it seems much more likely that they used geldings in front of chariots since they possessed a calmer temperament (O'Daniel Cantrell 2011:26; Delpout and Matić 2025) and are easier to manage on the campaign. While a horse reaches 45–52 km/h at a full gallop, with a chariot this is reduced to about 38 km/h (Köpp-Junk 2015a:133, 291–296, Tables 7, 9). The battle scenes often show the pharaoh as the largest figure in the scene, mounted in his chariot (Figure 10), the horses charging into the enemy's territory. These scenes were made with a very specific purpose: conveying the pharaoh's victory over the enemy to his audience. Naturally, the purpose of the image dictates its content and appearance and should therefore be approached very carefully when treating it as a historical source (Delpout and Willekes 2023).

Although the most common use of the horse is in combination with the chariot, there are some rare exceptions of other wheeled vehicles occurring in military context. The Sanam relief from the time of King Taharqa from Dynasty 25 (690–664 BC) shows two four- and six-wheeled transport wagons with six unprofiled spokes per wheel, pulled by horses (Griffith 1921/22: Plate 32). Since the square wagon bodies are very high, it is not possible to see what loads the wagons are carrying. Other wagons, which, however, are not of Egyptian but Hittite origin and are therefore mentioned here only for the sake of completeness, are the four two-axle wagons with six-spoked wheels depicted in the Sethos temple at Abydos (Naville 1930: Plate 17). Two of them are drawn by cattle, the other two by horses.

Depictions from several different contexts also show the use of the horse as a mount in military campaigns. Scouts, soldiers and messengers moved on horseback to transmit their messages as fast as possible (Schulmann 1957:267). The earliest depiction of a horseman armed with a club and bow dates from the time of Thutmose III (1486–1425 BC), probably showing the king as the rider himself (Schulmann 1957:264; Decker 1971:137; Köpp-Junk 2022: Figure 10). In the tomb of Horemheb in Saqqara (1319–1292 BC), a horseman with a whip in his hand is depicted, which is interpreted as a mounted scout (Schulman 1957:263). A limestone relief currently in the National Museum of Scotland shows a Nubian horseman with a whip (inv. no. A.1955.81) and the image of a horseman decorates the fragment of a toy



Figure 10. A New Kingdom relief in the Karnak temple at Luxor shows the king in his chariot. Photo: H. Köpp-Junk.



Figure 11. Depiction of a rider in the Battle of Qadesh in the temple of Luxor, dating to Dynasty 19. Photo: H. Köpp-Junk.

chariot (Schulmann 1957:264–266, Plates 1, 5). Further evidence dates to the Ramesside period (1292–1075 BC). At least four horsemen appear in the reliefs of the Battle at Qadesh (1274 BC) from the 19th dynasty, who, as can be seen from the texts accompanying them, are scouts (Figure 11) (Wreszinski 1935:169, Plate 64). From the reign of Seti I (1323–1279 BC) and Ramesses II (1303–1213 BC) seven equestrian representations of foreigners like Hittites and Syrians fleeing from Egyptians are preserved (Wreszinski 1935, Plates 36, 45, 57, 107, 169). Schulman considers all but two, who are unarmed, to be scouts (Schulmann 1957, 268). Some more examples date to the Ramesside Period such as a limestone ostrakon with an Egyptian horseman, found in Deir el-Medineh. He wears a wig and can possibly be identified as an officer on the basis of his clothing. The depiction is very similar to another limestone ostrakon found at the same site. Here the horse wears a saddle blanket (Schulman 1957:268; Davies 1917:2, Plate 51; Köpp-Junk 2015a:169).

Status symbol

Chariots were a prestigious means of passenger transport in Ancient Egypt. Although the price of a horse is not known, the price of a donkey in Ramesside times was 25–40 deben, a weight unit used in ancient Egypt (Janssen 1975:167f., 172–173). In comparison, the monthly wage of the specialised workers in Deir el-Medineh was 25–30 deben (Janssen 1975:510–515). In Papyrus Anastasi, the price of a chariot is given as 8 deben, with the drawbar costing 3 deben and the chariot body 5 deben (Papyrus Anastasi III 6:7–8). However, at this point it is assumed to be silver deben rather than copper deben (Janssen 1975:329). This implies that the chariot cost a fortune in the truest sense of the word and the owner of such a chariot had to be able to afford not only the vehicle itself, but also at least two horses. The purchase price must be added to the costly maintenance of the vehicle. Thus, it was certainly more prestigious to be represented not only with a horse, but with a team and chariot. If a person is represented riding on a chariot, then apart from the wealth represented, that person is shown physically mastering the technical innovation of the chariot.

Raising and training draught animals and developing vehicular technology was an expensive and time-consuming investment. It is therefore likely to be representative of high status (Bibby 2001:13). Since status is always relative, the mere occurrence of a horse in someone's tomb is not per se an indication of anyone's status. In order for the depiction of the horse to function as such, it needs to show the tomb owner's direct access to wealth and resources (Delpeut 2021). When applying the Costly Signalling Theory (Bird and Smith 2005:221–248), we can conclude that hunting scenes from private tombs are extremely effective status symbols (Delpeut 2021:7–15). It is important to keep in mind that whether or not the tomb owner actually went hunting is

irrelevant. It was important to have a representation in the tomb, as this circumstance would then continue for all eternity. In a royal setting, the difference between pharaohs and others are other visual elements of the horses and chariots. The horse itself does not necessarily indicate status, since all parties have them. Rather, the size of the chariot, the number of spokes, and the depiction of the horses' sex signal the pharaoh's high status. (Delpeut 2021:4–7). The horses in the Kushite period were also signs of prestige. At that time, the horse was not only a functional instrument of warfare and transportation, but also an ideological symbol and a self-renewing source of social and economic capital (Schrader et al. 2018:384). The Nubians were known for their superior horses, which shows their specialisation in horse breeding and training. This in turn would have imparted a degree of social capital, meaning those who owned, or were affiliated with horses, may have been considered as belonging to the elite (Schrader et al. 2018:393).

Conclusion

The introduction of the horse into ancient Egypt around 1600 BC brought some changes into Egyptian society. First of all, it revolutionised warfare, enabling the Egyptians to level the playing field now that they too possessed the horse and a chariot, which are both a huge technological advancement. Temple reliefs show the importance of the horse both on a strategic as well as an iconographic level, showing the pharaoh victorious over all of Egypt's enemies, charging into battle. This shows the second change in society, as the horse made it into the pictorial tradition in royal as well as private contexts. Depictions in private tombs show us that horses were used for sport and hunting, as well as a mode of prestigious transportation for members of the elite. Depictions of horse riding rarely occur, suggesting their primary use was indeed to pull a chariot. Horse riders are usually associated with military scouts or messengers who required a more agile mode of transportation. The horse in language quickly deserved its own signifier, which is rendered as a horse, and the texts that remain often are associated with the pharaoh showing his best side, such as in the texts describing the Battle of Qadesh, where Ramses mentions his horses' names, and that they alone were responsible for the 'victory' at Qadesh. Due to Egypt's dry climate, there are limited remains left of ancient Egyptian harnesses, although the images show us roughly how the chariot harness as well as the bridle would have worked. Most of these two-dimensional depictions of how the bridle worked are supported by metal bridle parts that have survived, as well as some leather remains. The horse also brought along changes in social life, as it was a means of prestige to be able to own a horse and chariot, as it showed direct access to wealth and resources. Images show us how the horse was used as a status marker, making the difference between members of the elite. Textual evidence

shows us that the introduction of the horse brought along a new military branch focussing solely on the role of the horse in military context. Considering the few remains of horses found in Egypt, one of the remaining questions is where all the horses are, since there was no tradition of mummification of horses in ancient Egypt.

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Introducing Horses to Kofun Japan

The Dawn of Equine Culture focussing on Kawachi (河内) (Current Osaka Region)

Chun Ho Kim

Introduction

While modern horses spread across the Eurasian steppes to east Asia by the late 2nd into the 1st millennium BCE, their introduction into Japan took considerably longer (Hong et al. 2020; Librado et al. 2021, 2024; Sekiyama 2010). The *Wajinden*, or annals of the 3rd century CE (Treatise on the Wa People in the Records of the Three Kingdoms; Ishihara 1985), describe the Yamatai-koku period, which spanned from the 1st to the 3rd century CE, as a transformative epoch in Japanese history. This era is distinguished by a noticeable absence of large domesticated animals, including cattle and horses (Matsui 1991; Sekiyama 2010). The text reports that, “Until the Yamatai-koku period, the archipelago was devoid of cattle, horses, leopards, sheep, and magpies”, which predates a phase of profound change precipitated by the subsequent introduction of horses from the Korean Peninsula. While horses were indeed gifted by neighbouring Korean kingdoms, the knowledge of equine management and horseback riding initially remained a closely guarded secret. Only with the southward expansion of the Goguryeo Kingdom, did Japan began to fully embrace equestrian knowledge, prompting a strategic alliance between the Baekje Kingdom and the Yamato regime during the Kofun period (c. 300 to 538 CE), thereby initiating the widespread adoption of horses throughout the islands (Sasaki 2018).

The introduction of these horses posed a formidable challenge to the ancient Japanese (*Wajin*), who were unaccustomed to such large animals. These horses demanded considerable skill to utilise, and their arrival marks the dawn of Japan’s equestrian culture (Isahaya and Mukai 2023; Kamachi 2020; Matsui 1991; Sekiyama 2010). Baekje immigrants in Kawachi (present-day Osaka plain) not only bred horses, but developed specialised medicines and produced tack, evidencing a nascent equestrian culture (Nojima 2008, 2016a, 2016b). An account of a royal hunt on Awaji Island from the reign of Emperor Richu, c. 400-405 CE, underscores the paramount importance of horse breeders from Kawachi. Detailed in the *Nihon shoki* (The Chronicles of Japan), this episode highlights the elevated status and strategic significance of equine breeders, who had by then become integral to the military and political strategies of early Japan, operating directly under the imperial command (Ujiya 1988). The integration of equine breeding and management into early imperial Japan signifies a period of considerable economic and technological investment. The establishment of horse ranches, especially in proximity to the Yamato regime in Kawachi, was a deliberate endeavour, reflecting the immense economic and military value of horses in this era.

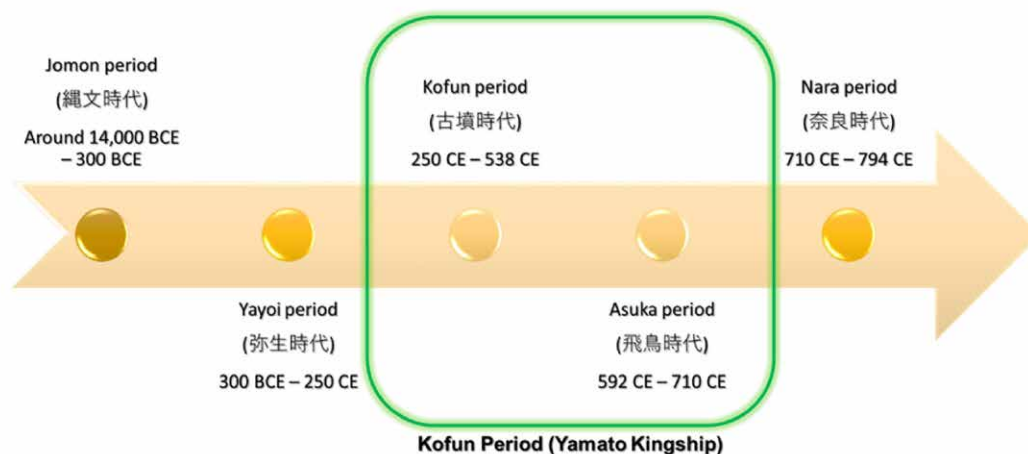


Figure 1. Timeline of Japanese history.

This chapter discusses the origins, arrival, and assimilation of horses and their breeders into the Japanese Archipelago, and describes their key cultural, military, and technological impacts. With archaeological and historical records, the process of the introduction of horses to Japan is outlined, with a particular focus on the Kawachi region during the Kofun period (Figure 1). A view of the initial phases of horse use in Japan is offered, including the details of when, by whom, and through what means horses and their breeders were introduced to the archipelago.

Galvanising the Gallop: The Trans-cultural Odyssey of Equestrianism from Baekje to Japan

The introduction and assimilation of horse culture from the Korean Peninsula to Japan unfurls as a saga of intercultural exchange, diplomatic endeavours, and the transformation of early Japanese society. Central to this narrative is the Kingdom of Baekje in southwest Korea, whose role in ferrying equestrian practices to the Japanese Archipelago encapsulates a period of cultural and technological transfer. Achiki, an eminent scholar from Baekje, emerges as a pivotal envoy in this cultural transmission, and his mission to foster the integration of horseback riding into Japan is chronicled in the *Nihon Shoki* (Ujiya 1988).

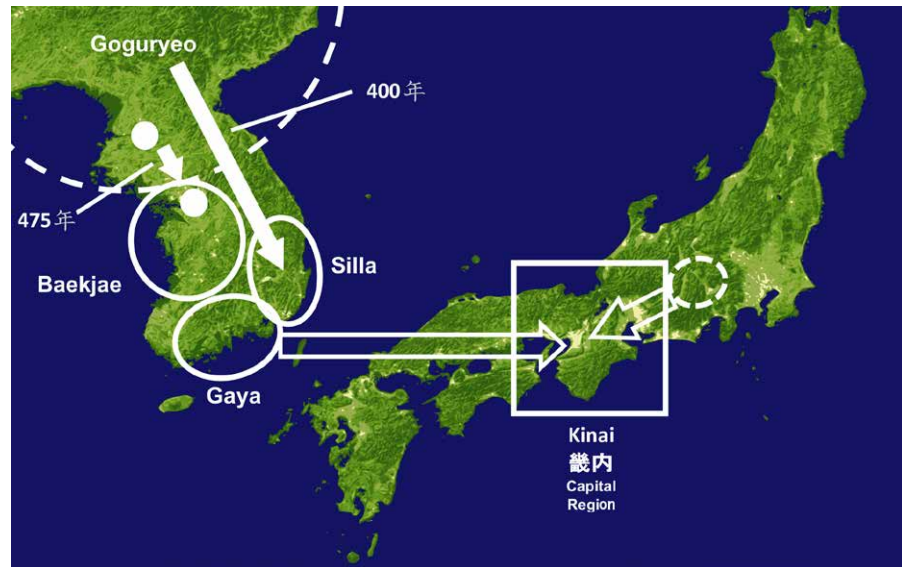
The introduction of equestrianism during the Kofun period delineates a clear demarcation in Japan's history because there is a conspicuous absence of horses before this era (Isahaya and Mukai 2023; Sekiyama 2010). After this period, equestrian classes from the Korean Peninsula arrived, and influential clans within the Yamato polity were established during the late Kofun and Asuka periods, underlining the impacts of horse culture on the socio-political formations and military operations. The genesis and widespread adoption of equestrianism in Japan

are inextricably linked with the political, economic, and societal dynamics of both the Korean Peninsula and the Japanese Archipelago. The period of the Three Kingdoms (c. 57 BCE to 668 CE) in Korea provides the backdrop for understanding the migration of equestrian groups to Japan, laying the foundational stones for the assimilation and adoption of horse culture within Japanese societies.

The strategic importation of horses by immigrants from Baekje, potentially including members of the Soga clan and Yamato authorities, catalysed their ascendancy within the Japanese hierarchy (Na 2019; Nakakubo 2017). The clan's proficiency in equine breeding and training enabled them to impart advanced equestrian knowledge, heralding a new chapter in Japanese history characterised by the utilisation of cavalry in warfare, which increased social stratification. In turn, an emblematic status was accorded to horses in ceremonial and imperial contexts. Furthermore, the significance of horses transcended the confines of the battlefield and ceremonial venues, with additional uses in agriculture and transportation. This integration accentuated the multifaceted influence of equestrian practices on Japanese society, from augmenting agricultural productivity to streamlining communication and commerce throughout the archipelago.

Horse riding and breeding expertise was introduced from the Korean peninsula to Japan by people from Baekje (and also the Gaya Kingdom), who brought robust and spirited horses to a population unfamiliar with equine management (Figure 2) (Isahaya and Mukai 2023; Kamachi 2020). Korean immigrants introduced a wealth of knowledge in equine rearing, fundamentally reshaping the Japanese landscape (Nam 1996). The strong currents, narrow topographical features and complexities inherent in moving horses across the Sea of Japan/East Sea and the Seto Inland Sea were effectively exploited by Baekje, which had the advantage

Figure 2. Movement of horse breeding groups between Korean Peninsula and Japanese Archipelago during 3rd–5th century CE (Kinai is the Osaka region) after Migishima et al. (2019. 馬の考古学. 雄山閣. p.56).



in shipbuilding at the time with the use of semi-structured vessels. The archaeological and literary evidence supporting this narrative is robust, with records from the 15th year of Emperor Kinmei's reign (c. 539–571 CE), which describes the arrival of a hundred horses – a testament to the magnitude of this enterprise (Kamachi 2020).

Kawachi's pre-eminence in the annals of Japanese horse culture is beyond dispute. As the principal locale for equine use and ranching, Kawachi's strategic location enabled the efficient transport and distribution of horses throughout the archipelago, cementing its status as a crucial nexus in the expansion of Japan's equestrian prowess. Horse rearing was consolidated, and equestrian practices were institutionalised by 700 CE (*Nihon shoki* 720, Ujiya 1988). This era witnessed the ascendance of influential clans under the support of the Yamato authorities, who commissioned monumental tombs and established an extensive early form of horse ranches, thereby weaving horses into the landscape of Japan's socio-political and economic domains. The maritime routes linking the Korean Peninsula with Kawachi were instrumental in facilitating this cultural and technological exchange. The evolution from the inception of horse ranches to the exploration of these nautical pathways offers insight into the logistical challenges and innovative solutions that characterised this period of historical interchange.

Early equine breeding in Korean peninsula during the Three Kingdom period

The kingdom of Baekje in the Korean peninsula, during the period of the Three Kingdoms, developed a sophisticated equine management and breeding system. This system highlighted Baekje's military and diplomatic acumen and mirrored a cultural veneration for horses. From the early reign of King Goi in 260 CE, Baekje's strategic foresight in

equine management was unmistakable. The founding of six governmental offices, or 佐平, notably included one dedicated exclusively to the oversight of military horses. This functioned akin to a contemporary Ministry of Defence, underscoring the kingdom's early institutionalisation of equine matters (Nam 1996). Such recognition of horses' strategic value in warfare and governance was pioneering (Yanshou 1974).

Under King Seong (523–554 CE), this system evolved with the creation of a specialised Central Management Office, 馬部, tasked with the oversight of equine management. This move signified Baekje's advanced administrative strategy towards horse breeding and care, setting a precedent in equestrian practices (Nam 1996; Yanshou 1974). Baekje's equine management also intertwined with its strategic international relations, notably with Japan (Wa). Contrasting with Goguryeo's stance, Baekje leveraged equine trade to counterbalance Goguryeo's territorial expansions. This strategy came to the fore during King Geunchogo's reign, with the initiation of a significant equine trade by presenting two fine horses to Emperor Ojin of Japan. This act marked the commencement of a profound cultural exchange (*Nihon shoki* 720, Ujiya 1988).

The introduction of superior horses from the Mòhé during King Goi's era was a pivotal moment in Baekje's horse breeding programme (Nam 1996). This importation likely enhanced and gradually replaced indigenous horses, showcasing Baekje's approach to equine stock improvement through selective breeding and international trade (*Nihon shoki* 720, Ujiya 1988). Beyond military and diplomatic exploits, Baekje's system embraced military, ceremonial, and agricultural dimensions of equine use. This approach, from advanced breeding techniques to the establishment of dedicated governmental horse management offices, highlighted Baekje's strategic

innovations. Integrating horses into the social fabric not only aided military campaigns but also fortified diplomatic ties with Japan, nurturing a rich cultural exchange. The legacy of Baekje's equine system, marked by strategic breeding, sophisticated management, and versatile societal utilisation, transcended regional boundaries, shaping the evolution of horse culture in Japan, affirming Baekje's important role in East Asian history.

Baekje's equine management and breeding practices offer a lens into the kingdom's social, military, and cultural priorities. Positioned along the Han River in Pungnap-dong, Seoul, the Pungnap Earthen Fortification epitomises Baekje's architectural and military ingenuity during Korea's Three Kingdom period. Its impressive design demonstrates early engineering prowess and a strategic emphasis on equestrian strength, crucial for cavalry training and deployment (Hong 2012; Lee 2017). Archaeological discoveries within this fortress, particularly in Tomb 9 in the Gyeongdang area, unveil a tradition of equine sacrifice, reflecting the horse's ritualistic roles. This suggests broader cultural practices, possibly related to deity veneration or wartime rituals (Park 2012). Comparative analyses link these practices to ancient rites across East Asia, including Japan, hinting at a shared cultural ritualistic landscape. Radiocarbon dating corroborates Baekje's equine history, further evidenced by unearthed horse tack and skulls (Choe et al. 2016).

Ongoing research and conservation efforts continue to unravel the complex cultural layers of ancient Korea at the Pungnap Earthen Fortification, spotlighting Baekje's equestrian heritage, architectural skill, and military strategies (Figure 3) (Hong 2012; Lee 2013). In transitioning to Baekje's maritime activities, the kingdom's innovative equine practices not only fortified its military capabilities but also facilitated expansive sea routes from the Korean Peninsula to Kawachi. These routes underpinned Baekje's strategic engagements and cultural exchanges, particularly with Japan, which divulges an advanced understanding of maritime navigation and international diplomacy. This maritime prowess, alongside Baekje's equine excellence, reveals a sophisticated network of trade and cultural interchange.

Sea Routes from the Korean Peninsula to Kawachi

Recent archaeological excavations at the Shitomiyakita site (都屋北遺跡) reveal the logistical foundations of the trans-maritime exchange that facilitated the introduction of horse culture from the Korean Peninsula to Japan (Nojima 2008). Six wells constructed from wooden planks were unearthed, alongside remnants of semi-structured boats (準構造船) (Figure 4) (Lim 2022), revealing the sophistication of ancient Japanese maritime technology and a tangible connection to the seafaring practices of Baekje and Gaya immigrants.



Figure 3. Pungnap Earthen Fortification (After map from the Korean National Heritage Service: https://www.heritage.go.kr/heri/cul/culSelectDetail.do?VdkVgwKey=13,00110000,11&pageNo=1_1_1_0).

These Korean maritime architectural techniques influenced the evolution of Japanese boat construction methods.

Perilous sea voyages were undertaken by Korean settlers travelling to the Japanese archipelago (Figure 5). The exploration of the sea routes from Korea to Japan is a key element in reconstructing this chapter of East Asian maritime history, raising questions about the itinerary of these voyages (Lim 2022). The methodologies employed in stabilising and transporting horses across the sea, the estimated number of voyagers involved, and the logistical challenges faced, require further investigation. This journey across the sea was no mere feat of navigation; it represented a complex undertaking involving careful planning and considerable risk (Takada 2016), especially in the transportation of horses. The logistical challenges of ensuring the safe passage of these animals across the sea highlight the ingenuity and resilience of those involved. An examination is required of the technologies and strategies employed, including the design of the vessels, the methods of securing the horses onboard, and the navigational skills required to traverse the unpredictable waters between the Korean Peninsula and Kawachi. Moreover, the broader implications of these maritime endeavours extend beyond the technical aspects of navigation and animal transportation. They illuminate the extensive cultural and technological exchange that underpinned the integration of horse culture into Japanese society. The movement of



Figure 4. Reconstructed models of the ships of Baekje immigrants, now on display at the Hanseong Baekje Museum (Photo by the author).



Figure 5. Suggested route by which migrants from Baekje would have taken to the Seto Inland Sea (瀬戸内海), connecting two bases in northern Kyushu (Dazaifu) and Kinai (Nambatsu) (Figure after map retrieved from <https://www.uminet.jp/know/detail.php?id=22>).

people, animals, and technologies across these sea routes facilitated not only the dissemination of equestrian practices but also a deeper intercultural exchange.

This transfer of horses and horse breeders to Japan during the Kofun period is believed to have been via the strategic maritime conduit of the Seto Inland Sea, stretching from the Kanmon Straits to Awaji Island. This route played an indispensable role in the dissemination of equine culture across the Japanese archipelago (Takada 2016). Despite its comparatively mild Setouchi climate, renowned for lacking the large waves typical of more turbulent seas, the Seto Inland Sea's waters are reputed among seafarers as some of the most challenging maritime routes within Japan. The root of this difficulty lies in the tidal patterns, governed by the contrasting sea levels of the Pacific Ocean and the Seto Inland Sea itself. The Naruto Strait exemplifies this dynamic interaction between the waters, creating a constantly shifting tidal flow, which significantly complicates navigation (Takada 2016). This unpredictability was especially challenging for early Japanese seafarers, reliant on the era's nascent maritime technologies. Consequently, the advanced maritime techniques and knowledge from the Korean Peninsula played a crucial role in overcoming these navigational hurdles. This expertise was instrumental in the successful transport of horses across these perilous straits, highlighting the Korean influence on Japanese maritime navigation during this period. The importation of horses via the Seto Inland Sea identifies the relationship between environmental conditions and maritime technology. It stands as a testament to the ingenuity and adaptability of ancient mariners who navigated these challenging waters, facilitating a cultural exchange that significantly influenced Japanese society. The successful transportation of horses across such a complex maritime landscape reflects a remarkable achievement in navigation and maritime engineering, indicative of the interaction between different cultures in ancient East Asia.

Upon their arrival in the Kinki region, immigrants encountered the unique geographical landscape of the Kawachi Plain, starkly different from today's Osaka region. This terrain, characterised by an expansive bay to the east and the Uemachi plateau projecting out like a peninsula, underwent significant environmental transformations over time, evolving into the Osaka Plain through sediment deposits from the flooding of the Yodo and Yamato rivers (Isahaya et al. 2023). The historical absence of horses in Japan until the Kofun period underscores the significance of maritime transport in introducing these animals to the archipelago and identifies the skilled transportation of these animals by ship. Transporting horses across the sea, through the challenging waters of the Seto Inland Sea aboard semi-structured ships, presented considerable logistical challenges. Skilled horse breeders, possibly introduced by figures such as Achiki from Baekje, were

necessary to ensure the well-being of the horses during these voyages (Takada 2016). The dangerous journey culminated on the eastern shores of Lake Kawachi, where these early settlers established horse ranches, laying the foundation for Japan's equestrian culture.

The introduction of horses to the Kawachi Plain marked the onset of a new chapter in Japan's history, founding sites of early horse production. The geographical setting of Kawachi Bay, nestled within modern Osaka and bordered by the Ikoma mountain valley to the east, played a pivotal role in the development of early equestrian centres. This area is rich in archaeological sites containing horse bones and equestrian artefacts, revealing the initial interactions between humans and horses in Japan. The discovery of such sites underscores the significance of the Kawachi region as a hub for the breeding of horses (Takada 2016).

Main Sites with Early Horses in Kawachi

Kawachi Bay shaped the Osaka region and its surrounding areas for millennia. Enclosed by the verdant Ikoma Mountain to the east and a peninsula known for its archaeological wealth to the west, this region has been central to the development of early Japanese culture, with a particular emphasis on horse breeding. Positioned strategically between the Yodo River to the north and the Yamato River to the south, Kawachi Bay historically received alluvial deposits, significantly altering the landscape. This process of sedimentation contributed to the formation of the Uemachi Plateau, a geological development that gradually transformed the bay's connection to the sea, ultimately leading to the emergence of Lake Kawachi, a freshwater body isolated from the ocean by a growing sand peninsula (Osaka Brand Committee 2006). This transformation is considered a key factor in the region's ecological and societal development.

The isolation of Kawachi Bay from oceanic influence facilitated a shift in local ecosystems and human activities (Figure 6). Archaeological sites along the newly formed peninsula have revealed extensive evidence of horses, suggesting the area's prominence in early equestrian practices in Japan. The evolution of the natural landscape was interdependent with the development of human societies, particularly in terms of agriculture, fishing, and animal husbandry. The transition from Kawachi Bay to Lake Kawachi, as facilitated by the natural barrier of the Uemachi Plateau, created conditions favourable for human settlement, and eventually horse-rearing. The geographical features of the region, including its rivers and the protective mountains, have been instrumental in supporting agricultural practices, fishing, and, notably, the breeding of horses, which played a significant role in the socio-economic development of the area (Osaka Brand Committee 2006). Reflecting on Kawachi Bay from its origins

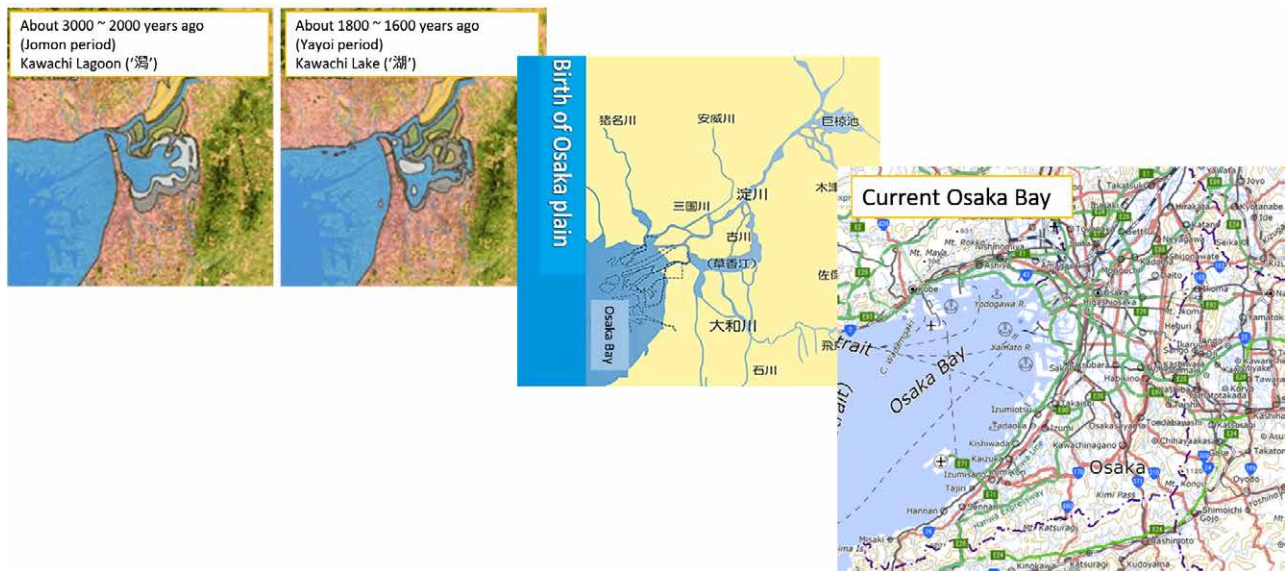


Figure 6. Geographical changes in the Kawachi region. After maps from: (Left) Naniwa Sea Time Museum, http://kouwan.pa.kkr.mlit.go.jp/kankyo-db/intro/detail/rekishi/detail_p07.aspx; (Middle) from Osaka Brand Committee (2006), https://www.suito-osaka.jp/special/history/history_2.html; (Right) from: Geospatial Information Authority of Japan Map <https://maps.gsi.go.jp/#9/34.613770/135.504272/&base=std&ls=std&disp=1&vs=c1g1j0h0k0l0u0t0z0r0s0m0f1>.

Figure 7. Sarara Ranch with features shown at various elevations from sea level. Re-designed and simplified, after map retrieved from the Shijonawate City Authority. <https://www.city.shijonawate.lg.jp/site/bunkazai-shiseki/1898.html>.



to its present status within the Osaka metropolitan area underscores the profound impact geographical features have on the course of human history. The story of Kawachi Bay exemplifies the dynamic interplay between the natural environment and human society, offering a glimpse into Japan's historical landscape and its longstanding relationship with equestrian traditions.

During the Kofun period, the unique topographical characteristics of the region were important to the settlement and horse breeding practices of immigrants who traversed the Genkai-nada Sea. Settling in Kawachi, these immigrants initiated a tradition of horse breeding that saw increased development from the mid- to late Kofun period. The areas now known as Shijonawate, Neyagawa, and Daito became active centres of horse

breeding. Sarara Ranch emerged as a key site where horse-breeding groups, primarily immigrants from the Korean Peninsula, operated their ranches (Isahaya et al. 2023). Historical documentation in the *Nihon Shoki* reveals that by the 12th year of Emperor Tenmu's reign, Baekje (or Silla) clans likely established entities such as Sararanoumakai Usaginoumakai (Ujiya 1988). Archaeological evidence, including horse bones and various artefacts, suggests Sarara's significance beyond mere grazing land.

Geographically, Shijonawate-shi was nestled among the Ikoma Mountains, with the Tahara district to its east and Lake Kawachi to its west. This area was traversed by the Sarara, Okabe, Kiyotaki, Esemi, and Gongen rivers, which originated from the mountain valleys, including Mt. Iimori. These rivers, which currently flow into the

Neyagawa River, were instrumental in shaping the landscape during the Kofun period, contributing to the creation of a conducive environment for horse breeding across the Osaka Plain. The strategic use of the terrain, with its varied elevation from Lake Kawachi to Mt. Ikoma, facilitated the establishment of a port for landing horses at the lowest elevation, around which a village and related activities thrived. Settlements and areas designated for festivals or rituals were situated on slightly elevated flatlands, while burial mounds were constructed at the highest points near the mountain's base (Murakami and Jitsumori 2013; Nishio 1988). This topographical diversity aided in the physical conditioning of the horses, and in the efficient management of water resources through lakes and rivers acting as natural barriers, making the area ideal for ranching activities.

Furthermore, the Kiyotaki Road, connecting the Yamato government's seat with Sarara Ranch (Figure 7), intersects with Higashigoya Road, demonstrating the region's strategic importance as a transportation nexus. These geographical and infrastructural advantages positioned the Kawachi region as a prime location for early horse ranching activities (Figure 8) (Isahaya et al. 2023;

Nojima 2008). The distinction in the roles of horse breeding grounds, influenced by the altitude within the Kawachi region, highlights the understanding and utilisation of the landscape by early settlers for equestrian purposes. Geography, human settlement, and horse breeding were intimately related in ancient Japan – the natural landscape and human ingenuity converged to cultivate a rich tradition of equestrianism in the Kofun period.

Two Main Sites

Nakano site (中野遺跡)

The Nakano site (Figure 9), uncovered during an extensive archaeological excavation in 2012 ahead of residential redevelopment to the west of the Shijonawate Post Office, has become a crucial point of interest for scholars tracing Japan's historical and cultural development. Stretching from Nakano Honmachi to Nakano 2-chome, the Narai site offers insights into a civilisation that spanned from the Kofun era to the Middle Ages, covering the Kamakura and Muromachi periods. Artefacts unearthed indicate the first half of the 6th century CE as a period of significant habitation and utilisation (Nojima 2005, 2008, 2016a, 2016b, 2016c).

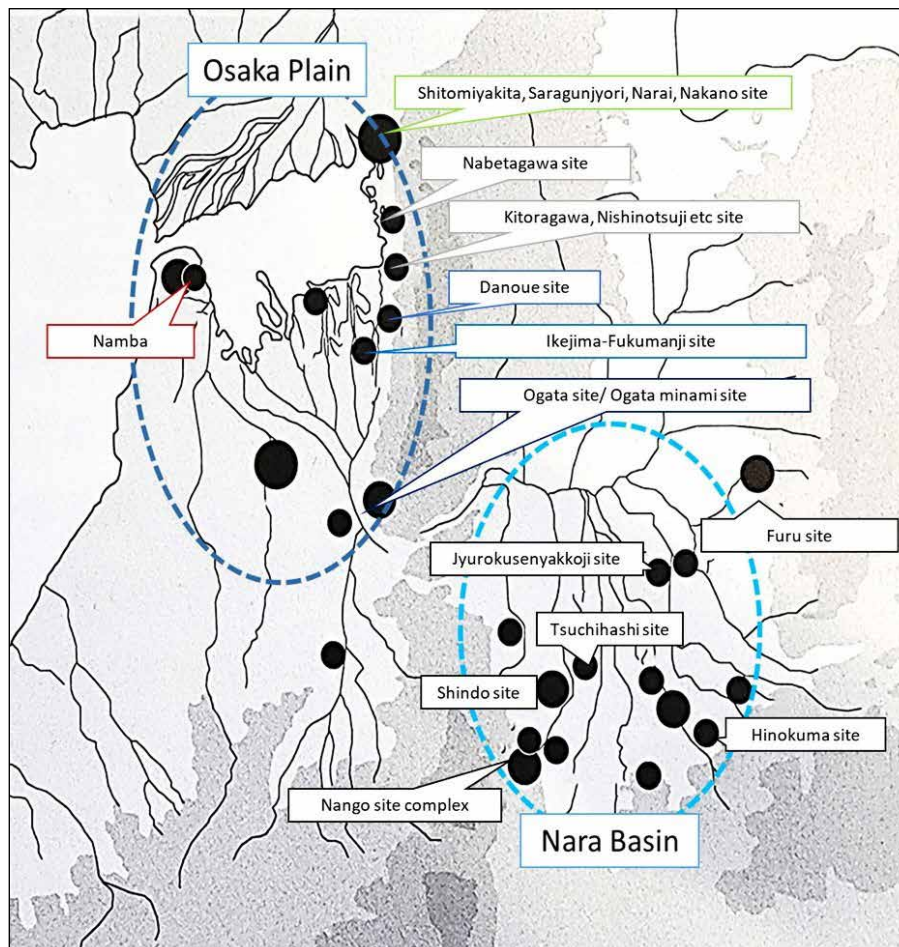


Figure 8. Map of excavated horse related remains from the Osaka Plain (Kawachi) (Left) and Nara Basin (Right) dating from the Kofun period (translated and re-designed map as created by Maruyama 2022:3, in Isahaya et al. 2023). The amount of horse remains found is indicated by the size of the circles.

Pottery tools and remains of dwellings that were excavated from Nakano offer valuable insights into the lifestyles, economic activities, and social structures of its occupants (Murakami and Jitsumor 2013; Nojima 2005, 2008, 2016a, 2016b, 2016c; Nishio 1988). These excavations show the strategic significance of Nakano as a centre of trade, culture, and illustrate the geopolitical shifts that shaped Japan from the late ancient period into the medieval era. The discovery of horse remains attests to

the inhabitants' utilisation of horses, such as the right mandible of a horse placed horizontally on a charred branch at the edge of a substantial ditch. These are among the oldest horse remains found in Shijonawate, which were recovered alongside salt manufacturing earthenware, red-painted pots, and jade, suggesting an interweaving of ritual activities and cultural practices centred on horses. A *Motohori* well from the mid-Kofun period further illuminates the Nakano inhabitant's relationships with



Figure 9. Nakano site (photo taken by the author).



Figure 10. Sitomiyakita site today (photo taken by the author).



Figure 11. The full skeleton of a horse excavated from Sitomiyakita (Public Domain).

horses. Discovered without any supporting structure, this well contained a significant quantity of salt manufacturing pottery and Korean-style porcelain earthenware, indicative of the influence of Korean Peninsula technology, as well as horse teeth. These artefacts hint at a strong connection to the Korean Peninsula, likely introduced by people adept in horse husbandry and earthenware production. Despite challenges posed by corrosion and soil damage, the analysis of these equine remains offers a glimpse into the ritual practices and cultural exchanges that characterised the region, pointing to a society that held horses in high regard, both for their utility and symbolic significance. Horses were not merely animals of burden or symbols of elite status; they played a central role in the community's economic, cultural, and ritualistic practices.

Sitomiyakita site (部屋北遺跡)

The Sitomiyakita site is located within the northeastern reaches of Kawachi and dates from the mid-5th to the 6th century CE (Figure 10). The archaeological excavations, initiated in 2001 by the Osaka Prefectural Board of Education, were spurred on by the development projects of the Neyagawa Basin Sewerage Nawate Mizu Mirai Centre. This investigation, delineated into five distinct zones labelled A through E, has revealed the intricacies of the site, with Zones A, B, and C alone spanning approximately 17,200 square metres (Iwase et al. 2009).

The discovery of a remarkably preserved horse skeleton at Sitomiyakita indicates its significance within the broader equine history of Japan (Isahaya et al. 2023; Kamachi 2020). This has kindled interest amongst both Korean and Japanese archaeologists to explore the web of cultural exchanges and technologies that bridged the Korean Peninsula and Japan during this era.

Excavations at Sitomiyakita unearthed pottery associated with salt production, shedding light on the economic activities. However, the discovery of a late 5th century horse skeleton, alongside a furnace and Korean-style pottery, revealed a deeper connection to equine culture. This link was further solidified with the discovery of additional Korean-style pottery, horse tack, including a wooden stirrup, and the pommel and cantle of a saddle, and horse teeth, affirming the site's role in equestrian pursuits (Iwase et al. 2009; Sasaki 2018). Further excavation found the remains of two juvenile horses, hinting at the site's use for horse breeding. The full horse skeleton that was recovered was approximately 127 cm tall at the withers, much like the small modern Misaki breed in present day Japan, and aged between five to six years based on dental attrition (Figure 11). Additional subadult horse teeth were also found, aged between 1.5 and 2 years, further confirming the site's breeding activities (see detailed analysis in Isahaya et al. 2023). The coexistence of Korean pottery with horse remains suggests the

settlement of Korean immigrants in the region, bringing with them their domestic hearths (*Kamato*), horses, and kiln technologies. This cultural fusion is also evidenced by equine-related artefacts, including wooden horse tack, such as bridles, some of which bear resemblance to those found on the famous horse figurines, or *haniwa* (Isahaya and Mukai 2023).

Within the wider Kawachi context during the Kofun period, the prominence of horses is not only captured through depictions in ancient tombs but also through their vital roles in the military, communication, and transportation networks, which bolstered the Yamato Kingdom's dominion. Excavations near Shijonawate-shi, uncovered burial artefacts from settlements at the base of Mount Ikoma, attesting to the elite status accorded to horse breeding, as chronicled in historical texts like the *Nihon Shoki*. By the Nara period, around 700 CE, a formal system for horse breeding and management, indicative of a state-controlled ranch, was ostensibly established. The zenith of horse breeding during this time, particularly in Kawachi, reflects the influence these animals had in shaping the socio-political landscape of the era. Through its archaeological discoveries, the Sitomiyakita site reveals the symbiotic relationship between horses and the cultural, economic, and social dynamics of Japan during the mid-5th to 6th centuries CE.

The archaeological discoveries at Nakano and Sitomiyakita highlight the significance of horse breeding and its impacts (Iwase et al. 2009; Murakami and Jitsumor 2013; Nishio 1988; Nojima 2005, 2008, 2016a, 2016b, 2016c). These excavations revealed evidence for the introduction of horses to Japan and have also unveiled the relationship between human settlements and their environment in the Kawachi region. There was a sophisticated level of interaction between the inhabitants of this area and their natural surroundings, facilitated by the strategic use of geography for agricultural, ceremonial, and equestrian purposes. The evidence of horse-related artefacts, alongside pottery and tools, demonstrates the integral role horses played in the economic, cultural, and ritualistic practices of the period. This relationship between humans and horses is indicative of a society that valued these animals not just for their practical utility but also for their symbolic significance within the community. The presence of Korean-style pottery and equine remains further points to the dynamic exchange of culture and technology across regions, enriching early Japanese society. The archaeological research at Nakano and Sitomiyakita reveals some of the complexities of ancient human-animal relationships and their dependency on the evolving landscape. The natural transformation of Kawachi Bay into Lake Kawachi, alongside the development of the Uemachi Plateau, played a pivotal role in shaping the conditions favourable for horse breeding and the subsequent cultural

and technological changes of the region. The legacy of horse breeding in the Kawachi region, as revealed through these excavations, offers a unique lens through which to view the interplay between culture, technology, and environment in ancient Japan.

Conclusion: The Role of Horses in Shaping Japanese History and Culture

The Kofun period, spanning from the 3rd to the 6th century CE, was a pivotal epoch in Japan's historical and cultural landscape, particularly with the introduction of horses to the Japanese archipelago, along with the establishment of horse ranches, and the subsequent adoption of horses in cultural and military practices. This era witnessed the emergence of keyhole-shaped tombs, which served as the final resting places of the elite and as symbols of power and unity across the archipelago. The integration of horses into Japanese society during this time, believed to have been facilitated by cultural exchanges with the Korean Peninsula, introduced primarily through interactions with the Baekje Kingdom, revolutionised Japanese warfare. The establishment of cavalry units marked a departure from the infantry-centric tactics of earlier periods. This strategic innovation enhanced mobility and combat effectiveness, allowing for more dynamic and decisive military engagements. The Kofun period's *haniwa* figurines often depict horses and warriors, providing archaeological evidence of the horse's role in warfare and society. Beyond the battlefield, horses brought advancements in agricultural efficiency and land management. The introduction of horse-drawn ploughs and other equestrian-related agricultural implements improved productivity, supporting the socio-economic development of the burgeoning Japanese state. This agricultural revolution, underpinned by the utilisation of horses, laid the foundation for increased social complexity and stratification.

In the socio-cultural realm, horses attained a sacrosanct status, becoming symbols of wealth, power, and divine favour. Their inclusion in Shinto rituals and ceremonies underscores their elevated status, acting as intermediaries between the spiritual and temporal worlds. The Kofun period's burial mounds sometimes included horse trappings, signifying the importance of these animals in both life and death. The *haniwa* figurines, beyond their military representations, also depicted horses in various poses, signifying their integral role in daily life and the afterlife. The Kofun period's artistic representations further underscore the horse's significance within the Japanese cultural lexicon. The period saw the development of equestrian motifs in art and sculpture, with horses often symbolising nobility, perseverance, and unity. These representations serve as a testament to the deep reverence for horses that permeated Japanese society, reflecting their essential role not only in practical terms but also in the spiritual and cultural imagination.

This era of equestrianism in Japan is a testament to the dynamic interplay between external influences and internal adaptations. The introduction and integration of horse culture during the Kofun period illustrates cultural exchange, whereby horses emerged as pivotal assets in warfare, agriculture, and societal identity. The impacts of horses in this period include transforming military strategies and agricultural practices to reshaping socio-cultural dynamics and religious practices. The Kofun period set the stage for the evolution of Japanese military tactics and agricultural practices but also marked the

beginning of a profound relationship between horses and the Japanese people, a relationship that would continue to evolve and shape the cultural landscape of Japan for centuries to come. The intimate relationships between horses and Japanese society during the Kofun period reveal the complex web of cultural, military, and economic transformations that shaped early Japanese history. This reveals the enduring legacy of the Kofun period's equestrian culture, highlighting its significance in the broader narrative of Japan's historical and cultural development.

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Horse and Rider in the Avar Empire (late 6th–early 9th century AD)

Birgit Bühler

Introduction

The Avars, a nomadic tribal confederation that originated in Central and Inner Asia in the mid–6th century AD, ruled the Carpathian Basin from 568 to around 800 (for Avar-period archaeology and history, see Anke et al. 2008; Curta 2021a; Daim 2003). Previous research suggests that horses were an important aspect of life in the Avar realm. According to the historical sources, the Avars were accomplished mounted warriors. Their outstanding skills in mounted archery, but also in fighting with a range of different weapons on horseback, appear to have been crucial for their military success, especially when they first arrived in Europe in the late sixth and early seventh centuries AD.

Historical Sources

Although there are no written sources from the Avar realm itself, some information is available in the historiography of neighbouring cultures, such as the Byzantine empire. The most detailed information on Avar mounted warriors is available in the so-called “Strategikon” (Dennis 1984), a Byzantine military handbook (Rózycki 2017; Kardaras 2015; Hyland 1994) attributed to the Byzantine Emperor Maurice (AD 582–602). However, a high-ranking Byzantine commander may have been the author of this text. In general, the “Strategikon” demonstrates that, in military contexts, a variety of traditions of breeding, keeping, and training horses were relevant during the transition from Late Antiquity to the Early Middle Ages in Eurasia. Traditions of horsemanship are also dependent on the lifestyle of the population in question. The “Strategikon” gives the following description of the Avar army, around AD 600:

A vast herd of male and female horses follow them, both to provide nourishment and to give the impression of a huge army. They do not encamp within entrenchments, as do the Persians and the Romans, but until the day of battle, spread about according to tribes and clans, they continuously graze their horses both summer and winter (Dennis 1984:116–117).

In general, equestrian nomads tend to develop traditions of horsemanship which are very different from more settled, urban populations of the same period (Jäger 2006). Significantly, around the year 600, eastern Europe is a place where different traditions of horse keeping, breeding and horsemanship meet, and it seems that Avar culture played an important role in the transmission of innovations in equestrian equipment and training (Kardaras 2015; Hyland 1994; La Salvia 2012; Curta 2008; Curta 2015; Curta 2021b; Csiky 2021).

Avar Mounted Combat and Archery

In the “Strategikon” (Dennis 1984), several aspects of Avar equestrian training and equipment are recommended. This suggests that for Byzantine military commanders around the year AD 600, the equipment and training of the Avar mounted warriors was exemplary in many respects, reflecting the military success of the Avars at this time. The “Strategikon” gives the following description of Avar mounted warriors:

They are armed with mail, swords, bows, and lances. In combat most of them attack doubly armed; lances slung over their shoulders and holding bows in their hands, they make use of both as need requires. Not only do they wear armour themselves, but in addition the horses of their illustrious men are covered in front with iron or felt. They give special attention to training in archery on horseback (Dennis 1984:116).

The Avars’ preference for mounted archery is also apparent from their military strategies, *“They prefer battles fought at long range, ambushes, encircling their adversaries, simulated retreats and sudden returns, and wedge-shaped formations, that is, in scattered groups”* (Dennis 1984:117). The “Strategikon” also emphasises the Avars’ preference for mounted combat, and attributes the latter to their training and lifestyle, *“Also in the event of battle, when opposed by an infantry force in close formation, they stay on their horses and do not dismount, for they do not last long fighting on foot. They have been brought up on horseback ...”* (Dennis 1984:117–118).

Warriors of all periods and cultures, whether infantry or cavalry, must have invested a lot of time in perfecting their fighting skills, because, in the event of battle, excellent fighting skills were a matter of life and death. Furthermore, beginning this training as early as possible is an advantage. In the medieval Mongolian Empire, according to Chinese historiographer Meng Hung, children were given small bows and arrows at age four to five, expected to ride and hunt as frequently as possible and could be conscripted for battle at the age of fifteen (Hyland 1994:130). It is quite likely that in other, pre- and protohistoric steppe cultures, like the Avars, a mounted archer’s career followed a similar pattern. To reach the level of proficiency attested to Avar mounted warriors by the historical sources, we can assume that they must have begun their training at an early age and from then on, must have worked a considerable amount of time every day on perfecting their skills. Mounted archery requires an extraordinary amount of regular training, because the technique of aiming with bow and arrow from horseback needs to be “instinctive”, which can only be effective if the archer acquires sufficient practice in shooting from horseback. For Avar mounted warriors, hunting from horseback was presumably one way of staying in training during long periods of peace. Hunting was likely an important part of

the lifestyle of the Avar elite, because it allowed the mounted warriors to train their fighting skills during times of peace. The “Strategikon” also discusses hunting as an additional way of training for battle during times of peace and stresses the outstanding ability of equestrian nomads in hunting from horseback with bow and arrow (Dennis 1984:165–169).

Archaeological Sources

The archaeological evidence from the numerous Avar-period burial grounds in the Carpathian Basin suggests that horses were essential within the Avar realm, both from a practical and from a symbolic point of view (overviews in Anke et al. 2008; Daim 2003; Curta 2021a). The phenomenon of horse-human burials, as well as other rituals involving horses and horse-riding equipment as part of the burial custom, is a diverse practice in the Avar period, with considerable regional and chronological differences, which appear to reflect a range of cultural traditions (Balogh 2009; Cosma 2018; Fedele 2020; Kiss 1996; Makoldi 2008). However, throughout the Avar period, horse-human burials constitute only a small proportion of all Avar-period burials (10% on average, but with variation between cemeteries; see Bede 2012). Furthermore, the prevalence of a wide range of valuable items of personal adornment and grave goods within horse-human burials indicates that only individuals with high social status were buried with horses and/or horse-riding equipment. Significantly, in the Late Avar Period, especially during its final phase in the late 8th century (Late Avar Period III), there is an increased prevalence of horse-human burials in the periphery of the Avar Empire. Additionally, burials of women and children with horse remains occur more frequently than in earlier phases of the Avar period. These phenomena may be observed in the Late Avar (8th century AD) cemeteries at Komárno (Slovakia), but also in some Avar cemeteries during the same period in the Vienna (Austria) region (Čilinská 1990; Baron 2018a, 2018b).

Recent archaeogenetic research (Gnecchi-Ruscone et al. 2022), partly in combination with isotopic analyses (Gnecchi-Ruscone et al. 2024), suggests that distinct communities of steppe descent arrived and settled in the Carpathian Basin in the 7th century AD. Apparently, a fast, long-distance, trans-Eurasian migration of early Avar elites from the northern East Asian steppe took place. These results confirm the importance of horses suggested by the historical and archaeological evidence, in particular for the Avar elite. The genomic evidence also suggests a connection between early Avar elites in the Carpathian Basin and the elite of the Rouran empire in Mongolia. Furthermore, a high proportion of East Asian ancestry seems to have been maintained within the Avar-period elites in the Carpathian Basin for two centuries (Gnecchi-Ruscone et al. 2022; Gnecchi-Ruscone et al. 2024).

Although we can reconstruct many aspects of the equipment of the Avar horse, in particular the horse bridle with its iron bit and elaborate metal ornaments on

all leather straps, the exact construction of Avar saddles is not yet clear due to a general lack of preservation of organic materials in Avar-period burials. According to the current state of research, we can assume that Avar saddles were of a similar construction type to those of other early medieval steppe cultures (cf. Gřešák et al. 2019; Hyland 1994; Bálint 1989). For example, in Borodaevka (middle Volga/Don area), the wooden construction of a saddle from the 7th century AD was found, is of a similar type to saddles used in Central Asia during the same period (Bálint 1989: Figures 18, 118, 65/1).

In this context, it is also important to note that Avar horses were found to be considerably smaller and slighter than modern sport horses, more like present-day native ponies, with an average maximum withers height around 140 cm. Throughout the Avar realm, the sex, age and general usability of horses selected for horse-human-burials appears to follow a clear pattern: they are predominantly male (stallions or geldings) and in an age-group which would have been already broken in and suitable for usage as a riding horse, as is also suggested by most of them being buried with saddle and bridle. Furthermore, many of the horses show pathologies and traumata of the spine (such as *spondylosis ankylosans* and healed fractures in the body of vertebrae), and in the forelimbs (for example different degrees of splints or *desmoiditis ossificans ligamentum interosseum* between metapodial bones), which are quite common in riding horses. The evidence suggests that many of the horses buried in Avar-period horse-human-burials were in fact riding horses, buried with their owner (Baron 2018a, 2018b; Bartosiewicz 2006; Bökönyi 1974; Gudea et al. 2022; Marković et al. 2015; Vukičević et al. 2017).

Bioarchaeology of Riding in Avar Populations

In general, the biomechanics of horse riding are based on three aspects, which are closely related: the horse, the saddle, and the rider. In detail, there are considerable differences between different pre- and protohistoric equestrian cultures regarding these aspects. While the fundamentals of the communication between rider and horse have remained constant, throughout the history of equestrianism, certain aspects of any horse-riding style are culturally specific and are closely linked to the horse tack and saddle constructions, the types of equestrian activities carried out, and the prevalent horse types. The evaluation of “horse-riding syndrome” is especially important to understand who rode, and how they rode (for a summary of the state of research see Berthon et al. 2023). While some of the traits belonging to the horse-riding syndrome, such as the vertical ovalisation of the acetabulum and the Poirier’s facet, seem to be present in all populations of habitual horse riders, the prevalence of other characteristics (such as the robusticity of particular entheses, as well as enthesal changes) appears

to vary between different cultures of habitual horse riders. Several researchers in bioarchaeology have recently drawn attention to this issue (Berthon et al. 2023). Research on culturally specific traits observed in the osteological analysis of ancient and medieval populations of habitual horse riders is not yet available, but needed. In this context, populations from the Avar realm constitute an interesting example, as the Avars are assumed to have introduced the stirrup into European equestrian culture (Csiky 2021). However, due to a scarcity of relevant iconographic and historic sources, little is known about the Avar riding style. For example, the question remains whether mounted archers shot while standing in the stirrups or while sitting down in the saddle. From a biomechanical point of view, the short stature and slim build of known Avar horses could be relevant for the human osteology of Avar populations (regarding the prevalence of the horse-riding syndrome), as very large horses, or those with a broad rump, may put more strain on the rider’s hip joint than horses of slighter build.

Osteological evidence of the prevalence of horse-riding syndrome in Avar populations could also serve as an out-group “control” for the comparison with earlier populations in prehistory (cf. Kanne 2022). This adds another dimension to prehistoric and historic interpretations, based traditionally on the study of material culture and burial customs. At least in the initial period of their history in Eastern and Central Europe, the Avars were not only mounted warriors, but also equestrian nomads, with huge herds of livestock. Historical records from other cultures of equestrian nomads and warriors from different periods (e.g., Iron Age Scythians or the medieval Mongol Empire) suggest that the lifestyle of equestrian nomads usually requires the participation of all age groups – men, women, and children (Hyland 1994). On the other hand, the historical context, as well as the available archaeological evidence, have suggested that, from the later 7th century AD onwards, a considerable proportion of the population of the Avar realm may have led a less mobile and less “warlike” life than when the Avars first arrived in the Carpathian basin in the late 6th century. Economic and social changes within the Avar realm also likely affected lifestyle and activity patterns of the population. We should further keep in mind that the Avar empire was multi-cultural and was presumably also influenced by human mobility from different regions of Eurasia, including the steppes.

Recent osteoarchaeological research on the horse-riding syndrome within an Avar-period population from Eastern Austria (burial ground Wien11–Csokorgasse; 7th–8th century AD) has provided evidence for habitual horse riding in certain segments of the adult population at this site, with some variation between different social groups (Bühler and Kirchengast 2022a, 2022b, 2022c). In particular, the results of research on horse riding syndrome could be relevant for determining identities of different segments of the

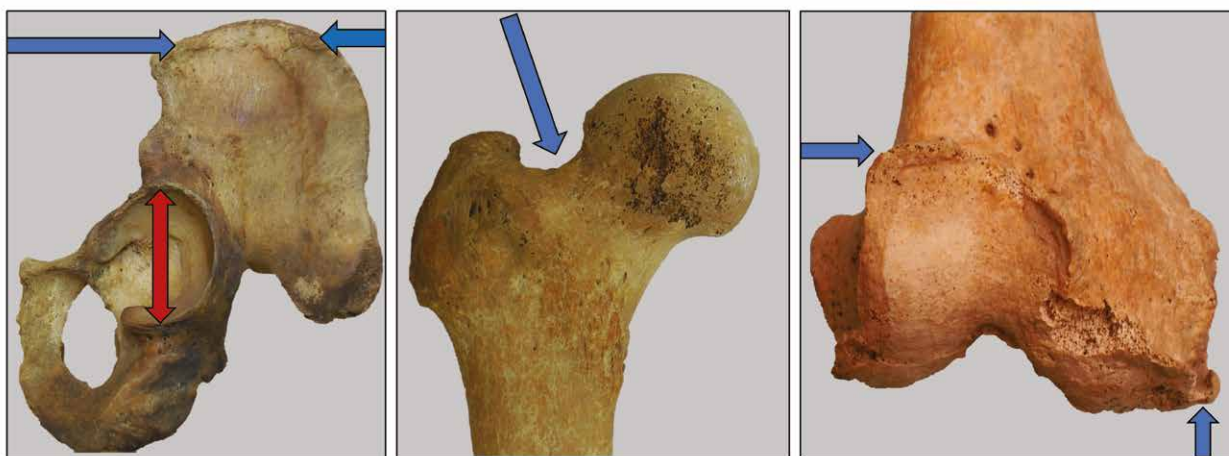


Figure 1. Skeletal examples of horse-riding syndrome from Wien 11–Csokorgrasse. Left: Burial 21, early 8th century AD (young adult, male), left os coxae, ventral view, with pronounced entheses of gluteal muscles (blue arrows) and vertical ovalisation (vertical elongation) of acetabulum (hip socket) (red arrow). Centre: Burial 348, mid-7th century AD (middle adult, male), right proximal femur, ventral view, with a “Poirier’s Facet” (blue arrow). Right: Burial 315, mid-7th century AD (old adult, female), distal right femur, with the patellar surface exhibiting pronounced osteoarthritis along the upper edge (both blue arrows). Images not to scale. Photos by B. Bühler.

population in the Avar period, in particular the elusive elites. Utilising the osteoarchaeological analysis of horse-riding syndrome, a group of high-status Avar warriors may have been identified. Their lifestyle, in the final phase of the Avar Empire, appears to have differed from that of the lower-status male population buried within an Avar cemetery (Bühler and Kirchengast 2022c). These results could assist in interpreting the phenomenon of an increase in horse-human burials along the northwestern border of the Avar Empire in Late Avar Period II–III (second half of the 8th century AD; Trugly 1987; Daim 2003; Anke et al. 2008; Baron 2018a, 2018b). In view of these results, the phenomenon of horse-human burials could be more than just a distant reflection of the steppe nomadic past within Late Avar society. Instead, it could suggest that a specific, high status social group preserved mounted warrior traditions – a lifestyle dominated by training for mounted combat as well as hunting, even at a time when lower-status inhabitants of the Avar Empire led a very different lifestyle, focusing on agriculture (cf. Djukic et al. 2018). Similarly, recent results of osteological research on an Avar population in the Vienna region revealed a generation of Avar women who immigrated, with an increased prevalence of the horse-riding syndrome, as compared to later female generations (Bühler and Kirchengast 2022a). Continued research like this could add a new perspective to archaeological research on the role of women in Avar society.

Avars and the Introduction of the Stirrup

According to the current state of research, the Avars played an important role in the introduction of stirrups into European equestrian culture (Csiky 2021). Some researchers have suggested that Avar mounted warriors were the first

cavalry which used stirrups on a regular basis (Anke et al. 2008; Daim 2003). However, many aspects of the process of transmission of this innovation – which had a considerable, long-term effect on the development of European horsemanship – remain unclear (Curta 2008, Csiky 2021). Stirrups occur in Avar horse-human burials from the Early Avar Period (late 6th–early 7th century AD) onward. In the “Strategikon” (Dennis 1984), stirrups are also mentioned, but not as a typically Avar innovation, such as tents or specific types of armour for horses and warriors, nor in a context where there is mention of the Avars (Rózycki 2017; Kardaras 2015; Caprioli 2020). In principle, the use of stirrups for mounted combat has several practical advantages, including increased stability, flexibility, and security on horseback. It can also facilitate mounting the horse from the ground. Stirrups can be advantageous for horseback archery. If the horseback archer stands up slightly in the stirrups, this can facilitate fast loading and precise, stable shooting with bow and arrow.

Obviously, the exact details of horse-riding technique in the Avar period are no longer accessible to us. Nevertheless, some basic principles of the communication between rider and horse remain the same throughout the history of equestrianism – past or present. Similarly, much can be inferred about Avar horse-riding technique due to the necessities of horseback archery. For instance, we can safely assume that Avar horse-riding technique must have focused on controlling the horse effectively without reins, using only the rider’s seat and legs, because this is crucial for horseback archery and other types of mounted combat. Other important aspects must have been efficiency and comfort when covering long distances at moderate to high speeds. The Avars possibly used some kind of “half-seat”

when cantering and galloping, presumably with the help of shortened stirrup straps. We cannot say for certain whether Avar horseback archers stood up in the saddle, with the help of stirrups, to shoot (cf. Hyland 1994). However, ethnographic parallels, such as contemporary Mongolian horse archers, and the riding style of many modern competitive horseback archers demonstrate that this improves precision and speed in shooting with bow and arrow from horseback. Similarly, being able to direct the horse without using the reins is a major prerequisite for using any type of weapon on horseback, but especially for horseback archery. For many tasks in the everyday work of pastoralists on horseback, being able to direct the horse only with the seat and legs is an asset, for example when using a lasso, opening gates, or separating individual animals from the herd. Furthermore, a comparative study of horse-riding technique within modern “schools” of horseback archery around the world could be helpful for understanding the riding styles of early medieval populations of mounted archers.

Conclusions

Horses were an important aspect of life in the Avar realm. According to the historical sources, the Avars were accomplished mounted warriors, with outstanding skills in mounted archery, but also in fighting with a range of

different weapons on horseback. The phenomenon of horse-human burials, as well as other rituals involving horses and horse-riding equipment as part of the burial custom, in Avar-period archaeological contexts is diverse, with considerable regional and chronological differences, reflecting a range of different cultural traditions. However, throughout the Avar period, horse-human burials constitute only a small proportion of all Avar-period burials and the prevalence of a wide range of valuable items of personal adornment and grave goods within horse-human burials indicates that only individuals with high social status were buried with horses and/or horse-riding equipment. Stirrups occur in Avar horse-human burials from the Early Avar Period (late 6th–early 7th century AD) onward. It seems that the Avars played an important role in the introduction of stirrups into European equestrian culture. The results of research on the horse-riding syndrome could be relevant for determining identities of different segments of the population in the Avar period, in particular the elusive elites. Utilising the osteoarchaeological analysis of the horse-riding syndrome, a group of high-status Avar warriors may have been identified within an Avar cemetery in present-day Austria. Their lifestyle, in the final phase of the Avar Empire, appears to have differed from that of the lower-status male population buried in the same cemetery.

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Horses in the Viking Age

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Horses were vital to the movement, communication, and ideological landscapes of people in the Viking age (750–1050 CE). While Viking age Scandinavians may be better known for their ships, the burials, poetry, and iconography of these peoples reveal an intimate and meaningful relationship with their equine companions. Horses were used for transport, for networking and forging social relationships (through gifting of horses and their equipment), in hunting and war, and finally in death.¹ In many cases, the horse may have been associated with a warrior identity, but the everyday experiences of men and women with these working animals would have played a huge role in their cultural status, and horses as draft animals and companions seem to have played just as great a role in funeral rites and burial traditions as the warrior steed (Hedenstierna-Jonson and Ljungkvist 2021; Bill 2016). Notably, relationships with horses were not confined to burial or riding but were also the focus of certain social activities in this period. There is strong evidence that horse-fights and races played a role in local and regional gatherings and assemblies in Viking age and medieval Norway, Sweden, and Iceland (Atkin 1977–78:34; Solheim 1956:53; Stylegar 2014; Loftsgarden et al. 2017, 235; Ødegaard 2018), and horses seem to have played a significant role in pre-Christian religious beliefs, although often our examples of this are derived from later medieval, Christian writings.² The application of scientific methods, such as the analysis of lipid biomarkers, DNA work, and the study of isotopes and phytoliths, have increasingly proved their usefulness in expanding and developing our understandings of how horses and humans interacted and the possibilities of the resulting relationships (Löffelmann et al. 2023; Out et al. 2022; Sulus et al. 2022; Nistelberger et al. 2019; Wutke et al. 2016), and we can find further evidence of how horses worked with humans in life by examining the details of bit manufacture, and by examining the spaces in which horses and humans lived and worked together (Nørgaard 2021; Jennbert 2011:150; Sundkvist 2001:158).

The associations between horses and death and funerary rites seem long-standing, and a large part of our knowledge of how people lived with and used horses in the Viking age comes from burials, in which horses, parts of horses, and/or horse equipment were often a feature (in both elite and lower status graves, both inhumations and cremations) – although the numbers of burials with horses and horse equipment varied widely across Viking age Iceland and Scandinavia, and even across different regions. For example, so-called ‘equestrian burials’ flourished in certain parts of tenth-century Denmark, while in central

1 For focussed studies on horses in Viking age and medieval burials: Armstrong Oma 2018; Braathen 1989; Meling 2000; Müller-Wille 1970–71; Leifsson 2018; Sikora 2003; Sundkvist 1992, 2001. For studies focussed on the horse and rider, see Pedersen 2014, 2021. For horses in pre-Christian religion in Scandinavia and Iceland: Jennbert 2011; Loumand 2006.

2 For example, *Vǫlsa þáttr*, preserved in the fourteenth-century Flateyjarbók, in which a preserved horse penis called *Vǫlsi* stands at the centre of non-Christian religious activity in a remote household in Norway (Vigfússon and Unger 1862:331–6; see also Murphy 2018), and the ritualised eating of horsemeat in *Hákonar saga góða* (Aðalbjarnarson 1941–51: I, 171–172).



Figure 1. Grave A505 from Trekroner-Grydehøj: the burial of a female figure, possibly a magic practitioner, with horse and dog (Illustration by Mirosław Kuźma. Copyright by Leszek Gardela and Mirosław Kuźma).

Sweden, burials with horses were much more common in the earlier Vendel period (c. 540–790 AD) (Hedenstierna-Jonson and Ljungkvist 2021; Pedersen 2014:207). ‘Equestrian burials’ are a label given to those burials containing a human figure as well as horse equipment, spurs, and sometimes a horse. Such burials are usually but not always sexed male, and the chamber grave Bj. 581 at Birka is a notable example of a burial in which the remains of a biologically sexed female figure were buried with ‘warrior’ accoutrements, riding equipment, and two horses (Gardela 2021:47–55; Price et al. 2019; Hedenstierna-Jonson et al. 2017).³ Horses themselves have often seemed to be less present in these graves than the equipment associated with them, but recent excavation and analysis of the Fregerslev II burial (Sulas et al. 2022) has revealed that a grave without apparent horse remains, can be shown, through various analyses of soil chemistry, to have once hosted an equine body that has since decomposed into the soil.⁴ Variations also appear between graves that include evidence of riding equipment and those including draught equipment such as harnesses, with the earlier graves at Vendel and Valsgärde often containing the latter (Hedenstierna-Jonson and Ljungkvist 2021). In Viking age Iceland, inhumation burial with horses was common (prior to the Christian conversion c. 999/1000 AD), although sometimes without the horse equipment mentioned above. Many of the so-called pre-Christian inhumation burials of Iceland contained at least one horse, and there are even possible examples of horses buried on their own, with or without a related human grave. Therefore, a careful distinction should be made between burials *with* horses, and burials *of* horses (Eldjárn and Friðriksson 2000; Pétursdóttir 2007; Leifsson 2012, 2018). Burials with horses that could be called ‘Norse’ graves, have also been identified in the Scottish Isles, and areas of mainland Scotland, Ireland, and England with evidence of settlement by peoples from Denmark or Norway, suggesting that such burials were a feature of Norse culture that was transplanted across these areas of the Norse diaspora (Cooke 2016; Mazza 2020; Sikora 2003).⁵

Horses and horse equipment in burials are not restricted to those with an explicit warrior identity, and their presence is sometimes associated with an elite status.

- 3 A set of wagon burials have been seen as the female counterpart to the equestrian burials (although it has been rare to find horses or horse equipment in these graves); like some burials of women with horses, these wagon burials have been linked to notable female figures in society such as magic practitioners or widows (Eisenschmidt 2021; Staecker 2002).
- 4 The employment of such analyses on other burial sites may show that horses were more present in Viking age burials in mainland Scandinavia than previously thought.
- 5 Interestingly, it seems that the ‘ambling’ horses of Iceland were originally transported from diaspora areas in Viking age England (Wutke et al. 2016).

In large ship burials such as Ladby (11 horses), Oseberg (10 horses) and Gokstad (12 horses), the horses seem to reflect multiple spheres of meaning: some as riding horses, some as traction, and all as sacrificial objects or participants (Arwill-Nordbladh 2003:21; Jennbert 2011:158; Pedersen 2014:127; Sørensen 2001; Thorvildsen 1957). It is also possible that horses could have been buried as partners in ritual practice with human magic practitioners, as proposed, for example, for Grave A505 from Trekroner-Grydehøj in modern-day Denmark (see Figure 1), where a horse was laid in the grave with one leg seemingly over the female figure (Gardela 2021:74–76, 108–111; Evans Tang and Ruiter 2023a, 2023b). The reasons for burying horses, or burying horses with human bodies, in Viking age Scandinavia were undoubtedly complex, with variation across space and time.

In Denmark, the equestrian burials can be seen as part of local, regional, and international developments, and such a burial tradition may have emerged due to socio-political changes that encouraged local and regional elites to adopt a specific burial practice that acted as a public manifestation of power and status (like later Christian elites building churches) (Pedersen 2014:231, 240, 258–9, 266–7, 2021:134–5). In Viking age Iceland, such burials may have had a role in cementing (or creating) certain identities for certain groups or families, although the specific nature of human-horse relationships cannot be ignored, and the distinct circumstances around the migration to and settlement of Iceland in the Viking age may have created a particular milieu for these horse burials (Evans Tang 2022; Leifsson 2021; Pétursdóttir 2007).⁶

The association of horses with death can also be seen in iconographic sources such as the ninth-century picture-stone from Tjängvide, which shows a rider approaching a woman with a drinking horn, often interpreted as a dead warrior riding to Valhalla on an eight-legged horse (Figure 2) (Ellmers 1980; Roesdahl 1980:191–3, 1983, 2021; see also Oehrl 2019, 2020).

The eight-legged depiction of the horse on this stone (and the Ardre Kyrke stone) has been linked with Sleipnir, the eight-legged steed of Odin in Norse mythology (as recorded in later medieval sources), although it has also been suggested that the eight-legged depiction represents an interpretation of a horse performing the *tölt*, a pace distinct to certain breeds of horses, including those found in Viking age England and Iceland (Jennbert 2011:153; Wutke et al. 2016; for Sleipnir, and other mythical horses, see Faulkes 1982:30, 46, 1998: 20). The depictions of the riders on these stones may also exhibit a desire on the part

- 6 Certain groups in Gotland seem also to have been especially tied to a collective identity around the horse, based on their production of copper-alloy horse amulets and specific burial practices (Jensen 2013; Toplak 2023).



Figure 2. Tjängvide stone: showing a rider on an eight-legged horse being greeted by a figure with a drinking horn (Photo by Swedish History Museum).

of local elites to emulate a lifestyle known from connections with the Christian Carolingian empire (Jennbert 2011:208; Lundin 2006). Nonetheless, in eddic poems (recorded in medieval manuscripts, but with their roots in Viking age stories), we find Sleipnir and other mythological horses depicted as creatures that were able to move between worlds, leading scholars to argue that Sleipnir, and horses in general, may have been considered as psychopomps (Jónas Kristjánsson and Vésteinn Ólason 2014:358, 375, 381–2, 446; Loumand 2006; for a discussion of the possible links between the eight-legged horse and shamanistic practice see Price 2019:264, 266–7). In Old Norse poetic language, metaphors are often used, called kennings, that use one thing to describe another; and horses are included in various kennings, especially for the gallows (for example ‘hábrjóstr Sleipnir hǫrva’, [high-chested Sleipnir of flax cords]), further strengthening the conceptual links between horses and death (Marold 2012:28; Price 2019:61).

Kennings can also reveal additional associations between horses and other features of Viking life, as horses, especially as draught animals, seem to have been held in a close conceptual relationship with ships through kennings such as ‘skær sunða’ (horse of the sounds > SHIP). While other traction animals, such as oxen, are sometimes used in kennings for ship (suggesting that four-legged draught animals are the key signifier here, rather than specifically horses), we also find the concept of the ship used in kennings for horse, for example ‘longship of Odin > HORSE’ and ‘ship of the league > HORSE’, suggesting a rather more intense blending of horse and ship bodies in their relationships with humans (Clunies Ross 2017; Whaley 2017).⁷ The blending of horse and non-horse is seen also in the concept of the human-horse riding unit (Armstrong Oma 2018), the use of horsehair in clothing, such as the woven horsehair bands in the pre-Viking burials at Høgø and Evedø, and in ropemaking for ships (Bønder-Jørgensen 2001; Westerdahl 2010:275).⁸ In Iceland, the horse seems to

have taken on some of the transportation roles elsewhere fulfilled by the ship or boat – a role that may be meaningful in relation to the significant numbers of horses in burials in Iceland and the apparent importance of horses in later saga narratives (Evans Tang 2021, 2022; Rohrbach 2009; Pétursdóttir 2007:2; Byock 2001:46).

It is likely that horses held important roles in pre-Christian cults, such as those of the god Freyr, and were associated with fertility, although the descriptions of sacred herds of horses come from later medieval writings, rather than the Viking age itself.⁹ The keeping of such herds may have fulfilled a purpose of providing sacrificial animals for ritual feasting, rather than performing any specific purpose in life. Horse sacrifice and feasting on horse meat (as seen from butchery marks on horse bones) are likely to have been vital elements of certain communal rituals in the Viking age, perhaps preceded by horse racing (Perdikaris 1990; 1996. Hoek–Springer 2000:27).¹⁰ Racing the horses to exhaustion may have made them easier to kill, and therefore more pliable for dramatic methods of slaughter, such as striking the centre of the forehead, slitting the throat or decapitation – or indeed all of the above, as suggested for the horse in burial II at Dalvík (Brimnes) in Eyjafjarðarsýsla, Iceland (Leifsson 2018:118–121, 305).¹¹ Decapitation as a method of killing is seen elsewhere in Viking age Iceland in the killing of cattle at Hofstaðir (Lucas

7 Descriptions sometimes equate the rudder of the ship and the bit of the horse, and one kenning calling the horse the ‘animal of fishing gear’ links the reins of the horse with the ropes and lines of the fishing boat: language blending the bodies of ships and horses (Jesch 2017). It may be that these links extended to such items of clothing as horsehair woven bands, clothing which may have been understood as controlling features of personal identities, just as the ropes of the ship or bridle of the horse control these agents.

8 Horsehair seems to have held some significance in human-horse relations in medieval Scandinavia, with the names of mythological and literary horses containing *-faxi* (mane), for example Freyfaxi in *Hrafnkels saga Freysgoða*, and Gullfaxi and Hrímfaxi from mythological tradition (Faulkes 1998:20, 90; Jón Jóhannesson 1950; Jónas Kristjánsson and Vésteinn Ólason 2014). In the Sagas of Icelanders, we also see that trimming the manes of their horses is an activity undertaken by men, even those who would not usually undertake farm work (for example, *Bjarnar saga* ch. 32, *Gull-Þóris saga* ch. 14, and *Finnboga saga* chs 23 and 24).

9 For example, a sacred herd of horses in *Óláfs saga Tryggvasonar*, and a horse, Freyfaxi, in *Hrafnkels saga*, dedicated to Freyr: both thirteenth-century narratives (Vigfússon and Unger 1860:401; Jón Jóhannesson 1950:100). The idea of sacred horses seems to echo the description of the white horses of Germanic tribes in Tacitus, which were apparently kept in a specific grove, cared for by specific persons, and forbidden to be used for normal purposes – only for auguries (Rives 1999, ch. 10). A similar practice is described in Saxo Grammaticus concerning a community in eastern Europe (Ellis Davidson 1996:128; Ślupecki 2020; McKinnell 2020:76–7; Sikora 2023), but there does not seem to be much evidence at all for such practice in Viking age Scandinavia. Even Freyfaxi, while allegedly dedicated to Freyr, performs no apparent ritual function.

10 See also Ibn Faḍlān’s account of a Rūsiyyah funeral (Montgomery 2000:16). It is also possible that hooves or legs held a ritual significance, perhaps related to racing, or to the special position of horses as travellers. The hooves and legs of horses seem to be singled out for special attention at certain sites, for example at Borg in Östergötland, where horses had their hind legs struck with an axe before being killed; and horse legs (alongside heads) feature often in the house sacrifices of the Middle Ages (Falk 2006; Nielsen 2006:245). At Trelleborg, meatless parts of the horse such as the hooves were present in the sacrificial wells, as well as more fleshy parts of the animal (Gottfredsen et al. 2015).

11 Evidence from inhumation burials in the Baltic suggests that horses may have been stabbed with an iron spike to bleed them before deposition in graves (Zinoviev 2011:79–80). It is worth noting that raising the heart rate of an animal (via exercise) will cause the blood to leave the body faster in the case of puncturing or severing an artery, creating a dramatic spray of blood and adding to the theatre of the killing.

and McGovern 2007:22–23). It may also be that extended periods of exercise such as racing lowered hormones in the horse, such as cortisol and epinephrine, which can detrimentally affect the taste and texture of meat: making a raced horse a tastier sacrificial meal (Nemec Svete et al. 2012; Micera et al. 2010).¹²

It is possible that, rather than a sacred stallion unused to people and work, a trained riding horse would have been considered a prestigious gift for divine powers, and such a trained stallion–gift is possibly seen in the ‘riderless steed’ brooch mould from Ribe (Deckers, Croix and Sindbæk 2021; see also Kaliff and Oestigaard 2020:216–18). The depiction of a riding horse in these brooch types emphasises the intense training relationships between humans and horses that would have been required for such figures to exist. Armstrong Oma (2018), in her analysis of the Gausel bridle, has suggested that human-horse relationships in life should be at the forefront of discussions of horses in Scandinavia, especially in burial contexts. Bridles and bits can be considered as ‘binders’: objects that fused the human and the horse together, and in turn came to represent the human-horse hybrid by themselves (therefore a piece of riding equipment could fulfill the ‘horse’ function in a grave without the need for the deposition of a whole horse, just as parts of animal bodies can be understood to represent a whole animal) (Armstrong Oma 2018:135). Strong human-horse relationships are found in the medieval poetic and saga literature of Iceland, and the saga literature especially is haunted by ‘special’ horses, as treasured objects, sacred animals, and valued partners, and such animals might be seen as memories of Viking age horses and earlier human-horse relationships, especially when associated with the development of communities in a new land (Evans Tang 2021, 2022).

I close this chapter with a perspective on horses and their relationships with humans that may seem rather more modern: that of equine-assisted therapy. In an episode from the medieval *Bjarnar saga Hítðælakappa*, a saga which describes an imagined Viking age, a woman has fallen into a deep depression after learning about the death of her first love. There is only one thing that seems to relieve her pain, which is riding on a horse:

Henni þótt sér þat helzt ró, at hon sæti á hestbaki, en Þórðr leiddi undir henni aptr ok fram, ok gerði hann þat, at honum þótti stór mein á vera, en vildi við leita at hugga hana (Nordal and Jónsson 1938:207).

The most relief was offered to her by sitting on horseback as Þórðr led her horse back and forth. He did so, even though it was a great pain to him, as he wanted to try to comfort her. (Translation by author)

Here the horse is calming, healing. Not a warrior’s mount or a divine sacrifice. They are a comforting companion, and such companions filled the Viking world. It is fitting that more and more scholarship has turned towards considering horses, even when found in burials, as multifaceted actors within multiple spaces and relationships in life (see Armstrong Oma 2018; Armstrong Oma 2022; Eriksen and Ratican in press; Evans Tang 2022; Evans Tang and Ruiter 2023b).

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12 The eating of horsemeat is also seen in fantastical settings as markers for a barbaric, non-human nature, for example in *Bárðar saga Snæfellsáss* (ch. 15) in which horsemeat is served at a wedding feast between the daughter of a troll and a human man, for the troll guests to consume (which they do so in a bestial manner) (Anderson 1997:257).

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The History and Historiography of the Horse in India

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The horse has been central to Indian culture since about the fifteenth century BCE and until the turn of the nineteenth century CE. Nonetheless, there is no single consolidated, standardised primary source on this history, with sections on and references to the horse scattered across numerous texts pertaining to different periods and regions of the Indian subcontinent or South Asia. The earliest example of this is the Rig Veda, dated to circa 1200–900 BCE as the oldest of the four Vedas. These four compendiums of hymns and incantations were composed by the Indo-Aryan settlers of north India and became the basis for the Vedic religion that, in turn, developed into Hinduism. The Rig Veda contains 215 references to the horse, mentioning it thirty-nine times more than the cow, the other Indo-Aryan animal par excellence that came to be considered sacred by upper-caste Hindus (Sharma 1995:14). These references to horses are contained within hymns extolling Vedic warrior chiefs who rode horse-drawn chariots or dedicated to the *ashvamedha yajna* or horse sacrifice (Chandra 2021:3–4). Thus, they present only a picture of the horse's eminent place in Vedic culture rather than give historical facts. An important later example is the Mughal chronicle *Ain-i Akbari* written by Abul Fazl in the late sixteenth century. It is one volume (the one providing the record of the administration under Akbar) of three constituting the official history of the reign of the mighty Mughal emperor Akbar. While eleven sections are dedicated to horses and a number of subsections to related topics like the cavalry and polo, making equine matters a weighty subject, it is, nonetheless, one of many topics covered. Meanwhile, the arcane genres of Ashvashatra, Shalihotra and Faras manuscripts, combining bestiary with manual, provide little historical information. The modern historiography on the subject is also sparse, consisting mainly of a few journal articles/book chapters (see, in particular, Arha 2016; Chakravarti 1991, 1999, 2009; Gommans 1994; Mishra 2012; Lally 2015; Lambourn 2003; Sachdev 2007). In some books, the horse provides a key theme but not the central or only focus (cf. Digby 1971; Gommans 2019) and/or the monograph falls outside the realm of animal history (cf. Deloche 1990). Then there is at least one unpublished thesis touching on the subject (Meadows 2013). Recently, however, two dedicated monographs were published (Chandra 2021; Doniger 2021). In my work, including this essay, I have in fact tried to show how visual sources, particularly paintings, can throw light on the history of the horse in India and fill in the gaps in textual sources.

If the scholarly discourse on the horse in India was limited for the longest time, it is perhaps because it was overly, almost exclusively, oriented towards untangling two knots. The first relates to the origins of the horse in South Asia since the native population of

wild horses disappeared around 8000 BCE (Habib 2017:53). There was a long-standing debate about the origins of the domesticated horse in India, whether it was native to the region – like the *khur*, the Indian wild ass or onager (*Equus hemionus khur*) – or not. This debate stemmed from the contrast between the limited evidence of the horse from the Bronze Age Harappan, or Indus Valley, Civilisation and the surplus of it from the Indo-Aryan culture that followed the Harappan Civilisation as the dominant one in north India (see, for example, Sharma 1995:14–34; Trautmann 2007). Recent finds added fuel to the fire; it was contended that the horse remains excavated from one Harappan site, Surkotada, cover the entire Harappan period, c. 2300–1700 BCE (Bökönyi et al. 2010). One expert agreed that the remains suggest that the domesticated horse was available by the mature phase of the Harappan Civilisation towards the end of the third millennium BCE, although he insisted that any horses arrived domesticated rather than being domesticated within the Harappan milieu (Bökönyi et al. 2010:297–307). But other experts challenged the contention altogether, unsure about both the nature of the remains, which could just as well be those of the *khur*, and the context of the site itself, assessed to be ‘poorly-defined’ (Bökönyi et al. 2010:308–315). Meanwhile, others raised the intriguing possibility of any random remains reflecting the earliest evidence of the import of horses into India by land or sea, a phenomenon which is increasingly well attested from the later periods (Bökönyi et al. 2010:315–316). Yet another contentious find are the three chariots with solid wheels excavated from the site of Sanauli, dated to 2000–1800 BCE. While the archaeological reports identified them as horse-drawn chariots, an external scholar quickly cast doubts by arguing that these were carts pulled by bulls (Parpola 2020).

Thus, this was not an issue of two conflicting sets of information as much as of a mindset on the part of some votaries of the native origins of the horse as a domesticate. For them, if the horse was not present during the Harappan Civilisation, then the Harappans were different from the Indo-Aryans who introduced the horse on a large scale. This, in turn, would mean that the Indo-Aryans migrated into India – the fact of them having done so gradually, in many rounds from, essentially, Central Asia from about the fifteenth century was confirmed by genetic research (Narsimhan et al. 2019), as well as archaeologically and linguistically (Anthony 2010; Thapar 1996; Trautmann 2007:230–253). Moreover, their use of the horse and the spoked-wheel chariot enabled them to spread quickly into north India and establish themselves all over the region. Since these migrants founded the Vedic religion in India, which became the basis for Hinduism, it would become more difficult for modern Hindu nationalists to take retrospective exception to later migrations (Muslims, mainly) into India. The problem with such a polemical divide is that the proponents of Indo-Aryan migrations may have

overemphasised the ‘foreign’ origins of the horse – and arguably, by extension, the Indo-Aryans as well as the later migrants – in their eagerness to counter the nationalists. It is of course important to note that the horse was not native to India, with genetic research recently confirming that the ancestors of all modern domesticated horses originated in the Western Eurasian steppes, from where they spread and provided the dominant lineages in different parts of the world in roughly the second millennium BCE (Librado et al. 2021). Yet it is also important to remember that the horse had a long run on the subcontinent, from its first appearance on the scene until the modern, mechanised age. And it matters little if the horse was native to India or not if the intention is to study the history of the horse in India, which was certainly an ancient one. The story of the horse in India must not get stuck at its origins.

The other reason for the preoccupation with the notion of foreign, the second knot, has to do with a continuous history of importing horses from Central Asia and the Middle East. For a while at least, they were also imported from Tibet, until horses began to be bred in the regions through which these Tibetan horses had been imported based on the same stock (Chandra 2021:79–81). It is this aspect of the horse scene of India that received far more attention than successful attempts to breed horses in some, if not all, parts of the subcontinent to supplement the foreign supply and perhaps cater to local and non-elite demand. Though there is evidence of importing horses from earlier periods, references to the caravan trade in horses from, mainly, Central Asia and, increasingly, the sea trade from the Middle East are even more numerous and often quite spectacular from about the eleventh century CE. For example, from circa the eleventh to the seventeenth centuries, horses were one of the two main items of import into India. It is even possible to make an estimate of the vast numbers of horses imported between the late sixteenth and seventeenth centuries when much of India was under the rule of the Mughal dynasty – up to 30,000 by the late sixteenth century and anywhere between that number and 100,000 by the late seventeenth (probably closer to the former) (Moosvi 1987:378; Chandra 2021:13, 31). The Moroccan globetrotter Ibn Battuta left a vivid description of the passage of a herd of 6,000 horses from the Eurasian steppes all the way to India in the early fourteenth century (Ibn Battuta 1953:145). Similarly, there is a wall painting in a temple in Tamil Nadu, the Narumpunatha (Shiva) Temple in Tiruppudaimarudur, from circa the seventeenth–eighteenth centuries, depicting a ship packed with horses, as well as Arab traders, riders and sailors (Figure 1).

Indeed, it appears that additional references from the later periods cannot only be put down to a greater availability of sources but may well be indicative of an increase in the demand for these ‘foreign’ horses. This can be correlated to the arrival of Central Asian Turks in the eleventh century, who raided and invaded India from



Figure 1. Wall painting in the gopuram interior, Narumpunatha (Shiva) temple, Tiruppudaimarudur, Tamil Nadu, circa seventeenth–eighteenth century. Photo by Crispin Branfoot. This wall painting is evocative of the sea trade in horses between the Middle East and India, which lasted on a considerable scale for at least a millennium until it petered out in the twentieth century.

bases in Afghanistan, establishing their rule in many areas of the subcontinent, including the Delhi sultanate (cf. Digby 1971). Their style of warfare, the mounted archery that distinguished it and associated battle tactics, were introduced in India on a wide scale, and the importance of both light and heavy cavalry grew even in those parts that were not under Turkic rule (Wink 1997:3–4, 79–95). Although different Indian armies diversified along various lines over time (the introduction of gunpowder having a transformational effect, for example), the cavalry remained central until the introduction of European-style armies under colonial influence in the eighteenth century (Gommans and Kolf 2001:26–42).

Horses had not been absent from the battlefields of India before the coming of the Turks. Ancient Indian armies had included arms of horse-drawn chariots and cavalry/mounted troops (Trautmann 2015:108–138). While the chariot fell into disuse by the turn of the first millennium CE, the cavalry remained a fixture in many armies. Even mounted archery had been practiced for a period under the Gupta rulers of north India, i.e., between the fourth

and sixth centuries, but it did not catch on enough to last beyond that (Yadava 2001:86–89) (Figure 2).

As ‘the age of cavalry warfare’ dawned in India from the eleventh–twelfth century, it was probably found that not enough horses were bred in India to meet the demand (Chandra 2021:11–14). Moreover, there appears to have been an elitist preference for imported horses all along, especially among the migrant communities of Turks, Iranians, Arabs and Afghans. The differing taste for horses across different communities and regions in India is a theme I explore across my book (Chandra 2021), often in relation to paintings. The Mughals, for example, favoured Arab-Persian horses the most, described by Abul Fazl as the top-ranking steeds within the Mughal establishment (Abul Fazl 1873:134, 233). There are numerous references to prestigious gifts of these horses from the Shah of Iran to different Mughal emperors and the lengths that Mughal emperors such as Shah Jahan were prepared to go to in order to procure such horses (cf. Chandra 2021:62–63, 144; Lambourn 2003). There is also a historical painting, contained within the illustrated copy of the *Padshahnama* (the official chronicle of the



Figure 2. Plaque with Galloping Horse and Rider. Uttar Pradesh, Gupta period, fourth-fifth century. Terracotta with red pigment, 21.3 × 25.5 × 7.3 cm. The Art Institute of Chicago, gift of Paul F. Walter and Marilyn Walter Grounds. Note that these early mounted archers of India were riding without stirrups, the use of which was only established in the region in the ninth to eleventh centuries.

reign of Shah Jahan, now in the Royal Collection Trust at Windsor Castle in the UK) which features a piebald Persian horse (Chandra 2021:113–114) (Figure 3). The painting portrays Shah Jahan receiving the Iranian ambassador, Muhammad Ali Beg, in his court in 1631. The painting is dated to about a couple of years later, that is, circa 1633. It is quite well known for its style, as well as its representation of a lavish Shah Jahani *darbar*, a diplomatic mission and the exchange of diplomatic niceties in the Mughal context. The anthropocentric analyses of this painting always miss the central placement of four horses in the painting, even though the significance of the horse to the Mughal empire is indisputable. *Mansabdari* or the official ranking system of the empire from Akbar's time was based on the number of horses/horsemen that officials were required to bring to the army (Moosvi 1981). The Mughal chronicler Abul Fazl summed it up wonderfully when he wrote that the horse is 'of so great importance for the government, and an almost supernatural means for the attainment of personal greatness' (Abul Fazl 1873:133). Furthermore, there has long been a fashion for piebald and skewbald horses within the traditional horse culture of India, as attested by a number of paintings and the continuing demand for them at livestock fairs (Figures 6 and 7). They were once especially bred in Central Asia and Iran for import to India (Pour 2013:126). Shah Jahan himself had a soft spot for piebald horses (Chandra 2021:81), besides Arab-Persian ones. Indeed, the piebald in the painting stands slightly in front of the other three horses, as though it is the best of them and constitutes a special present from either the Iranian ruler or his ambassador.

Shah Jahan was repeatedly portrayed across different settings on a stallion that looks similar to or even the same as the Persian piebald: both as a divine king heralded by cherubs and an aesthete (Figures 4 and 5). It seems that a particular kind of horse became associated with the comportment of Shah Jahan, an integral part of not only his equestrian iconography but also the image of him as a sacred king. This piebald might well have had its origins in the very horse which was a gift from the Iranian monarch or ambassador before it became a stock image.

In spite of their fascination with Arab-Persian horses, the Mughals retained a fondness for horses from Central Asia, linked to their ancestral heritage as Turco-Mongol nomads and renowned for battle-hardiness (Chandra 2021:35–37). As in the case of prize Arab-Persian horses, the Mughal emperors received Central Asian horses as gifts from the different rulers of the region as well as procured them directly. There is an older, Central Asian counterpart to the abovementioned Shah Jahani historical painting. This one is from the illustrated copy of the *Akbarnama*, the official history of the reign of Akbar, in the collection of the Chester Beatty Library in Dublin (https://viewer.cbl.ie/viewer/object/In_03_54/1/. Accessed 29 February 2024). In this painting, Akbar sits in court and receives a gift of two horses from the incoming embassy from Badakshan. While the event took place in 1561, the painting is dated to the turn of the seventeenth century. One of the horses is a dappled grey, the other has the golden coat of a forebearer of the Akhal-Teke.

None of this means that horses could not be bred in India. Indeed, Central Asian horses formed only one of



Figure 3. Shah Jahan Receives the Persian Ambassador Muhammad Ali Beg, 1631. Mughal painting from the illustrated *Padshahnama*, circa 1633. Opaque watercolour and gold on paper, 30.7 × 20.2 cm. Royal Collection Trust, UK/Wikimedia Commons.



Figure 4. Equestrian portrait of Shah Jahan. Mughal painting, seventeenth century. Ink, opaque watercolour and gold on paper, 31.4 × 21.3 cm. The Metropolitan Museum of Art, gift of Alexander Smith Cochran, 1913.



Figure 5. Shah Jahan on Horseback. By Payag, Mughal painting, folio from the Shah Jahan Album, dated here to circa 1631–33. Ink, opaque watercolour and gold on paper, 38.9 × 25.7 cm. The Metropolitan Museum of Art, purchase, Rogers Fund and the Kevorkian Foundation Gift, 1955.

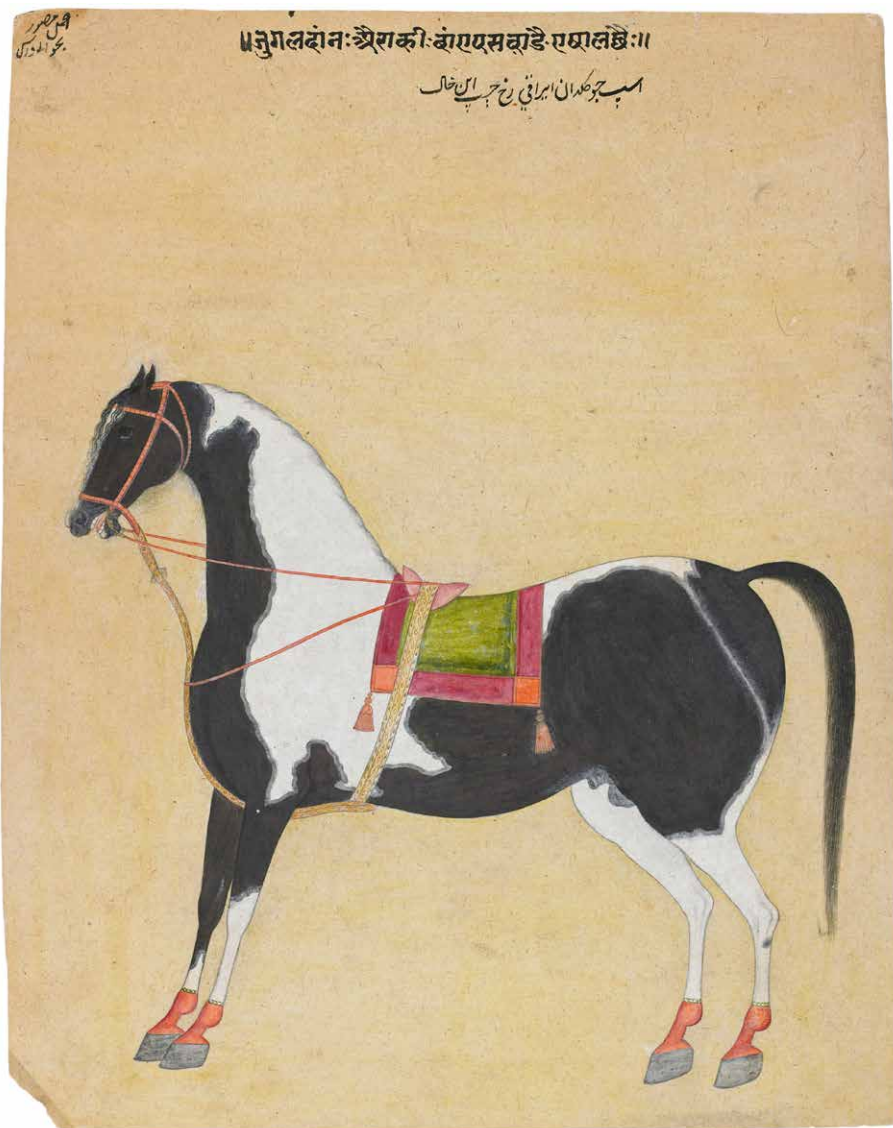


Figure 6. The Iraqi Steed Jugaldan. By Bhavani Das, court painting from Kishangarh, Rajasthan, circa 1720. Opaque watercolour on paper, 31.12 × 24.45 cm. Minneapolis Institute of Art, the Katherine Kitteredge McMillian Memorial Fund.

the two largest contingents of horses in the Mughal army; the other providing the rank and file was a contingent of the Indian ‘Tazi’ horse (Abul Fazl 1873:243, note by translator). If this was the case in the Mughal north by the late sixteenth century, then, in the earlier part of the century, the army of the Vijayanagara empire that then dominated south India consisted of troops that were mainly mounted on local horses, even as the elites preferred horses imported by sea route (Sewell 1962:362). There is sufficient evidence from the ancient period itself, of horses being bred in different parts of South Asia (Gupta 1983–4:188–191). While certain areas such as Punjab and Gujarat seem to have produced horses continuously since ancient times, others such as Rajasthan and the Deccan emerged as breeding centres much later, in the sixteenth–seventeenth centuries (Chandra 2021:70–98, 126–138). By the late sixteenth century, almost all of the

‘western frontier’, from Punjab to Gujarat, encompassing Sindh, Balochistan and Rajasthan, were producing horses. Indeed, many of the modern breeds of India and Pakistan are associated with this region, historically consisting of arid and semi-arid zones rich in grasslands. These breeds include the Kathiawari, Kutchi-Sindhi and Marwari from present-day India, and, from Pakistan, the Sindhi, Balochi and Unmol (Rousseau 2017:320–323). Across the width of the north Indian heartland from the western frontier, the alpine meadows of the western and eastern Himalayas as well as the foothills also provided fertile territory for breeds of horses to emerge, originally produced from the Tibetan horses imported into this region, as previously mentioned. Horses with the same Roman-nosed profile appear in wall paintings from the western Himalayas and eastern India indicating the development of kindred breeds from the same stock (Figure 8).

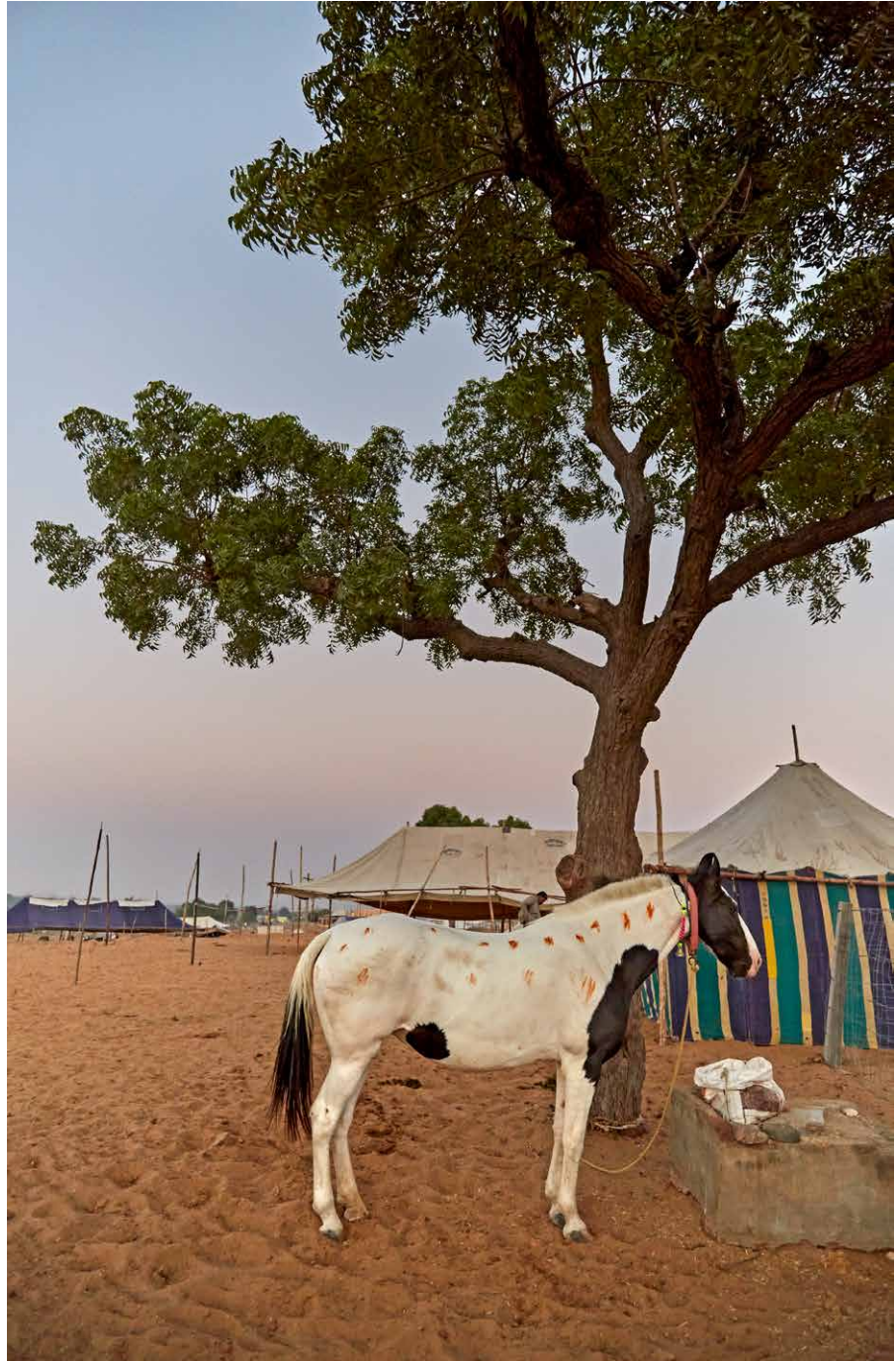


Figure 7. A horse on the fairgrounds, Pushkar livestock fair, Rajasthan, 2017. Photo by Dinesh Khanna.

The current recognised Indian breeds include horses associated with the Himalayan belt, comprising the Spiti, Zanskari and Bhutia. The development of the Manipuri pony, the final of the Indian breeds surviving into the present, may lead to imagining that the Himalayan breeding zone extended into the hills of Northeast India. The Manipuri was generally believed to be descended from the Asian wild horse (McBane 2004:249; Rousseau 2017:326), or Przewalski's Horse, but current aDNA research has

shown that all modern horses, including the Manipuri, are descended from one lineage, DOM2, with ancestors on the Pontic Caspian steppes (Librado et al. 2021). The Przewalski does not share ancestry with any other living horses, and is a sister class (Gaunitz et al. 2018). As such, some genetic research is being conducted on the related breeds of the Kathiawari, Kutchi-Sindhi and Marwari that reveals that these horses are phylogenetically closer to the Arab than the Thoroughbred (Chandra 2021:243–n.11). Although the



Figure 8. Mounted archer. Wall painting in the Vairochana Temple 1/Shakyamuni Lhakhang, Mangyu monastery, Ladakh, circa eleventh–twelfth century. Photo by Peter van Ham.

Thoroughbred was originally bred from Arab stallions, the Indian breeds seem to have been continuously bred from Arab stock until recently. Such research on the Himalayan-Manipuri breeds is also required to throw further light on their antecedents.

After all, the origins of the modern equestrian sport of polo can be linked to the Manipuri. Polo was played in courtly circles in much of the Indian mainland since at least the medieval period as evidenced by textual references and increasingly by paintings from different court ateliers (Chandra 2021:144–146). Paintings also show that women participated enthusiastically in the sport in spite of being in purdah (Chandra 2021:155). Thus, polo did not just help to forge elite masculinity but also enabled women from such households to overcome seclusion. Moreover, polo was not just played in the subcontinent as an elite sport but more popular versions of it existed in the greater western Himalayas, from Chitral, Gilgit-Baltistan to Ladakh, and in Manipur in Northeast India, although it is difficult to uncover their origins. It is possible, however, to trace modern polo back to Manipur (Chandra 2021:82–83). While the earliest reference to polo in Manipur in the *Cheitharon Kumpapa*, or *Court Chronicle of the Kings of Manipur*, dates to the early

seventeenth century when the game was standardised, oral tradition gives it mythological, romantic beginnings (Parratt 2005:67, 68–n. 7). The modern game was devised initially as the quintessential colonial sport after some British colonial officials and tea planters saw Manipuri teams play matches in Assam, leading to the formation of the first club of modern polo in Silchar in the mid-nineteenth century. Some of the many ironies surrounding the horse cultures of the subcontinent under colonial rule revolve around Manipur. Initially, Manipuri ponies were snapped up by early colonial adopters of the game and even exported to Britain, leading to the depletion of stocks, before they were discarded in favour of Argentine polo ponies and, of course, the Thoroughbred. Manipuri ponies were possibly dismissed for being too small, 11.2 hands at most in the nineteenth century, by the British, who were obsessed with horse sizes. It is said that a maharaja of Manipur, Churachand Singh, introduced the modern game in his state after he picked it up at Mayo College, the boarding school established in Ajmer in Rajasthan during the colonial period for Indian princes under British paramountcy.

Previous scholarship has tended to bypass all this rich history to focus on the import of horses to the extent

that it reinforces pre-modern and colonial impressions of an Indian environment unsuited to raising horses (Chandra 2021:12–14, 16–19). Much has been made of the negative testimonies of foreign travellers such as the Venetian Marco Polo, without realising that any such criticism pertained to a specific part of the subcontinent and a period, or could be second-hand or biased (Chandra 2021:12, 49–52). Meanwhile, the positive accounts of others have not been factored in. For example, in the seventeenth century, the French traveller Jean de Thevenot wrote about Delhi: ‘There is an abundance of all sorts of horses [including] the Country breed, which the [Mughals] make use of, and which are very good horses’ (Sen 1946:62). But then Thevenot was hardly as famous, or categorical, as Polo. The colonial view of Indian breeds was similarly uncritically accepted without accounting for colonial prejudice and racist projection. Neither was it examined in light of the history of the horse in England, that is, the historical experience of the colonists themselves (Chandra 2021:16–19).¹ The result of such a limited historiographical outlook is that while there is understanding of the political and social implications of the international horse trade, there is hardly any research on many other vital aspects. One of them is the development of Indian breeds, and their decline in the colonial period, as touched upon above. The illustrious historical breed of the Deccan, comprising the Bhima or Deccani ponies, for example, became extinct, unsung after enabling the dramatic rise of the Maratha light cavalry. Meanwhile, the fate of the Manipuri hangs in the balance. Another aspect that has attracted hardly any research are the traditions of horse care and management in India as well as their intersection with ritualistic practice as perhaps hinted in the *Ashvashatra*/*Shalihotra* and *Faras* genres. It seems that not enough horses were being bred in India to meet the ever-growing demand, for there is no other reason for them to be imported on such a vast scale. Having said that, by the eighteenth century, homegrown horses may well have been supplying most of the demand; this being either the cause or effect, or both, of the decline of the international trade (Chandra 2021:37–40). It is also worth remembering that, historically, there might not have been such a contrast between South Asia and the larger Asian continent in the minds of their populations, which conceived of the many different regions of Asia as an interconnected space between which people, commodities and ideas flowed.²

The horse was typically studied along utilitarian lines, as a war animal or a trade commodity. The recent monographs

have, however, taken a cultural lens to demonstrate the profound influence of the horse on mythology, art, lore and literature across different parts and religions of India as well as normative and folk traditions (Chandra 2021; Doniger 2021). The horse is shown to have shaped historical developments, social identities and cultural events. For example, it is well known that the horse was instrumental in the rise of elite martial classes such as the Rajputs and the Marathas (Chandra 2021:84–91, 121–38). But subaltern or lower-status identities such as that of the Nayak Bhil community of Rajasthan also formed around the animal, as is discussed below. My own book (Chandra 2021) emphasises the interface between humans and horses in India, aiming to bring out the social contract and emotive bonds that informed the long historical association in general. Tales of battles fought over horses, stories such as that of a chief becoming a desert-wandering ascetic after his



Figure 9. Chand Bibi Hawking with Attendants in a Landscape. Attributed to Deccan, circa 1700. Opaque watercolour, gold and silver on card-weight paper, 25.4 × 15.9 cm. The Metropolitan Museum of Art, Louis E. and Theresa S. Seley Purchase Fund for Islamic Art, 1999.

1 For an updated version of this argument, see the UK edition of the book by Holland House, 2022:16–19 or the Indian paperback edition by Picador India, 2022:21–26.

2 I am grateful to Prajakti Kalra for this idea.



Figure 10. Details of a phad or cloth scroll painting depicting the epic of Pabuji. By Rajendra Joshi, Shahpura, Bhilwara, Rajasthan, circa 1990. Collection of Rupayan Sansthan, Jodhpur, photo by Kuldeep Kothari.

mare is stolen, and 'horse-and-groom' paintings that were produced alongside stately equestrian portraits are just a few examples of the profound, pervasive impact of the horse. If an Indian princess, Chand Bibi, was iconised in paintings produced in the eighteenth century as hawking on horseback (Figure 9), equestrian statues of two queens, Tarabai and Rani Lakshmi Bai of Jhansi, were raised in recent times.

A leitmotif in my book is the tradition of Pabuji, a deified folk hero of Rajasthan, presented through both oral and written stories as well as an epic that was narrated by a bard-priest (often accompanied by his wife) over seven nights. Rare as a full recital increasingly is, it was narrated against the backdrop of a large cloth painting representing characters and episodes from the saga. The narration by the bard-priest includes singing and dancing to the tune of the ravanhatta, a sort of fiddle, and tiny bells, as well reciting. One can imagine the number of plots and subplots contained within an epic that can only be told in its entirety over the course of seven nights. However, the main storyline revolves around a blood feud between two Rajput clans, Pabuji's and his rival Jindrao's, the cutthroat rivalry between the two Rajput chiefs breaking out over a black mare, called Kesar Kalmi, that they both coveted. To add strength to feeling,

she is Pabuji's semi-divine mother reincarnated as the mare. A written version of the story from the late seventeenth century attributes very different origins to the mare: she is supposed to be born of a mare who was impregnated by a horse discharged from the sea. This gem of a detail evokes the sea trade in horses from the Middle East and indicates that Arab stallions were crossed with local mares to engineer local breeds (Chandra 2021:132). While Pabuji and Jindrao are both high-class Rajputs, Pabuji's bard-priests come from the subaltern Nayak Bhil community. The Bhil tribesmen of western Rajasthan began to serve Rajput lords as syces or grooms in their stables (Chandra 2021:205, 254–n. 1). This group came to be known by the distinct name of Nayak, which was adopted by the Bhils of the region as a whole over time. It is worth mentioning that Pabuji's followers come mainly from the Raika or Rebari community, another lower-status group that historically consisted of camel breeders and herders. The painting that illustrates the epic is dominated by the larger-than-life figure of the man himself, Pabuji, his beautiful black mare, Kesar Kalmi, and an equestrian portrait with the both of them going for Pabuji's wedding (Figure 10).

Colonial rule transformed the horse culture of India in different ways, as I discuss in my book, while industri-

alisation and mechanisation rendered the horse in India, as everywhere else, as marginal to human civilisation as it was once central. Yet the remnants of both Western and traditional horse culture can still be seen in India. The Indian army continues to have two mounted units, including the President's Bodyguard, the household cavalry of the Indian head of state (Chhina and Chandra 2015). Considered the foremost regiment of the Indian army, it escorts the president to the annual Republic Day Parade in New Delhi, where it delivers the national salute received by the president. Most major cities have racecourses. Equestrian sports based on international standards from

polo to dressage, eventing and showjumping are practiced within the Indian army and the urban elite world. At the 2020 Tokyo Olympics, Fouaad Mirza, descended from Aly Asker, a horse trader who migrated to India from Shiraz in the early nineteenth century, became the first Indian to reach the finals in individual eventing. At the same time, Indian horses, even as their breeds are precarious since the British sought to replace them with horses to their taste, are still traded at traditional livestock fairs. One such fair is held in Pushkar in Rajasthan, now famous for camels, but once also known for the horses that were at the heart of the history of India (Figure 7).

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PART III

**WORKING AND LIVING
WITH HORSES**

Approaches to Researching Horse Training in Medieval Western Europe: Thirteenth to Fifteenth Centuries

Camille M.L. Vo Van Qui

Medieval horse training is a subject of growing interest among historians, especially given the importance of horses in warfare, economy and travel (Davis 1989; Hyland 1994). Written sources are relatively limited for medieval Western Europe: only the first chapters of the Jordanus Rufus's *De medicina equorum* (c. 1250), a veterinary treatise written in Latin, give any original indications on the practicalities of training a horse to become a warhorse (Molin 1818). Rufus was a knight and marshal of Emperor Frederic II. His treatise was extremely popular in the late Middle Ages, as shown by the fact that 173 identified manuscripts exist, and that vernacular translations in languages such as Italian, French, Occitan, and Hebrew were made (Montinaro 2015). This text has been extensively studied from a veterinary point of view and is considered to be representative of the scientific progress of the thirteenth century (Prévot 1991; Harrison 2022). Rufus was used by other medieval authors, such as Lorenzo Rusio, Pietro de Crescenzi, or Guillaume de Villiers, for instance. Guillaume de Villiers was a *maréchal* (farrier/veterinarian/horseman) from rural Normandy who wrote a veterinary treatise around 1456 (Pouille-Drieux 1966). He appears to have adapted Rufus's method to a non-chivalric context, where mares are ridden: he mentions that when mares are pregnant, they should not be worked or made to carry heavy burdens, perhaps as a reference to agricultural work (Vo Van Qui 2023). This contrasts with the fact that Rufus initially focussed on a male warhorse or destrier. Pietro de Crescenzi uses Rufus in an agricultural treatise, the *Opus ruralium commodorum* (1304–1306), mixing his advice with that of Latin agriculturists such as Varro (Richter 1998; Nisard 1864). Crescenzi appears to have intended his work to be used for general riding horses. Both Guillaume de Villiers' and Pietro de Crescenzi's use of Rufus seem to point to an adaptation of his training method beyond its original military context, testifying not only to the popularity of this text but also to its universality (Vo Van Qui 2024).

The scarcity of writings on the topic can be explained by the fact that practical horse-breaking and training techniques would have been transmitted mostly orally. This means that written sources need to be studied carefully; the reasons behind their existence must be questioned. A text is not necessarily representative of widespread practices. Rather, it may have been written because it departed from usual traditions. The author may have wanted to write down the original technique they invented as a result of trial and experimentation. Therefore, horse training manuals may reflect the opinions of an individual rather than a long-standing practice. As a result, the origins, impact, and circulation of existing horse

training texts must be ascertained, with caution being taken when generalising. What Rufus puts into writing is often what he has personally experimented on and judged beneficial, as shown by his constant use of first-person verbs and references to his opinions and experience. The different steps of his method, according to the Latin edition published by Hieronymus Molin in 1818, can be summarised as such:

1. Birth of the horse, who must then roam freely.
2. Weaning of the horse (aged two).
3. Capture of the horse (aged three).
4. Taming of the horse (haltering, touching, etc.).
5. Introduction of the bit.
6. Groundwork.
7. Ridden work (bareback), at a walk, with no spurs but with a crop.
8. Ridden work (with a saddle, for one month), at a walk.
9. Exercise of trotting in fallow-fields (during the winter).
10. Exercise of cantering in fallow-fields.
11. Desensitisation to the sound of metal.
12. Extraction of teeth to accommodate the bit (aged five).
13. Exercise of going in and out of a group of horses.
14. Galloping exercise over increasing distances.

Those stages show a clear progression in the training. The gaits are introduced one after the other, the most demanding one, the gallop, only taking place when the horse is more physically mature. There is also an important focus on building a relationship with the horse, through the time dedicated to taming and desensitising him. Groundwork is insisted upon as an essential stage before riding the horse and much care is taken to not brutalise the horse at the beginning, as reflected, for example, in Rufus's insistence that only the gentlest of bits should be used at the start.

Rufus thoroughly explains and justifies the techniques he seems to have developed, but implicitly relies on his readers to already know orally-transmitted training traditions and glosses over some important stages. For instance, he explains that the future destrier must be raised in the mountains, in semi-wild conditions, for the first two to three years of his life, a stage which he justifies with physiological reasons, such as the health of the horses' legs. The horse must then be captured, but Rufus does not go into detail on the technicalities of this stage. He does not say how the colt must be brought down from the mountain, or how many men are involved, choosing instead to comment on the most appropriate material for the rope used to capture him. This omission is not very surprising since keeping horses in feral conditions as *equi sylvestres* was relatively common, though it would have applied to rounceys of low value rather than expensive destriers (Gladitz 1997). Therefore, Rufus would have

expected his readers to be familiar with this process. What he explains is what he invented and feels needs further justification; for example, that destriers as well as rounceys could be left to roam freely, the benefits no doubt outweighing the potential risks (loss of the horse through death or injury linked to the terrain, the climate, or even predators). The fact that Rufus relied and expanded on techniques that are now lost must be taken into account when studying his text which was addressed to knowledgeable readers who would have been able to fill in the gaps. His method is neither wholly representative of medieval Western European horse training nor completely understandable on its own.

Much remains unsaid in Rufus's method and open to interpretation, leaving the reader free to make it their own, to a certain extent. Much information remains implicit, such as the purpose of the horse to whom the training was applied. Nowhere in the text is it said explicitly that the horse is being trained for war. Even in the veterinary chapters, there is no specific reference to wounds received on the battlefield, though other, accidental injuries, such as kicks by other horses, are mentioned. However, some stages of the training appear to have the purpose of preparing the horse for battle. One exercise is to habituate the horse to go past blacksmiths' shops so he would not be scared of the sounds of metal, specifically as a preparation to the noises of the battlefield. Much care is taken during this stage to not traumatise the horse, with the advice to not beat him with the spurs or the crop if he is afraid, but to gently encourage him forward. The negative association between the beating and the noise are highlighted by Rufus, showcasing his knowledge of equine psychology and of the mechanism of conditioning. Conditioning is also used during the introduction of the bit. Rufus suggests that honey should be applied on it, so that the horse would take the bit more willingly the next time, seeking to taste the honey again. Interestingly, this technique is still in use today, highlighting its effectiveness.

Another exercise that would have been useful to a warhorse specifically, is learn to go in and out of a group of other horses while always listening to his rider. Similarly, teaching the horse to gallop at full speed over increasing distances would have been essential for couched-lance charges. Of course, there always was a possibility that destriers would never see action on a battlefield. However, all those exercises would also have been useful for tournaments and jousting. Significantly, some manuscripts, which appear to have been adapted to non-chivalric contexts, omit all those military exercises (Vo Van Qui 2024). This further shows how the intended purpose of the horse determined the training and how adaptations of the text were made to respond to different audiences' expectations.

An overview of manuscripts containing Rufus's training method show that copyists and translators alike made their own modifications – sometimes in error, sometimes deliberately – to clarify or even to transform the advice given. Depending on where the text circulated, this can reflect an evolution in horse training or differing perceptions of the horse and needs to be taken into account when studying the manuals. Modern editions, though they are useful tools, cannot be solely relied upon. The manuscripts themselves need to be analysed, since they each give a snapshot of how horse training techniques may have been interpreted in a specific place at a certain point in time. Modifications must also be studied because they could reflect whether or not the advice was put into practice: this is an important consideration, given that horse training is a practical endeavour. For instance, the omission of the military exercises in some versions of the text could show that the only elements that were kept were those that were deemed useful in a non-chivalric context. Those manuscripts also omit mentions of curb bits or recommendations to change the bit to a stronger one, nor do they contain any indication that spurs must be worn, further hinting at a simplification of the text linked to non-elite purposes of horses (Vo Van Qui 2024).

The limitations of medieval written sources are not the only challenge when studying horse training. Anachronism poses a risk when interpreting the texts, with the temptation to compare them to modern practices or to attempt to understand them by assimilating them to modern trainers. Though modern horsemanship is a useful tool, medieval horse training methods can only be understood in the cultural context from which they originated. Though there is no doubt that the techniques used today are partly inherited from those used in the past, there are only a few instances where they shed real light on a study of historical horse training. One of the main reasons is that, in Western Europe for instance, horses are used in completely different ways today compared to their usage in the past. The perception of equids is also very different. To understand the specific medieval Western European view of the horse, the literature of the time can be investigated. For instance, the *Romance of Alexandre* by Alexandre de Paris (c. 1180) contains a passage on the taming and (accelerated) training of Bucephalus which gives insights into this specific stage of the fantasised relationship between knight and warhorse (Armstrong 1994). It is especially relevant since it echoes the practices described in the *De medicina equorum*, which it predates, suggesting a widespread and common procedure. For instance, both the romance and Rufus's treatise describe the training as done on a feral horse, and both highlight the use of touch to desensitise the horse before the equipment and the rider are introduced. Both the focus on the wild horse and the use of touch to

tame a feral beast appear to be specific to the cultural background of medieval Western Europe. In contrast, the training recommended by the Latin agriculturist Varro focussed on a young foal still with his mother, rather than an almost fully grown colt – making the process arguably safer. The fact that Pietro de Crescenzi includes the recommendation by Varro alongside his reinterpretation of Rufus could show that the latter's focus on a feral horse wasn't necessarily universally accepted, especially outside of a chivalric context.

The ideal of an exclusive relationship between man and horse, as represented by Alexander and Bucephalus, may also have played a role in the modalities of the training of elite horses. This ideal was also vehiculated by other romances, as well as by the encyclopaedias of the thirteenth century (Stadler 1920; Chabaille 1863). The latter portrayed the horse as a particularly intelligent animal, capable of recognising his master and willing to fight alongside him on the battlefield. Both Albertus Magnus and Brunetto Latini highlight that horses would shed tears of sadness at the death of their owner. This can show to what extent it was hoped that a knight and his destrier were expected to have a reciprocal and affectionate bond. Some elements of Rufus's training method may be a response to that. Though he justifies the feral upbringing of the horse with physiological reasons, it may also be linked to the desire that the horse should only bond to the person taming him. It is implied that the taming of the horse is done by the same person who rode him for the first time, bareback. Rufus does not explain why he introduces the rider before the saddle. It could be for practical reasons, such as limiting the number of new stimuli for the horse; the saddle involves the girth going round his belly and the stirrups flapping against his flanks. In a way, riding bareback may have also proven safer, providing the ability to make an emergency dismount. Additionally, it is tempting to think that there would have been more symbolic reasons, allowing the rider to have a better feel of the horse and become one with him. This contrasts with Varro, who recommends that prior to riding the horse should be habituated to having weight on his back, with a child first lying, then sitting on him. Once again, this recommendation is used by Pietro de Crescenzi.

Throughout the initial stages of the taming, there is also an insistence on gentleness and patience which links back to the ideal of a good relationship between horse and rider. Interestingly, this initial approach ultimately gives way to more coercion and even to the deliberate use of pain. Rufus recommends that some of the horse's teeth should be extracted, then that the bit should be put back in when the wounds are still raw, explicitly to prompt the horse to respond better to it due to the pain. This shows that despite the chivalric ideal at play in the romances, the encyclopaedias, and the beginning of the training method, ultimately, the horse had to submit to his master.

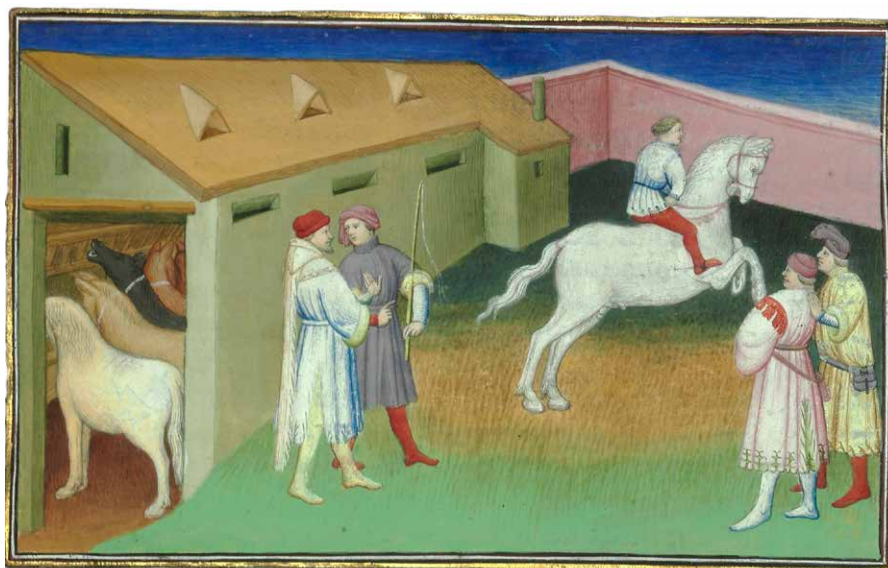


Figure 1. *Devisement du monde*, Marco Polo. Paris, BnF Fr 2810, fol. 92, (1410–1412) par le Maître de la Mazarine. This miniature shows a man riding a horse bareback, as per Rufus's recommendations for the first stages of the breaking-in, albeit with spurs. © Bibliothèque nationale de France.

Horse training techniques are always a response to:

1. the purpose of the horse in a specific context (warfare, travel, livestock herding, etc.),
2. the cultural perception of the horse (as a tool, companion, sentient being, etc.) in that context,
3. the human understanding (or lack of understanding) of the horse's physiology and psychology.

In order to properly analyse historical horse training techniques, those parameters must be taken into account and the context in which they were elaborated must be thoroughly studied. The significance of a given method cannot be understood separately from its cultural background. Two perspectives must then be taken into account: 1) the human experience, and 2) the equine experience. The development of animal studies and posthumanist perspectives facilitated a move away from a human-centred history in favour of equids as agents (Fudge 2002). When integrated with more human-centred approaches in history, this interdisciplinary approach, which takes into account the equine experience, proves helpful to the study of horse training, enabling a better understanding of the complexities of the horse-human relationship in a given time and place. Recent research on equines as agents has also been developed in other disciplines such as archaeology (Kanne 2022; Recht 2022).

Another essential approach for the study of historical horse training techniques is that of their potential effects on the horse: the analysis of the reason behind the creation of their techniques and the study of their effectiveness can highlight different aspects of the horse-human relationship. Zooarchaeology provides fascinating insights, for instance where physical damage due to bridles, bits, and saddles is

evident in the horses' skeletons (Kanne et al. 2025). Modern scientific knowledge on the cognitive abilities of horses is another invaluable tool. Domestication has resulted in many changes in the equine genome, resulting in physiological as well as cognitive evolutions (Orlando 2020). However, the behaviour of medieval horses was likely relatively similar to that observed in modern horses, especially in very old breeds or in horses raised in semi-wild conditions like medieval horses would have been. Therefore, the cognitive abilities of modern horses, on which an increasing number of studies are being done, are probably comparable to those of medieval horses (Brubaker and Udell 2016). Evidence of the similarity of modern and medieval equine behaviour can be found in Rufus's method itself. For instance, several passages mention the horse's potential adverse reactions to frightening or disturbing stimuli, such as being captured or loud noises. Desensitisation is used to resolve this, just as in several modern riding techniques. Rufus suggests, for example, that prior to shoeing, the horse should be prepared by the handling of his legs and feet and the tapping of his hooves with the hand and with a hammer, demonstrating both the awareness that this process could be frightening for the horse and the knowledge of how to prepare the horse for it. Similarly, Rufus discusses the sexual maturity and instincts of colts in a way that corresponds to modern knowledge (Mills and McDonnell 2005). He points out that the colt should be separated from his mother at two years old since it is the time when he would potentially try to copulate with her. The method of weaning he recommends – only separating the colt when he has reached sexual maturity – is a natural one that would likely cause less stress to the horses (Henry et al. 2020). This reflects the need to have a physically and mentally balanced animal at the start of its training.

This means that horses' reactions to ancient training techniques can be broadly ascertained, either from experimentation or from deduction, using knowledge of their responses to similar stimuli. Determining how horses would react can further aid in discovering why they were trained in a particular manner and not another. Veterinary literature and works on equine cognition and behaviour can prove interesting sources for complementary use with written treatises (Mills and McDonnell 2005; Waring 2003). Given the cultural perception of the horse in medieval Western Europe as a highly anthropomorphised animal, studies focussing on the way horses perceive humans or manifest emotions can give interesting insights (Proops and McComb 2012; Smith et al. 2016; Wathan et al. 2015). For instance, horses have been proven to be capable of recognising familiar humans (Proops and McComb 2012). This shows that the thirteenth-century encyclopaedists' ideal of the destrier recognising his master could have had some grounding in reality. Horses also have the ability to read human facial expressions and emotions (Smith et al. 2016). This makes the care taken at the beginning of Rufus's method, to always be gentle and patient towards the horse, all the more relevant. The text also includes the recommendation to never be angry towards the colt, lest he should acquire bad habits from it, further testifying to Rufus's knowledge of horse behaviour.

Many of the effects of training on horses are linked to the equipment used; therefore, studying it can help gain a better understanding of the training process. Where available, archaeological remains of bits, horseshoes, or spurs can provide a wealth of information (Clark 2004). Rufus's text gives a description of different types of bits, classified according to their severity, with the last type of bit mentioned so cruel, Rufus refuses to discuss it. The descriptions are relatively vague and difficult to understand, however, comparisons with preserved medieval bits can, to some extent, provide clarification. Simultaneously, the text can give further indications as to the purpose of different elements of the bit. Rufus's comments show clearly that some medieval horsemen were aware of how damaging harsh curb bits could be. He even dedicates a chapter to the wounds caused by such pieces of equipment in the veterinary part of his treatise. That those bits were used regardless, demonstrates the importance of controlling the horse, and echoes Rufus's deliberate use of pain. These contrasts, where the ideal of a close relationship with the horse could be accompanied by the need to knowingly sacrifice its welfare, effectively highlight the complexities of the medieval horse-human relationship.

Riding techniques, but also the symbolism linked to some piece of equipment such as spurs, in elite settings, can help to further understand the specificities of the training to which horses were subjected. Spurs make an appearance in Rufus's method: he declares that when the rider first gets on the horse, he must do so without a saddle and without

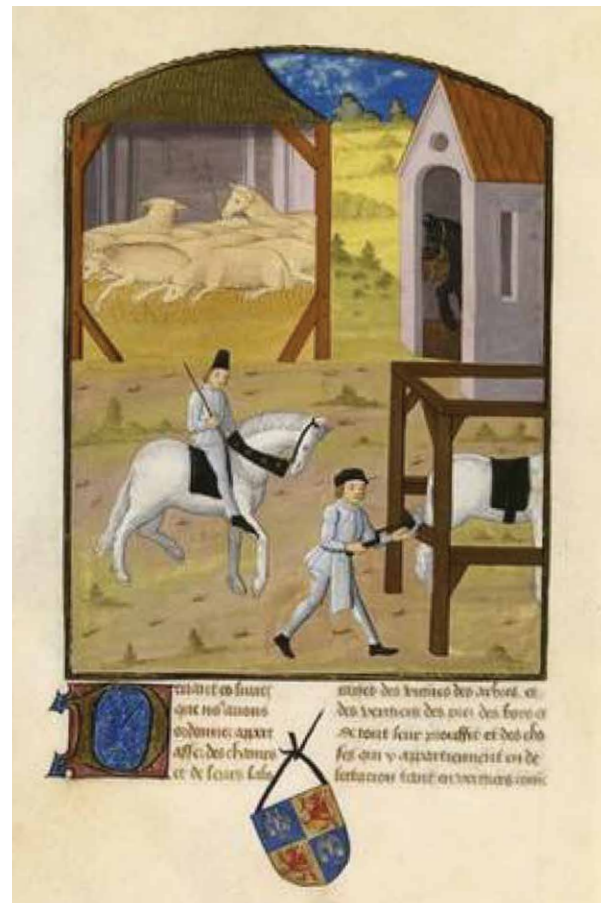


Figure 2. *Le Rustican*, Pietro de Crescenzi. Paris, BnF Fr. 12330 (1480–1485). This miniature from Crescenzi's agricultural treatise illustrates the shoeing of horses as well as the manner of riding with a crop, and no spurs, as described in Rufus's text. © Bibliothèque nationale de France.

spurs. Later, he points out that when the horse is afraid to go past a noisy place, he should not be violently beaten with the spurs, implying that, at this stage, they are worn. He does not say when they should be introduced, leaving that decision to the reader. Each time they are mentioned, spurs are accompanied by a negation regarding their use. They are a complex piece of equipment, used to give cues for direction. This becomes clear in the fact that Rufus indicates that a crop, exclusively used for directing the horse left and right, should be used when spurs are not worn. The size and potential sharpness of the spurs explain why they should not be worn when the horse is first ridden: since that process is done bareback, the rider's seat would have been different and spurs, therefore, may potentially have limited the stability of the rider's legs and increased the risk of accidental injuries.

Material culture must, like the written sources, be approached with caution. The pieces of equipment that are found in the archaeological record or collections are not



Figure 3. *Compilation des cronicques et ystores des Bretons, partie en III livretz*, Pierre le Baut (15th century). Paris, BnF Fr 8266 fol 344v. This manuscript miniature shows several overflexed destriers wearing curb bits, contrasting with a pack rouncey (on the left-hand side) wearing only a halter and holding his head in a more natural position. This emphasises the potential symbolism of hyperflexion, a head position characteristic of the horses of the elite, as a sign of social status. © Bibliothèque nationale de France.

always the most commonly used and can also be difficult to identify. For instance, mounts in copper alloy or iron that could be associated with curb bits have also been attributed to brooches, handles, and other objects (Webley 2020). Moreover, much of the equestrian equipment used daily during the training and handling of horses, such as headcollars, leadropes, bridles, or crops, were made of organic material, like leather, rope or wood, which rarely survives in archaeological assemblages. Some information can be found in iconography, though the veracity of the depictions would depend on the equestrian knowledge of the illustrator. Financial accounts, like those of King Charles VI of France, can provide lists of the equipment bought to care for the horses, including halters, saddles, and rugs (Billaud 1996). However, though they can provide information about the material used, they often do not say enough about their shape to help elucidate precisely how they were used on the horses.

Experimental application is yet another potentially fruitful avenue for the study of medieval Western European horse training, and one that is increasingly taken by researchers. From the reproduction of specific pieces of equipment, such as bits, to the testing of these objects as well as certain techniques, putting into practice Rufus's method can further our understanding of the impact, importance, and relevance of his work (Gassmann 2018; Jobst 2020; Ropa 2021; Vo Van Qui 2024). Not only can it help to determine

the effectiveness of certain techniques, but it also may aid in recreating, to some extent, probable oral traditions in practice at the time. Adopting an experimental approach can help to have a more holistic approach to historical horse training, moving past some of the limitations of written sources, and gaining more insight into the potential difficulties encountered during the process. However, equine welfare must always remain a central concern when employing such a practical research method, and techniques which could compromise it – such as the use of some types of curb bits or hyperflexion, a head position damaging to the horse's physical integrity – must be avoided (van Dierendonck et al. 2012). Such pieces of equipment and head position were clearly used at the time, and, in the case of hyperflexion, justified by Rufus as enabling better control of the horse. He explains, for example, that an overflexed horse, i.e., curling its neck and head inwards towards the chest, can be better directed to turn left or right. An overflexed position could also have had the advantage of keeping the horse's head out of the way of weapons. As for the very strong curb bits, they force the horse's head to remain in that position without any intervention from the rider. Those techniques had a reason for being in the medieval context but that does not justify their use in a modern context. However, it is important to analyse those reasons as they help understand the wider picture of medieval horse training.

Conclusion

An interdisciplinary approach is essential when studying historical horse training methods to investigate their complexities and highlight their potential practical effects on horses as well as the consequences on physical and psychological equine development. The reasons behind the creation of certain training methods must be investigated within the context of their cultural background to better understand the perception of the horse and of the horse-

human relationship that they reflect. Many sources can help with this, from literary texts and literary manuals to iconography and material culture. Though written sources are essential, moving away from them can help to shift the focus to the horse, putting the animal at the centre of the research. This is why interdisciplinary approaches, and especially those with an experimental dimension, can help explore the intricacies of medieval training in much more depth.

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The Horse in European Warfare

Helene Benkert and Birgit Bühler

Introduction

Warfare has been a critical aspect of humanity for millennia (Kissel and Kim 2018). The domestication and subsequent militarisation of the horse cannot be underestimated for its effects on human pursuits of martial dominance. Throughout the millennia, horses and other equids were key participants in wars and military campaigns (for broader overviews of mostly European cavalry see, for example: Black 2024; Ellis 2004; Noble 2015; Sidnell 2006). Their importance diminished only with the advent of mechanised warfare in the twentieth century. Many cultures around the world were famous horse warriors and the breeding, training and trading of (war)horses was a large-scale global industry from at least the Roman times (cf. Creighton et al. 2025; Gladitz 1997; Davis 1989; Junkelmann 1992; Turchin et al. 2016; Sidnell 2006).

In this chapter, we provide a very broad overview of the development and use of horses in warfare in Europe, highlighting the key periods and societies which employed horses in battle, dating from prehistory to the Post Medieval Period. Our coverage spans most of present-day Europe (with a focus on central and western Europe), and the mid-third millennium BC to the mid-second millennium AD. We explore evidence for the use of horses in warfare from archaeology and history, including bones, burials, artistic depictions, and historical documents. It is a vast topic, and the following account is by no means complete, especially since some periods and regions have thus far been somewhat neglected in research. The chapter will conclude with a brief look at the warhorse as an individual.

Origins

The earliest evidence for equids in warfare dates to c. 2600 BC. Heavy wagons are drawn by teams of equids on the Standard of Ur, an artefact from an important Sumerian city state located in modern-day Iraq (Figure 1). Recent genetic evidence suggests that these equids may have been *kungas*, a hybrid of female domestic donkeys and male Syrian wild asses (hemippes) (Bennett et al. 2022). Domestic donkeys and other equids appear to have been used in warfare from the mid third millennium, with the ancestors to modern domesticated horses appearing late in the third millennium BC (Librado et al. 2021). By 2200 BC, the modern domestic horse lineage (DOM2) expanded from the western Eurasian steppe, ushering in a period of widespread horse mobility (Librado et al. 2024).

Early horse riding and driving had an unparalleled impact on many aspects of human societies, which only increased as they were incorporated into warfare (Anthony 2007; Kanne 2022; Olsen 2006; Olsen et al. 2023; Outram 2023; Raulwing et al. 2019). While the first organised cavalries do not appear until the first millennium BC, horses were likely involved in military confrontations in other forms before then, such as raiding and

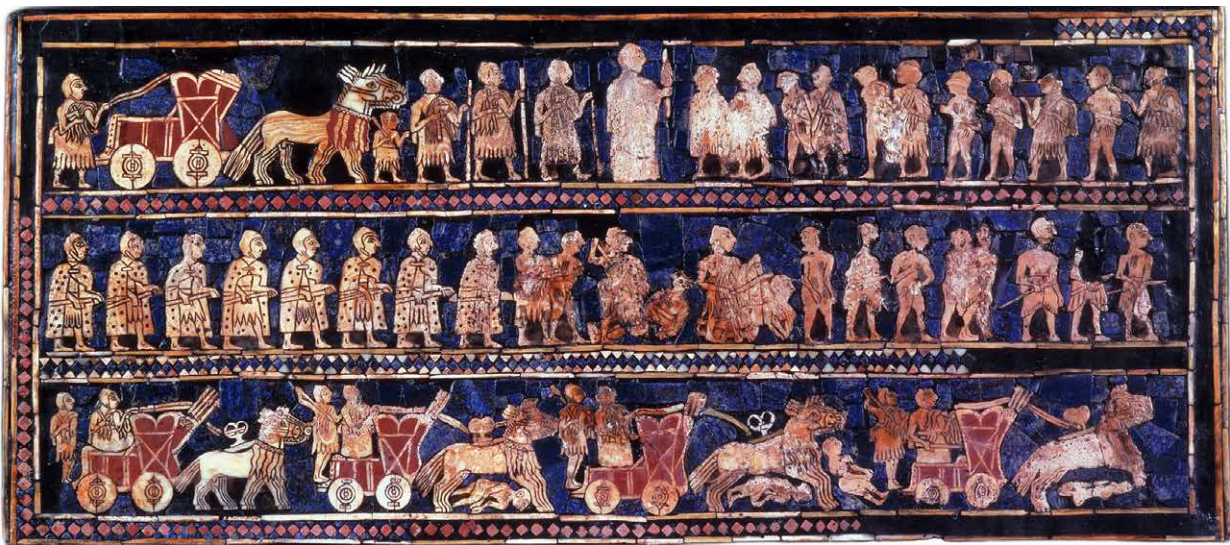


Figure 1. Standard of Ur showing the use of equid teams to pull (war)chariots. Image: Public Domain.

intermittent skirmishes (Anthony and Brown 2011; Anthony et al. 2006; Drews 2004; Kelekna 2009). Anthony and Brown (2011) argue that mounted warfare preceded chariots on the steppe, while it may have been the other way around in the Near East, in accordance with the equids native to the region that had previously been used in military activities (Noble 2014; Feldman and Sauvage 2015). Riding and chariotry were contemporaneous, with examples in the latter half of the Bronze Age showing both being used in battle for different purposes; the chariots functioned as a vehicle to bring participants to the battlefield or as a mobile firing platform, and ridden horses aided in communication and transport, and possibly in combat (Kelder 2012).

Chariot Warfare

Wheeled vehicles drawn by equids were known in the Near East in the third millennium BC (Littauer and Crouwel 1996, 2022; Raulwing et al. 2019), whilst chariots drawn by horses were developed in the northern Eurasian steppes sometime around the beginning of the second millennium BC; recent radiocarbon dates put the first chariots into the 19th and 20th centuries BC within the Sintashta-Petrovka complex (Chechushkov et al. 2018; Lindner 2020). The extent to which they were used in actual fighting is unclear, but the Sintashta-Petrovka chariot burials include weapons suitable for chariotry, and there are depictions of chariotry in battle scenes found on rock art from the Eurasian steppes and Scandinavia from the Bronze Age (Caspari et al. 2020; Kveiborg 2020). Art from Egypt (Figure 2; see also Lonneke, this volume), the Hittite Empire (c. 1650–1180 BC), and Assyria (c. 14th–11th BC) shows horse-drawn chariots explicitly in the context of war, often with archers shooting from the chariot

(Dalley 2017; Delpout and Willekes 2022; Jakob 2017; Feldman and Sauvage 2010; Sidnell 2006).

Chariots arrived in southern Europe at roughly the same time, in the mid-second millennium BC. In a comparative study of the chariots in the Near East and the Eastern Mediterranean, Feldman and Sauvage (2010) describe considerable regional variation regarding chariot use and catalogue relevant archaeological and (art) historical evidence. In Egypt, during the 18th dynasty, chariots are often found in royal tombs, alongside depictions of pharaohs riding chariots in both battle and during hunts to emphasise the interred's strength and status. Finds of chariots in the southern Levant are rare and missing altogether from the Aegean regions where their use is documented only through written sources and depictions, and a number of horse bits which are suitable for driving (Dietz 1992; Feldmann and Sauvage 2010; Littauer 1969; Pappi and Isaakidou 2015). Texts from Assyria and Babylonia indicate that chariots were in use and exported, together with horses, to Egypt, but archaeological remains to support this are scarce (Feldmann and Sauvage 2010: 89). Across the region, chariots appear to always be drawn by a pair of horses; this is further corroborated by double horse burials as for example in Dendra (Pappi and Isaakidou 2015). The presence of horses, chariots or related equipment in the archaeological, iconographic and historical record seems to be limited almost exclusively to the elite, serving as a marker of their status, military power, and wealth (Feldmann and Sauvage 2010; Pappi and Isaakidou 2015; Rigg 2022).

The Kikkuli text (c. 1345 BC) offers guidance on the training of chariot horses in the Hittite empire and is the earliest horse training manual still in existence

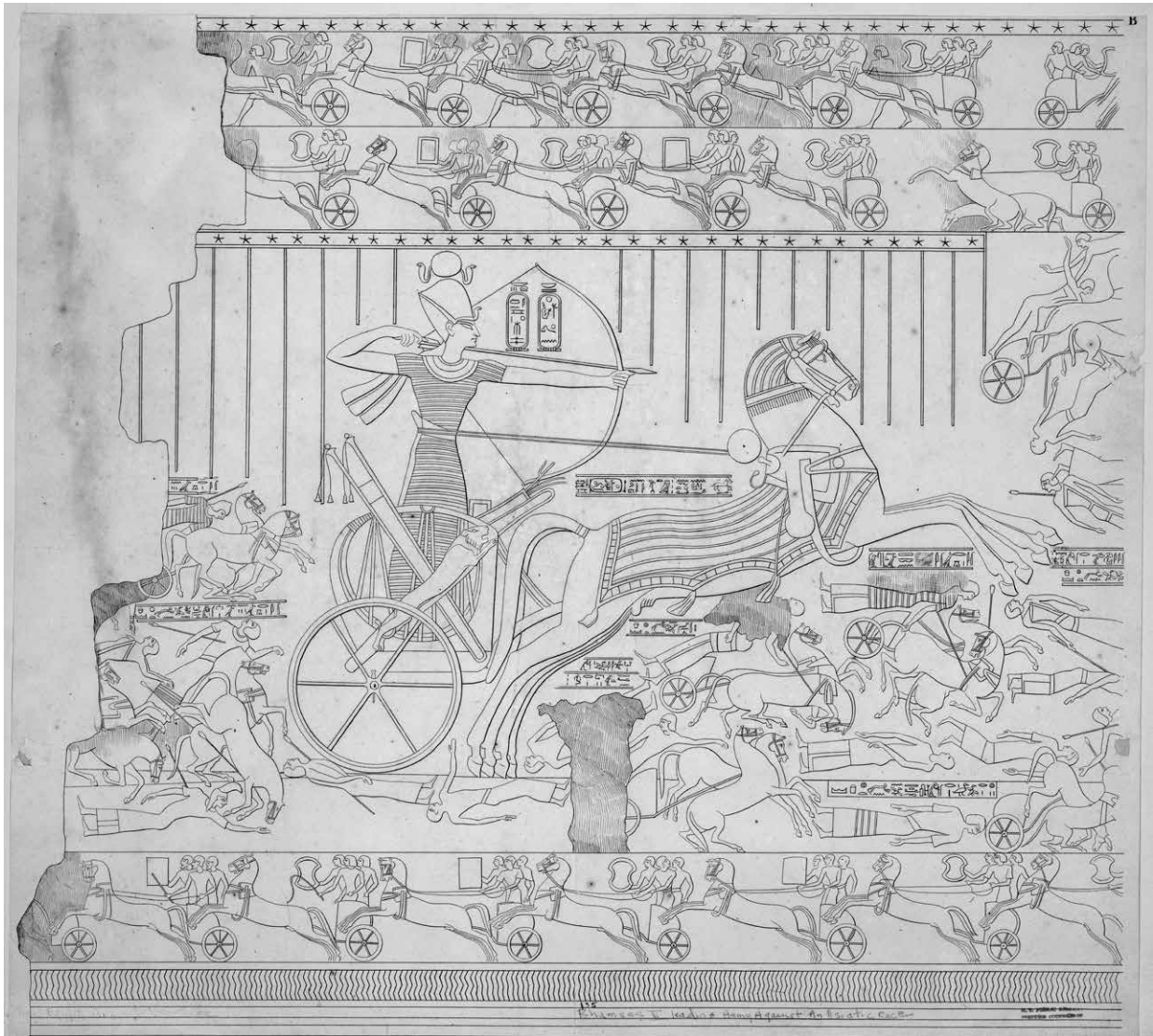


Figure 2. Rhamses III leading army against Asiatic race. The Miriam and Ira D. Wallach Division of Art, Prints and Photographs: Picture Collection, New York Public Library. Image: Public Domain.

(Raulwing 2009). It consists of several cuneiform tablets inscribed in the Hittite language by Kikkuli, a “horse trainer from the land of Mittani” (Raulwing 2005:61), and provides a rigorous training plan, including horse care and management (Raulwing 2009; Kelekna 2009). The interval training, done in horse pairs, and feeding regime clearly demonstrate an understanding of equine physiology and many aspects are still in use in modern horse training (Klecel and Martyniuk 2021; Nyland 2008; Willekes 2016).

Iron Age Chariots in Europe 5th c. BC–1st c. AD (Hallstatt/La Tène)

During the Hallstatt periods (c. 1200 BC to c. 450 BC), four-wheeled wagon burials can be found around the Alps, but unlike the two-wheeled chariots/carts of La Tène they

have not been associated with warfare and likely were more ritual in character (Stead 1965). Alongside mounted warfare (discussed below), the Celts employed chariots in warfare until the later La Tène period. In Britain, chariots were in use the longest and chariot burials are known for example from the Arras culture (Jay et al. 2012; Jensen and Kveiborg 2021; Kelekna 2009; Stead 1965). Illustrations of Celtic war chariots can be found on Roman coinage, showing a two-wheeled vehicle drawn by a pair of horses (Jennings 2011; Piggott 1952; Stead 1965; Tankó 2019). Written sources mention a large number of chariots deployed by the Gallic forces in the battle of Sentinum in the early 3rd century BC (Berecki 2018).

In La Tène period Europe, chariot warfare saw its peak before finally falling out of favour in the later

phases of the period, though it was employed in Britain until the 1st century BC (Jay et al. 2012; Jennings 2011; Kruta 2005; Tanko 2019). Chariots continued to be used outside of warfare, however, and chariot racing became a popular sport in the Roman Empire (Bell 2020; Klecel and Martyniuk 2021).

Early Mounted Warfare: Late Bronze Age to Iron Age

Though intermittent fighting on horseback in Europe is possible, even likely, from the onset of the Bronze Age with the arrival of the modern horse lineage (DOM2, see Kanne this volume), the Bronze Age battlefield in the Tollense valley in north-eastern Germany likely has the first archaeological evidence of the use of ridden horses in battle, c. 1250 BC (Lidke and Lorenz 2019; Lidke 2018). Disarticulated horse bones were found among the remains of over 130 humans who showed a high amount of perimortem lesions indicative of a violent encounter, and evidence of weaponry such as arrowheads (ibid.; Jantzen et al. 2011). In this context, it seems likely that the horses were directly involved in the conflict, although there is no evidence of lesions congruent with a battle nor any pathologies related to riding (Benecke and Dräger 2014). However, the humans presented with ‘reiter facets’ and a fractured femur, a common injury in horse riders, which may point towards someone falling off a horse, possibly as a result of the skirmish (Jantzen et al. 2011).

Kelder (2012) explores the use of riders in military operations in the Late Bronze Age of the eastern Mediterranean as scouts, and possibly as combatants, suggesting the origins of Greek cavalry lie here. From the beginning of the first millennium BC, horses were increasingly used in warfare across Eurasia, although the timing seems to have varied regionally depending on a variety of complex factors, including the availability of horses, sociopolitical changes, environmental contexts, and adoption of new technologies (Anthony and Brown 2011; Kanne 2022). The development of the recurve bow in combination with a shift in military ideology gave rise to the mounted archer from the steppes sometime between 900–700 BC (Anthony and Brown 2011), a point that has often been cited as a reason for the increase of mounted warfare. Another contributing factor is the influx of eastern mounted warriors from the steppes into Europe, demonstrated by new types of bits and other material culture appearing in the Carpathian Basin after 900 BC (Metzner-Nebelsick 1998, 2000, 2010).

In the early first millennium BC, mounted warrior elites, such as the Cimmerians, Scythians and, later, Sarmatians, were known in the Carpathian Basin (Bartosiewicz 2011; Metzner-Nebelsick 2020). The occurrence of a new bit type, dubbed Thraco-Cimmerian, corroborates the impact of the nomadic horse tribes from the North Caucasus and Pontic steppes on these developments (Metzner-Nebelsick 2002,

2020). The waves of incoming steppe peoples continued until the Middle Ages and continuously influenced the European equestrian world, in terms of technology and knowledge, but also culturally.

The Hallstatt culture of the late Bronze and early Iron Age encompassed much of modern Europe and was marked by a class of mounted warriors, evident in their funerary customs which frequently included horses; possibly also a result of contact with the steppe peoples (Jennings 2011; Kelekna 2009; Kmet’ová 2013a, b, 2014). Whether or not this qualifies as cavalry, horses were certainly involved in warfare and the Celts were noted for their skill on horseback and their love for war by contemporaries (Jennings 2011; Sidnell 2006). A large corpus of horse bits further highlights the Celts’ dedication to horsemanship, and iconographic evidence from the Hallstatt-Dolenjska culture demonstrates the importance of horses in Celtic society (e.g., Balkwill 1973; Frie 2018). The strong association of horses with a specifically male and often martial elite is visible not only in material culture and art but also in the faunal record which seems to show a preference for male horses, especially in burial contexts (Clavel et al. 2022; Fages et al. 2020; Frie 2018). While the development of a warhorse culture in (eastern) Europe may be the result of migration and cultural exchange it could also be a reaction to invasions from the east, i.e., the adaptation of mounted warfare for defensive purposes (Frie 2018).

Cavalry in Ancient Greece (800–146 BC)

In Ancient Greece, warfare was dominated by infantry, and small units of cavalry were employed only marginally. Nonetheless, horses, and likely other equids, were an important means of transport of both soldiers and provisions (e.g., Bugh 2019; Hyland 2013; Konijnendijk 2021; Willekes 2015). Further, they could be used for small skirmishes, for example to deter plundering and razing by enemy forces (Konijnendijk 2021). Much of Greek topography is not particularly conducive to horse rearing and thus horses were a limited resource, further aiding in solidifying the horse’s position as a status symbol (Willekes 2015)¹. As such, they were a luxury and coveted by the higher social classes who were fervently engaged in horse racing and hunting on horseback. The *hippotróphoi*, for example, were members of the elite, breeding and training horses specifically for participation in such races and games (Hippos n.d.; Willekes 2015)². During the Peloponnesian War,

1 There are exceptions, such as Thessaly, whose horses (and horsemen) were highly valued not just by the Greeks and Macedonians but also the Romans later on (Hyland 2013; Johnstone 2004).

2 A recent exhibition by the American School in Athens provides valuable insights on the horse in ancient Athens and the Classical Greek world, including Hippotrophia and the horse in war. See Hippos (no date).

the Persian cavalry inspired more interest in the use of a mounted military unit, but the concept did not take off until the 4th century BC. Under Alexander the Great and his father Philip of Macedon cavalry became much more prominent, and the legend of the taming of Bucephalus, Alexander's famous mount, aids in highlighting Alexander's skill as a horseman and (military) leader (Hyland 2013; Willekes 2015). While the Athenian cavalry counted some 200–300 riders, Alexander led several thousand mounted warriors on his expeditions across Macedonia and Asia Minor (Hyland 2013; Konijnendijk 2021).

Horses were a common part of the funerary rites for the (military) elite as is apparent in their continued burial in association with human warrior graves as well as from historical sources. The *Iliad*, for example, describes the sacrifice of four horses upon the death of Patroklos (Rigg 2022). The text also offers insights into horse care and management, especially in relation to warfare. Similarly, the well-known military treatises by Xenophon, *The Cavalry Commander* and *On Horsemanship*, provide detailed information on horsemanship and the training and management of warhorses in particular (Bugh 2019; Rigg 2022; Willekes 2015). The latter of these works is considered one of the classical equestrian manuals and highlights Xenophon's extensive knowledge of horse behaviour as well as his concern for equine welfare (Boot and McGreevy 2013; Willekes 2015). Alexander of Macedon drew on this knowledge when he began his successful military campaign across Asia Minor (Willekes 2015).

Later Iron Age Mounted Warfare

Pech Maho in southern France has yielded a large deposit of horse remains from around 200 BC. Uzunidis and colleagues (2023) found that these horses, predominantly males between 6 and 9 years old, had been gathered from various origins before being killed, possibly in a single event or season. They attribute the mass killing to a possible ritual purpose following a violent destruction event of the site, and do not preclude the possibility that a military aspect was involved as well. Similarly, in Denmark, the 3rd c. AD site of Illerup Aadal produced four horse skeletons amidst a ritual deposition of weaponry (Dobat et al. 2014). Like the sacrificial objects, the horses showed evidence of purposeful “destruction”, i.e., injuries which suggest “a gruesomely violent death” (Dobat et al. 2014:11). The site has been interpreted as sacrificial in association with an army and so the horses, possibly warhorses, would indicate the presence and importance of mounted warriors in Iron Age Scandinavia (Dobat et al. 2014). Other similar sites are known from northern Europe, dating from the 4th c. BC to the 5th c. AD, and horse remains discovered there have been linked to warfare via oral and spinal pathological lesions as well as their deposition with military paraphernalia and harnesses (Kveiborg and Nørgaard 2022).

In some regions of Bronze and Iron Age Europe (for example south-eastern Pannonia and southern Scandinavia), horses were only sacrificed by proxy, i.e., through deposition of equestrian equipment or occasionally parts of wagons, highlighting the presence of a mounted warrior elite and perhaps indicating that horses were too valuable for these groups to offer up the animals themselves (e.g., Dizdar and Radman-Livaja 2015; Jensen and Kveiborg 2021). Burials of parts of the horse were also common across Europe, usually either the head or head and hooves (suggesting the deposition of a skin) (Bliujienė and Butkus 2007; Cross 2011; Piggott 1962).

Roman Cavalry (509 BC–AD 476)

The Roman cavalry, like the infantry, was a renowned institution, and had a significant impact on Rome's military success, drawing horses and riders from across the vast Empire and beyond (Hyland 1990; Johnstone 2004; Sidnell 2006). In the beginning, during the city-state and republican times, horses contributed to the expansion of Rome's power, if not necessarily always in a military role; and with the continuous integration of several regions famous for their horses and horsemen, such as Etruria and Campania in Italy or, later, Thessaly, Cappadocia and Numidia in the wider reaches of the Empire, access to good stock further facilitated the growth of the Roman cavalry in both quality and quantity (Davies 1969; Gassmann 2017; Hyland 2013a, b; Johnstone 2004; Sidnell 2006). The Roman cavalry has been studied extensively, especially in terms of its organisation and function (e.g., Dawson 2024; Dixon and Southern 1997; Fábán 2015, 2017, 2020; Junkelmann 1990a, 1990b, 1992; McCall 2001; Sidnell 2006).

During the Republican period, *equites* (horsemen) were drawn from the upper classes of society, who had the means to maintain warhorses and acquire necessary equipment and skills, to form a citizen cavalry (Sidnell 2006) (Figure 3). It was not qualified enough yet to persist against Hannibal's largely Numidian cavalry and their hit-and-run style during the second Punic war in the 3rd century BC, or the Carthaginian cavalry in general (Hyland 2013b; Sidnell 2006). Nonetheless, Rome was victorious eventually and began its expansion across the Mediterranean. The citizen cavalry was replaced entirely by auxiliary forces formed of *alae*, leading to numerous successful encounters, such as against the Macedonian army in 200 BC (Hyland 2013b; Kelekna 2009; Sidnell 2006). This heterogeneous cavalry, drawn from horse tribes from within and outside of the Empire, was a major facilitator for the growth of the Roman cavalry (Gassmann 2017; Hyland 2013b; Sidnell 2006). In the later Imperial period, cavalry became ever more mobile, in order to deal with the many revolts and other hotspots of the 3rd century AD. An increase in numbers, again drawn from allies and dependents who had established mounted warriors, was



Figure 3. Tomb monument of a cavalryman from the 1st century AD, clearly showing the relatively small stature of the horse and the lack of stirrups. Germanic Roman Museum Cologne, Germany. Image: Wikimedia Commons, user: MrArifnajafov, CC BY-SA 3.0.

intended to aid in maintaining the Empire's borders and unity (Gassmann 2017; Hyland 2013b; Rance 2015).

Aside from horsemen, breeding stock was also imported from various regions of the Empire to secure ample access to horses fit for war and other purposes. Romans bred larger horses specifically for cavalry, and mules became a valuable beast of burden in both war and daily life (e.g., Baxter 1998; Clutton-Brock 1992; Granado et al. 2020; Hanot et al. 2017; Hyland 1990; Johnstone 2002, 2004; Lepetz et al. 2021). Zooarchaeological analyses of Roman equid remains have shown a remarkable diversity in withers heights, although this does include donkeys and mules. In many provinces the Roman breeding efforts resulted in a considerable size increase in horses and other livestock. In Britain, for example, Iron Age horses measured c. 126 cm while the later Roman ones stood at nearly 138 cm. (Albarella et al.

2008; Ameen et al. 2021b; Kanne 2022; Johnstone 2004). Horse breeding was a major industry in the northwestern provinces of the Empire, likely reflecting the presence of army veterans in these areas (Groot 2008, 2017).

Written sources, e.g., Arrian's *Ars Tactica* and Varro's and Vegetius' treatises, provide insights into horse training, care and breeding practices and there has been avid interest in experimental archaeological reconstruction of Roman equestrian equipment, riding styles and cavalry manoeuvres (see for example: Dawson 2024; Hyland 1990, 1993, 2013; Dixon and Southern 1997; Gassmann 2022; Gladitz 1997; Junkelmann 1990, 1991, 1992; Sidnell 2006; Watson 2022; Willekes 2016). Roman cavalry saddles formed an important piece of tack and although none survive in the archaeological record, attempts have been made at a reconstruction to investigate the saddle's functionality,

especially in a military context (Connolly 1986; Connolly and van Driel-Murray 1991; Watson 2022). Originally a Gallic invention (or possibly even earlier), the four-horned, treeless saddle provided security for the rider, especially when engaging in unbalancing manoeuvres during fighting, and facilitated better mounted warfare (Watson 2022). Other cavalry equipment, such as weaponry, armour, bits and harnesses of Romans and non-Roman contemporaries, highlights the wealth of material culture associated with (war)horses (Bishop 1988, 2020 a, b; Dixon and Southern 1997; Lau, von Carnap-Bornheim and von Freeden 2014; Hyland 1990; Stephenson and Dixon 2003).

Late Antiquity and Early Middle Ages

The migrations of Late Antiquity and the early Middle Ages were marked by the movement of many different groups of people, not few of them notable horse riders and breeders with efficient cavalries/mounted warrior units. It is beyond the scope of this paper to go into detail for all of them, however; the goal is to provide a broad overview of the larger and better known of these peoples and thus facilitate an initial understanding of mounted warfare at this time of large-scale spatial and cultural transformation.

West Rome and former provinces

The Iberian Peninsula had been a major supplier of horses for Rome's army from at least the 3rd century BC and continued its horse culture under Visigothic rule from the later 5th century. Their cavalry employed both light and heavy units as well as mounted archers, their equestrian knowledge possibly a result of earlier encounters with nomadic tribes during the Goths' migration (Gassmann 2017; Sánchez and Blánquez 2020; Sidnell 2006; for a definition of heavy and light cavalry see for example Gassmann 2017, 2024). Others, such as the Frankish for example, also maintained a notable cavalry in the wake of the former Roman provinces, indicating that the knowledge and craftsmanship of mounted warfare and related equestrianism continued through the fall of Rome (Gassmann 2017). This is further highlighted in the zooarchaeological record: while in many of Rome's provinces domestic animal species declined in size in Late Antiquity – likely a reflection of the loss of knowledge and organisation following the fall of the Western Roman Empire – horses appear to have retained their size into the early Middle Ages, which suggests continuity in regards to breeding practices and goals (Ameen et al. 2021b; Gassmann 2017; Rizzetto, Crabtree and Albarella 2017; Rizzetto and Albarella 2021). However, there was an overall decrease in diversity of withers heights in horses, but average heights remained between 13–14 hh, approximately, throughout western Europe (Ameen et al. 2021b; Gassmann 2017). In the east, a large number of horse skeletons from Yenikapı, Istanbul, suggest that the Roman

tradition of a wide variety of horse sizes persisted in the Byzantine Empire, with the majority falling into the range medium to large medium (136–155 cm), i.e., somewhat larger than in the west (Onar et al. 2015).

Byzantine Cavalry

Several waves of migration by nomadic people from the steppes, such as the Avars and Magyars, and the invasion of the Huns in the 4th and 5th centuries created conflict but also exchange of knowledge. For Late Antiquity and the Early Medieval Period, the so-called *Strategikon* (Dennis 1984), a Byzantine military handbook from the late 6th century, provides valuable information on Byzantine cavalry as well as on diverse traditions of equestrianism in military contexts, within a range of different cultures (cf. Kardaras 2015; for archaeological context, cf. Anke et al. 2008; Bálint 1989). Generally attributed to the Byzantine Emperor Maurice (AD 582–602), it reflects the “new” Byzantine cavalry, which was based on the late Roman cavalry but had undergone some changes (Dennis 1984; Rance 2015; Schmitt 2007). This new cavalry focused more heavily on mobility to allow for rapid and efficient interventions, mostly along the borders. The Persians as well as several nomadic tribes from the steppes, all notable horse people, were causing continuous trouble for the Byzantine Empire (Dennis 1984; Elton 2007; Gassmann 2017; Sidnell 2006). As before in the Roman Empire, the Byzantines complemented their cavalry through integration of established mounted warrior units so that they had a variety of light and heavy cavalry at their disposal (Dennis 1984; Gassmann 2017). The *Strategikon* also shows that the Byzantine Empire not only keenly observed their various enemies but implemented their techniques and equipment in their own cavalry (Dennis 1984; Elton 2007; Sidnell 2006).

Avars are thought to have brought the use of stirrups with them, with the first finds appearing in 7th century Hungary in Avar graves (for Avars see Bühler, this volume). However, stirrups are mentioned in the *Strategikon*, if not explicitly as an Avar invention, which implies an earlier date for reaching Europe, possibly in earlier, non-metal forms (Curta 2008, Littauer 1981). While stirrups did prove advantageous and became widespread in the early Middle Ages, they did not revolutionise mounted warfare in Europe as previously thought, but rather “brought incremental, evolutionary change” (Gassmann 2017:79; Moretti 1999).

Medieval Europe (c. 8th–16th c. AD)

The arrival of the equestrian cultures from the eastern steppes and the Moors in Iberia in the 8th century is suggested to have brought about a revival of cavalry in (western) Europe and the formation of a new social elite: the medieval knight (e.g., Clutton-Brock 1992b; Davis 1989; Gassmann 2021; Sidnell 2006). Although it seems that revival is inaccurate, considering that several

groups, including the Visigoths, Avars and Lombards, maintained cavalries as they moved and settled across the former (western) Roman provinces. However, cavalry did become much more prominent in medieval Europe, and the warhorse took on considerable military but also socio-economic and political importance in a way it had not before. Upon more recent evaluation of the role of cavalry in medieval warfare, the belief of cavalry being the dominant force on the battlefield and of the heavy cavalry overrunning any infantry like a tank has been overruled in favour of a much more nuanced and complex view (cf. Creighton et al. 2025. for a recent overview of this discussion; see also Bennett 1995; Gassmann 2021).

Different roles and tactics in warfare required different types of horses. The hit-and-run style employed by cavalries from the steppes (cf. Anke et al. 2008; Bálint 1989; Dennis 1984; Kardaras 2015) demanded fast and agile horses (Mayor 2014) while a medieval *mêlée* was ridden very differently and required other manoeuvres to be performed by the horse-rider pairs (Gassmann 2017, 2018). Especially in the earlier part of the medieval period it was common practice to ride horses *to battle* but dismount for the actual fighting (Creighton et al. 2025). There are several major manuscripts dealing with the training and keeping of medieval warhorses as well as cavalry tactics, including Jordanus Ruffus (AD 1256) or King Duarte I of Portugal (AD c. 1430). These texts have been studied for their insights into horse husbandry, breeding, training and veterinary care in medieval Europe (Forgeng 2016; Harrison 2018, 2022; Jobst 2020, 2021; Leet 2018; Prevot 1991; Ropa 2021; Vo Van Qui 2024; see also Vo Van Qui this volume: 85-92, 183-191).

The rise of chivalry is closely connected to horses and cavalry, as is reflected in the name (from Old French 'chevalrie' meaning 'horseman'), and it has been suggested that feudalism developed as a direct result of the demand for warhorses (Hyland 1994, 1998, 1999; Ayton 1994; Davis 1989; Kelekna 2009; Sidnell 2006). Certainly, the horse facilitated the establishment of the knight, whose ideals were shared across the continent (Benkert 2023; Hansson 2006). This demand for mounts also gave rise to organised horse breeding as a major industry (Ameen et al. 2021b; Creighton et al. 2025; Davis 1989; Liddiard 2022; Gladitz 1997; Pryor et al. 2024). Interregional horse trade bloomed, and some regions became renowned breeding centres, some of which had already distributed their quality stock across the Roman Empire (Gladitz 1997; Hyland 1999; Contamine 2008). Iberian horses, and from the 14th century onwards Lombardian horses, were considered the most valuable and exported on a large scale (Gladitz 1997; Hyland 1999; Davis 1987). Quality (war)horses were often given as diplomatic gifts as well (Davis 1987; Ekdahl 1991;

Contamine 2008). Moorish horses, i.e., horses brought in from North Africa and the Near East, were held in high esteem too, and their arrival on the Iberian Peninsula in the 8th century AD may potentially form part of the reason why horses from the region were so popular at the time (O'Callaghan 2003; Fages et al. 2019; Gladitz 1997; Hyland 1999; Davis 1989). War horses in particular were a symbol of status, and, as in earlier time periods, distinguished members of the elite. Part of this distinction were the cost of maintaining a (war) horse and the value of the animal itself (Clauss 2011). The breeding of these horses was largely catering to the higher social classes, producing valuable warhorses and mounts for hunting and riding. Most of the warhorses would have been likely used outside of military campaigns, for example for hunting, as a simple matter of keeping them fit while also providing a mode of transport and showing off the rider's wealth and standing. Whereas before it seems there had only been a single type of warhorse, medieval sources mention a variety of types which are based on the horse's function³. Among them, the *destrier* or *equus magnus*⁴ was the most valuable and expensive warhorse. Prices could vary quite drastically, and for a very good war mount could reach more than £100 (Creighton et al. 2025; Davis 1989; Gladitz 1997; Hyland 1998, 1999).

Horse burials are a common feature of pre-Christian Europe and judging by their common association with elaborately furnished graves they were mostly linked to a social elite (Benkert 2023; Fern 2005, 2007). Their inclusion in funerary rights, with or without an associated human burial, also highlights the strong ritual and symbolic value of horses throughout much of history (Benecke 1985; Benkert 2023; Cross 2011; Fern 2010; Pluskowski 2013). Whether or not these horses were warhorses and by which criteria these sacrifices were chosen remains unclear; however, they are often males in their prime which corresponds to the preference for stallions (and geldings) as riding horses that has been observed since the Bronze Age, at least in Europe (Clauss 2011; Clavel et al. 2016; Ekdahl 1998; Fages et al. 2020; Gladitz 1997; Hyland 1994; Kelekna 2009; Leifsson 2018). With the advent of Christianity, this valuable resource vanished. It has been suggested that this was a way to repress what the Church considered Pagan practices; similarly, the taboo on hippophagy (see French this volume: 227-231) was revived at the same time. These prohibitions also would

3 They can largely be categorised in four groups: military, agricultural, riding, hunting (Davis 1989). Each of these groups has several types of horses which could be distinguished, though it is unclear from the historical sources exactly how.

4 The term *equus magnus* first appears at the end of the 13th century and denotes the best of the warhorses. It is never specified what the term refers to specifically (Davis 1989).



Figure 4. Carved ivory box panel, c. 1320-40, French, showing a joust. The relatively small stature of the horses is clearly visible. The riders' outstretched legs with the long spurs reflect the western European riding style at the time and the curb bits were a staple part of a warhorse's equipment. MET object number 17.190.256, Gift of J. Pierpont Morgan, 1917. Image: Public Domain.

have meant that horses were available for riding, possibly in war, rather than be offered as sacrifices (Hyland 1999; Poole 2013). However, horses were still knackered at the end of their (useful) lives and their meat fed to dogs while other resources such as skins and bones were used as raw materials. Even the most valuable destriers were thus treated (Ameen et al. 2021a; Cross 2011; Hyland 1999; Levine 1989; Poole 2013; Thomas and Lacock 2000; Wilson and Edwards 1993).

Horse burials were also a common practice in the Nordic countries, including Iceland. The Norse settlers and Viking raiders, who spread out across the North Atlantic and even as far as the Mediterranean and the Black Sea in the earlier phases of the Middle Ages, may not have had cavalries as such, but the horse certainly played an important role in their culture and appears to have had a strong link to a martial elite (Evans Tang 2020; Evans Tang and Ruiter 2023; Fern 2005, 2010; Leifsson 2018; Pedersen and Schifter Bagge 2021; Stelter 2019). When the Vikings landed in Iceland in the 9th century, they brought horses with them. Genetic evidence suggests that they specifically selected horses which were able to amble (i.e., possess additional gaits). This ability is caused by a mutation on a specific gene and has not been found in early medieval Scandinavia, but there are cases from the British Isles which suggests that the Norse settlers may have brought not only their

own horses to Iceland but also some stock which they acquired, one way or another, during their invasion of Britain in the 8th and 9th centuries (Kristjansson et al. 2014; McGovern et al. 2007; Wutke et al. 2016).

The famous Bayeux tapestry depicts scenes from the Battle of Hastings in 1066 between the Anglo-Saxons and the Normans under William the Conqueror; the horses, war horses, are shown as medium-sized animals which is further supported by the zooarchaeological record (Ameen et al. 2021b; Davis 1988). The Norman cavalry was noted for its efficiency. According to written sources, William rode a Spanish stallion at Hastings which he had received from King Alphonso at the time. Indeed, there seem to be some differences between the English and the Norman horses, notably their manes and possibly their conformation (for analyses of the Bayeux horses see for example: Davis 1988; Keefer 1996, 2011; Sundkvist 2022). Following the conquest of England in the 11th century, average horse size decreased slightly and their bones became more slender, suggesting a change of either stock and/or breeding practices under Norman rule (Ameen et al. 2021b). This highlights the fact that larger body height did not necessarily make a better (war) horse, a theme which becomes even more prominent throughout the medieval period in Europe. Across the continent, average horse size varied only minimally between approximately 130–140 cm; horses larger

than 150 cm were extremely rare until the very end of the Middle Ages and the beginning of the early modern period (Ameen et al. 2021b; Benkert 2023; Creighton et al. 2025). Depictions of warhorses throughout the medieval period are consistent with these findings, showing riders' feet reaching well below their mounts' bellies (Figure 4) (e.g., Ameen et al. 2021b; Benkert 2023; Creighton et al. 2025). Although warhorses do not appear to have been large, or even necessarily larger than the contemporary average, their superiority is evident from the written sources. The Baltic during the northern crusades (12–16th century) provides an interesting case study: the Teutonic knights described the local horse, the *Schweik*, as small but hardy, and although they did use it as a pack animal, they considered their own horses far superior. The physical difference between these horses must have been striking because even in the zooarchaeological record two distinct populations are visible (Benkert 2023; Ekdahl 1991; Gladitz 1997; Pluskowski 2013; Pluskowski et al. 2019). Furthermore, while there is no admixture evident at crusader castles such as Cēsis Castle, the horse population at Vilnius castle, a local castle in Lithuania, showed signs of interbreeding and/or acquisition of Teutonic *Mönchspferden*, corroborating the narrative from historical sources (Benkert 2023).

Post-medieval to modern period (from c. 15/16th c.)

As firearms and artillery emerged on the battlefield in the later Middle Ages, the heavy cavalry horse became impractical and was replaced with lighter cavalry (Ayton 1994; Creighton et al. 2025; Davis 1989; Ekdahl 1998; Etzeberria Gallastegi 2020; Hacker 2015; Hyland 1999). Specialist tournament equipment became more widespread in England in the 15th century (Creighton et al. 2025), indicating a deviant development in warhorses. Initially, the tournament developed as a means to practise military horsemanship and cavalry techniques in the 8th century (Ayton 1994; Gassmann 2017; Hyland 1999). Later, the joust – a tournament competition which was carried out with lances and on horseback – replaced the earlier *mêlée*-style tournament and became a popular sport amongst the nobility (Ayton 1994; Creighton et al. 2025; Davis 1989; Hyland 1999). No longer a direct reflection of tactics on the battlefield, the joust became more specialised and likely produced the need for a horse with different qualities than the “classic” warhorses (cf. Gillmor 1992, 2020).

Heavy cavalry continued to be in use in some parts of Europe, such as France and Italy, until well into the 16th century, despite the high vulnerability of horses to artillery (Creighton et al. 2025). England's army returned to the use of mercenary cavalry units as had been practice during Roman times; this was likely a response to the loss



Figure 5: Official photo of British soldiers in France, during WWI, showing them waiting with their saddled mounts, 1914. Acc. 3155. Image: National Library of Scotland, CC BY 4.0.

of quality warhorses in Britain at the time (Creighton et al. 2025). Contrary to this development, horse armour which is preserved in European collections dates predominantly into these later centuries when the cavalry use on the battlefield was in decline, highlighting that warhorses remained an important part of late and post-medieval European warfare (Creighton et al. 2025).

With the shift in cavalry and military tactics in the later Middle Ages, the role of horses, and warhorses in particular, within society shifted as well; though they by no means lost any of their importance. Rather than the showy central figure of the medieval world, the horse became a quiet, albeit no less crucial part of daily life and continued to flourish and influence human society. This was accompanied with a change in riding style: classical riding schools emerged at many of the royal courts throughout Europe in the Early Modern period, starting with the ‘Spanish Riding School’ in Vienna, which was first mentioned in 1565 (Fischer et al. 2023). Equestrianism evolved to include horsemanship as an art form while retaining and improving the utilitarian and military aspects of previous centuries, eventually giving rise to modern dressage (Caramello 2022).

The horse in war

Horses' natural response to any perceived dangers is flight, fighting only to facilitate escape or, in case of stallions, to defend the herd. The battlefield, therefore, is no place for horses in any way. To create a warhorse, extensive training was needed to overrule the animal's instincts so as to maintain control over it in battle (Bennett 1995; Benkert 2023; Gassmann 2018; Harrison 2022; Jobst 2021; Mayor 2014; Willekes 2016). A good warhorse was not only a matter of prestige and victory but, much more practically, a matter of survival;

many historical manuals deal with the training of horses for war, whether ridden or driven. Several of these written sources also discuss the qualities of a good warhorse, often a mix of physical and mental characteristics; they are usually more vague on the latter. It seems clear that a horse's character and mental as well as emotional capabilities were of significant importance when choosing individuals for military use (Benkert 2023; Gassmann 2018; Harrison 2022; Hyland 2013; Vo Van Qui 2024). Some short-comings in character or physique could be mitigated through training as well as equipment, of course, but were potentially limiting the animal's usability. In any case, to sharpen a horse into a tool for war took considerable amounts of both time and effort and thus explains why (good) warhorses were so highly valued and valuable throughout history.

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Concluding remarks

The long history of horses in warfare stretches from prehistory to the near present. Horses continued to fulfil various important roles in the military in the early modern period, including transport of goods and people, pulling carts, and as mounts and weapons in themselves. With the advent of trench warfare, the use of barbed wire, tanks, and machine guns, true cavalry declined rapidly after WWI (Bökönyi 1974; Ellis 2004; Orr 1803; Phillips 2011). Horses still continued to play key roles in some capacities, for example in WWII, the Korean War or Afghanistan (Hutton 2014; Kelekna 2009; Medlock 2009). Strongly associated with colonial and military rule, some countries continue to maintain active cavalry or horse guards, such as in England and India (Dallal 2009; Joory 2021), and are still in deployment in some areas of the world.

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History of Equine Veterinary Medicine

Savaş Volkan Genç

The horse has been protected and guarded proportionately to its value since the moment it started to live with humans. Equine medicine established itself as a distinct and significant branch of veterinary medicine at an early stage (Donaghy 2010). Long before the advent of veterinary medicine and even before domestication, diseases have affected horses like every biological entity. Lesions have been found in bone and tooth fossils belonging to the *Parahippus* and *Archaeohippus* that lived 18 million years ago, as well as the Hipparion group and *Equus*, some 15–5 million years ago (Bendrey 2012; Rooney 1997). Archaeologically, veterinary care may be seen from the Bronze Age (Kanne 2022; Levine 2005; Taylor et al. 2018). Animal health has not only been an issue for animals. Animals have disappeared as a result of zoonoses or epidemics, causing severe problems for people from the past to the present (Bendrey 2012; Guthrie 1939; Levine 2005). In this chapter, I trace the history and development of equine veterinary medicine from historical sources.

Equine Medicine in Mesopotamia

The oldest information available about equine medicine originates from Babylon. Urlugaledinna, recorded as a healer in the city of Lagash (c. 3000 BCE), is sometimes considered the earliest known figure associated with animal care, although direct evidence for veterinary practice remains inconclusive (Dunlop and Williams 1996; Jones 2011). The Assyrian Empire was a pioneer in the supply and breeding of good horses. The earliest known text on equine nutrition and training was authored by Kikkuli¹ of Mitanni in the 14th century BCE. In the Syrian city of Ras-Shamra, a book on equine diseases and treatment was written in Ugaritic². At a time when the Assyrian civilization was weakened, Persian culture arose, which idealised horses even more, so much so that the word *Persian* is derived from the word for cavalry. It was the largest empire of its time, renowned for its superior cavalry and high-quality horses (Dunlop and Williams 1996).

Egypt possessed a significant number of horses during the New Kingdom period (c. 1550–1070 BC), later than the civilizations around it (Delpout and Köpp-Junk, this volume). The Hyksos occupation of Palestine demonstrated to Egypt the strategic value of the horse. Initially, Egypt was defenceless against chariots drawn by swift horses, but later incorporated them into its own military. However, they soon attained great knowledge about the horse,

1 Raulwing, P. 2009. *The Kikkuli Text. Hittite Training Instructions for Chariot Horses in the Second Half of the 2nd Millennium B.C. and Their Interdisciplinary Context*.

2 Marguerite Yon gives the following references on this subject in her book *The City of Ugarit at Tell Ras Shamra: The "House of Rasapabu" 1954*: Schaeffer C., "Rapport ...," *Syria* 31, p. 64 (cf. J.C. Courtois, UF 1979, pp. 114–15, Figure 13). 1981, Y. Calvet, "Aménagements hydrauliques d'Ugarit," *L'homme et l'eau I*, Lyon, pp. 38–40.

and even used straw sandals to protect their hooves (Delpeut and Hettema 2019; Hornung et al. 2006; Klecel 2021). The *Kahun Papyrus*³ reveals that in 1900 BC priests had advanced veterinary knowledge and a medicine system. Over time, Egypt raised very good horses, built very good chariots and expanded its territory to the Euphrates (Donaghy 2010; Dunlop and Williams 1996; Jones 2011; Jones 2021).

Equine Medicine in East Asia

The history of veterinary medicine in China began with the legend of an equine physician. One day, a dragon with droopy ears and an open mouth came to Ma Shih-huang, a specialist equine physician, for treatment. Ma Shih-huang pierced the dragon's lips and mouth, administered a liquorice root medicine, and healed the dragon. Then other dragons came for treatment and one day they took the veterinarian and left. No one knows where he was taken (Jones 2021; Tao 1940).

In ancient China, equine physicians were a respected, high social class. Sun Yang (659–620 BC) was considered a master in equine medicine and the father of veterinary acupuncture. He said that although horse anatomy, physiology and pathology can be read, expertise in horses can only be obtained with practice, not with a book. Four categories of medicine were recognised, ranked as nutritionists, physicians, surgeons and veterinarians (Hu and Liu 2020; Jones 2021). The performance of the veterinarians was evaluated on the mortality rate of the animals that they examined. Veterinary medicine had five departments, with veterinarians (*sheu-yi*) ranked highest in seniority, followed by four lower-grade doctors. China's attention to equestrianism transformed them from a farming society under Turkish rule to a militaristic state based on the strength of an equestrian warrior society (Dunlop and Williams 1996; Hu and Liu 2020; Jones 2021).

The Indian civilization, which was born between the Ganges and Indus rivers in 2500 BC, established hundreds of animal hospitals in the Vedic Period (1800–1600 BC). Early Vedic texts are the foundation of Ayurveda, the traditional Indian medicine. Respect for the life of all animals is the foundation of Indian faith. Indian medicine has its roots in Sanskrit Indo-Aryan texts written around 2000 BC. The basic concept is the acceptance that the universe consists of four elements (air, earth, fire, water). Ayurvedic texts⁴ have been transmitted through generations by copying and incorporating certain ideas and concepts from foreign cultures (Karasszon 1988; Smithcors 1958); later versions were translated into Persian, Chinese and Arabic. During this period,

some important figures in the history of medicine emerged. One of the most important, Rhazes⁵ (864–925/935 CE), was a physician, philosopher and alchemist, and lived during the Islamic Golden Age; he used these Ayurvedic texts to develop Islamic teachings (Jones 2021; Smithcors 1958).

In Indian mythology, Brahma gained the knowledge of veterinary medicine in the Vedas from Sun-God and protector of Atharvaveda which represents the foundation of Hindu medicine, also includes information on animal diseases, herbal medicines and treatments, his twin sons, the Asvins, born of a mare-god. In another legend, God Indra gave the miraculous horse Dhanvantari knowledge of life and surgery, thus making Dhanvantari the father of Indian medicine (Karasszon 1988; Majno 1975). The origin, breed, age and marking of the horses in the Indian royal stables were recorded and a veterinarian was employed. But according to records other than legends, Salihotra⁶, who is the first Indian horse healer, describes drugs, nasogastric tube, boluses, drains and cysts in horses in his work *Aswayurveda Siddhayoga Samgraha* (400 AD). In addition to these, in the work, castration, bleeding, enema, cauterization are also explained, and special attention is paid to the hooves. Furthermore, horse nutrition, training, temperament, gait, teeth and rider's expectations are discussed. The importance of the book had preserved itself over time, during the time of Mahmud of Ghazni (971–1030), a very important book was written on horse diseases called *Faras-name*⁷, which contains information on significant defects in horses that were crippling deformities. Birth anomalies, such as three ears, split hooves, and single testicles were also described. A work was translated 600 years later by Saiyed Abdulla Khan Bahadur Feroze Jung, by order of Shah Jahan (1628–1658), by quoting from Salihotra's work. The book was known as *Salhatur* and was later translated into English as *Kitab-ul-Vitrat* (Acar 2015; Baykuzu 2023; Karasszon 1988; Wynn and Fougere 2007). The Muslim invasion from the north in the 9th century and the Mughal Empire in the 16th century and Islamic medicine based on Hippocratic medicine hindered the progress of Ayurvedic medicine. During this long period, although traditional Indian medicine was completely suppressed over time, local village healers continued centuries-old practices (Dunlop and Williams 1996; Jones 2021; Majno 1975; Smithcors 1958).

3 Griffith, F. Ll. 1898. *The Petrie Papyri: Hieratic Papyri from Kahun and Gurob*. Pp. 5–11, Plates V–VI. London: Bernard Quaritch.

4 Mukhopadhyaya, G. 1913. *The Surgical Instruments of the Hindus, with a Comparative Study of the Surgical Instruments of the Greek, Roman, Arab, and the Modern European Surgeons*. I–XXI.

5 El Gammal, S.Y. 1995. Rhazes contribution to the development and progress of medical science. *Bulletin of the Indian Institute of the History of Medicine Hyderabad* 25(1–2):135–149.

6 Salihotra of Bhoja, 1953. Ed. by E.D. Kulkarni, Deccan College, Postgraduate and Research Institute, Sources of Indo-Aryan Lexicography, Poona. Code No: L 33, plates X–XX.

7 Choudhary, R.A. 2023. The Tradition of equine Veterinary Literature in Pre-Colonial and Colonial India: The Writing of Faras-nama Literature. *Studies in Humanities and Social Sciences* 29(1):141–167. <http://14.139.58.200/ojs/index.php/shss/article/view/1447>

Equine Medicine in Ancient Greece

Ancient Greek civilization was a mixture of culture and knowledge, encompassing the Aegean and its coasts, Asia Minor, the Levant and the Balkans, including city-states such as Athens, Sparta, Corinth and Thebes. In 400 BC, Plato and Aristotle developed a method of thinking that had a profound impact on humanity. Hellenistic thought spread to the world with Aristotle's student Alexander the Great (356–323 BC). It reached its peak in 300 BC with advances in astronomy, mathematics, geography, and especially medicine. After the Battle of Actium (31 BC), Rome took over the intellectual and metaphysical legacy of the Hellenistic world, including medical understanding. This legacy also included horse care and treatment (Donaghy 2010; Jones 2021; Karasszon 1988).

Ancient Greece gave birth to many thinkers and scientists, and comprised a period in which the first important studies on horses were recorded. Aristotle, a student of Plato, became the first veterinary scientist by recording his scientific studies in many fields. He documented that horses do not have a gallbladder, the reproductive ages of horses, and explained how to determine the age from teeth (Donaghy 2010; Jones 2021; Karasszon 1984). Aristotle's biological masterpiece, *Tōn perì tà ζῷα ἱστοριῶν* (*Ton perita zoia historion, Historia Animalium*), is mostly about horses and examines the concept of pathology and disease with the doctrine of the Hippocrates's⁸ four humours (blood, phlegm, yellow bile and black bile). He explained that horses in the pasture are generally healthy except for foot problems, hoof loss and hoof growth, and recommended castration to horses showing symptoms of abdominal pain (possibly from a strangulated scrotal hernia). The symptoms of tetanus were also described. The book further includes many original observations on the gait of the horse, laminitis, displacement of the bladder and swollen prepuce. He believed that the shrew's bite had a fatal venomous effect causing sudden death in a healthy animal; however, this claim is inconsistent with modern scientific understanding, which does not support a direct link to anthrax (Jones 2021; Karasszon 1984; Smithcors 1958).

8 Hippocrates of Kos (460–370 BC), was explaining the causes of diseases with a rational interpretation away from religion and magic, referred to as the father of medicine in recognition of his lasting contributions to the field, such as the use of prognosis and clinical observation, the systematic categorization of diseases, or the formulation of humoral theory. Hippocrates' humoral-pathology theory, his teachings on patient examination, and his rational recommendations have been very influential on veterinary medicine. The increased interest in horses, chariots, horse racing, and the development of cavalry encouraged medical research on horses. Animals have been described as optimistic, cold-blooded, irritable and melancholic. Horse doctors were referred to as *hippiatros* and are recorded in a papyrus dated 257 BC in Greek-influenced Egypt. It is described that castration, bleeding, cauterization and trepanation were all done in one labour (Dunlop and Williams 1996; Jones 2017; Jones 2021; Taher et al. 2018).

Simon of Athens⁹ who is the earliest known ancient Greek writer on the subject wrote detailed information about the horse in two works called *Veterinary Art* and *Inspection of Horses* (500 BC). They deal with the characteristics of a good horse and is titled, roughly, “on the ideal horse”. Described by Pliny as “*primus de equitatu scripsit*”, or “the first to have written on riding¹⁰”, he is mentioned in Xenophon's works. Xenophon (430–354 BC) was a philosopher, historian, and soldier from Athens, and also gave information about cavalry management in his work *Hipparchus. On Horsemanship* is the *Peri-Hippicon*, one of the two treatises on horsemanship by the Xenophon¹¹, which describes horse selection, management, training, and hygienic care, and outlines the basic ideals of equestrianism that are still familiar and used today (Donaghy 2010; Willekes 2016; Jones 2017; Jones 2021). Diseases, other than rheumatism and hoof care, were not included. The necessity of controlling the feeding was explained, so that the horses do not steal each other's food. It was stated that attention should be paid to the feet, and it was pointed out that the accumulation of urine on the floor is an undesirable situation, since moist and smooth ground will ruin even the best feet; therefore, the ground must be paved with special stones, each of which is the width of a horse's foot, so that the foot is dry and the sole is exposed. The text emphasises that it is easier to cure diseases while acute rather than to treat them after they become chronic or misdiagnosed (Jones 2021; Jones and Koolmes 2022).

Alexander the Great, a student of Aristotle, gained fame at a young age by training and riding the black stallion Bucephalus, which no one could ride. He conquered the Mediterranean, Western Asia, Arabia, Africa, and Southern Asia and established an empire that stretched as far as the

9 Ross, W., and S. Hornblower. 2016. Simon, of Athens. Oxford Classical Dictionary Online. <https://oxfordre.com/classics/view/10.1093/acrefore/9780199381135.001.0001/acrefore-9780199381135-e-5941>.

10 Pliny the Elder. 1942. *The Natural History. Pliny the Elder*. J. Bostock, M.D., F.R.S.H.T., B.A., ed. Riley, Esq. London: Taylor and Francis. Pliny the Elder. 1855. *Volume II, Natural History Books 3–7*. Trans. by H. Rackham. Loeb Classical Library 352. Cambridge: Harvard University Press.

11 Stoll, O. 2012. For the Glory of Athens: Xenophon's Hipparchikos <Logos>, a technical treatise and instruction manual on ideal leadership. *Studies in History and Philosophy of Science Part A* 43(2): 250–257. DOI:10.1016/j.shpsa.2011.12.023. Althoff, J. 2002. Form und Funktion der beiden hippologischen Schriften Xenophons Hipparchicus und De re equestri (mit einem Blick auf Simon von Athen). In T. Fögen, ed. *Antike Fachtexte*. Pp. 235–252. Berlin: Arrian. Xenophon. 1999. *Xenophon and Arrian: On Hunting with Hounds*. Trans. by A.A. Phillips and M.M. Willcock. London: Aris and Phillips. Xenophon. 1925. *Vol. VII Scripta Minora*. Trans. by E.C. Marchant and G.W. Bowerstock. Loeb Classical Library 183. Cambridge, MA: Harvard University Press.

Indus valley. He spread Greek culture and Aristotelian¹² philosophy. After Alexander the Great died in 323 BC, his empire was divided among his generals. General Ptolemy, the founder of the Ptolemaic Dynasty, built the famous science centre, *Museion*, which had laboratories, an observatory, reading rooms and a library of 700,000 scrolls, in the capital city of Alexandria in Egypt, which was under his control. It became the centre of Hellenistic culture and great advances in science, medicine and surgery were made there during its 800 years of existence. The basis of the medical knowledge developed here were experiments on animals, and this was also reflected in veterinary medicine and equine medicine (Dunlop and Williams 1996; Karasszon 1984; Smithcors 1958).

Equine Medicine in Ancient Rome

The cultural roots of Roman veterinary art were the Etruscans, who raised beautiful, long-legged horses suitable for riding and racing. In the early Roman period, human and veterinary medicine developed from the ancient art of divination with a mixture of folklore, magic, and religious rituals such as animal sacrifice. The priests made predictions by looking at the entrails of sacrificial animals. Fortune tellers were the first experts to give advice on the treatment of animal diseases. The work of healing and therapy was left/given to a trusted slave in large households (Belfiglio 2018; Jones 2021; Klecel and Martyniuk 2021).

The Roman corpus of veterinary texts is considerable. Marcus Portias Cato¹³ (234–149 BC) wrote *De Agri Cultura*, the oldest Roman agricultural and veterinary text. He condemned the practice of divination, even though he had ancient-superstitious beliefs such as burning coal, wooden plates, fasting, and standing upright next to the attendant in order to cure animals. Marcus Terentius Varro¹⁴ (116–27 BC) accepted contagion as a factor in the

epidemic and attributed the cause to very small, invisible animals (Belfiglio 2018b; Crittenden 2016). This miasma theory continued until the early 1800s. He said that equine medicine was as special as human medicine, veterinarians were called *hippiatroi*, or equine doctors. Publius Vergilius Maro¹⁵ (70–19 BC) described in his great work, *Georgica*, a severe equine disease (probably anthrax) in which wine was the only medicine. Grattius Faliscus¹⁶ (63 BC–14 AD) wrote about hunting methods, types of prey, selection of horses and dogs, and their management and care. The work of Aulus Cornelius Celsus¹⁷ (25 BC–50 AD) covered diagnosis, pharmacy, and surgery, and is considered the best source of Roman medical¹⁸ knowledge. Celsus departed from Hippocrates in several ways, and saw that the methods used in veterinary studies could have a place in human practice. Botanist Pedanius Dioscorides¹⁹ (40–90 AD) joined the Roman army as a Greek doctor, pharmacologist, and surgeon. His work was the main source for equine medicine for 1500 years, with Latin and Arabic translations used (Belfiglio 2018a; Belfiglio 2018b; Crittenden 2016; Jones 2021; Klecel and Martyniuk 2021).

As a physician, observer, and experimenter, Galen of Pergamon²⁰ (129–216 AD) created a synthesis of Greek medicine in his work consisting of nearly 400 medical treatises. While Hippocrates showed little respect for those who value animal health, Galen valued the collaboration between the two burgeoning disciplines. In *De Anatomicis Administrationibus*, he referred to people who healed animals. Along with the *Corpus Hippocratica*²¹, his works represented the medical achievements of antiquity. Its

- 12 The origin of the works known as *baitarnames* today is attributed to a legend that Alexander allegedly lived with his teacher Aristotle during his expeditions. Alexander falls ill during his eastern expedition. Aristotle tells him that if he drinks water from the fountain named *Žül-çüş* with forty bowls in the city of Belh, he will be healed. Alexander asks the ruler of Belh, Hüsrev, to send this water. Knowing that the water is healing, Hüsrev understands that Alexander is sick and does not send the water. Alexander got angry at this and besieged the city of Belh. Even if he besieged for three years, he could not take the city. His army weakens and his horses begin to get sick. Alexander, to his teacher Aristotle says: “*You have been dealing with science all this time, you have been a cure for the problems of mankind. Even if you write a book for these horses, if there is an illness on the road, they should apply it according to this book.*” Thereupon, Aristotle writes a book called *Veterinarian* about horse diseases and treatment (Yeşilova 2009).
- 13 Kuloğlu, M. 1990. M. Porcius Cato. *Ankara Üniversitesi DTCF Dergisi* 33(1–2): 321–329.
- 14 Harrison, F. 1918. *Roman Farm Management, The Treatises of Cato and Varro*. New York: The Macmillan Company. Varro. 1935. *On Agriculture*. Trans. by W.D. Hooper. Loeb Classical Library 283. Cambridge, MA: Harvard University Press.

- 15 Maro, P.V. 2006. *Georgica, Çiftçilik Sanatı*. Istanbul: Yapı Kredi Yayınları.
- 16 *Grati Falisci Cynegeticon [A poem of hunting by Grattius the Faliscian]*. C. Wase Gent, ed. and ill. In the digital collection Early English Books Online. <https://name.umdl.umich.edu/A85541.0001.001>. University of Michigan Library Digital Collections.
- 17 Donaldson I.M. 1478. Celsus: De medicina, Part 1. *Journal of the Royal College of Physicians Edinburgh* 44(3):252–4. DOI:10.4997/JRCPE.2014.314.
- 18 Allbutt, C. 1908. Celsus de Medicina, *The Classical Review* 22(5): 151–154. Celsus. 1938. *On Medicine, Volume III: Books 7–8*. W.G. Spencer, trans.. Loeb Classical Library 336. Cambridge, MA: Harvard University Press.
- 19 Dioscorides, P. 2000. *De Materia Medica, The Herbal of Dioscorides the Greek*. Johannesburg: IBIDIS Press. De Vos P. 2010. European materia medica in historical texts: longevity of a tradition and implications for future use. *Journal of Ethnopharmacology* 132(1):28–47. DOI:10.1016/j.jep.2010.05.035.
- 20 Toledo-Pereyra, L.H. 2002. Claudius Galenus of Pergamum: Surgeon of Gladiators. Father of Experimental Physiology. *Journal of Investigative Surgery* 15(6): 299–301. DOI:10.1080/08941930290086100. Nutton, V. 1973. The Chronology of Galen's Early Career. *The Classical Quarterly* 23(01):158. <https://doi.org/10.1017/s0009838800036600>.
- 21 Fowler R.C. 2023. On the Heart of the Hippocratic Corpus: its meaning, context and purpose. *Medical History* 67(3):266–283. DOI:10.1017/mdh.2023.22.

authority remained undisputed for nearly 1500 years (Ajita 2015; Jones 2021; Smithcors 1958).

Eumelus²², known as a great equine doctor, is one of seven authors cited in the *Hippiatrica* collection, an extremely important compilation of ancient texts from the late 3rd century/early 4th century AD (discussed further below). He is the earliest cited author to write about horses. In his writings, he discussed wounds, eye diseases, cough, digestive diseases, and parasites. He explained bloodletting and wound treatments, and advocated applying faeces to wounds to stop bleeding. To treat corneal wounds, he asked the operator to use his fasting saliva and spit into the affected eye after chewing salt. He stated that on a horse with a boil, before the boil filled with pus, the veterinarian should hold the boil with three fingers and say, 'I beat you'. He defended amulets, saying that most folkloric solutions are harmless but useless (Belfiglio 2018; Jones 2021).

Apsyrtus²³ (300–400 AD) was a senior veterinarian in the Roman army. He examined the horse practices of the nomadic tribes living around the Black Sea, and wrote a review that is mostly used in *Hippiatrica*. It is the most comprehensive surviving work on equine medicine in ancient Greece (Dunlop and Williams 1996; Jones 2021; Karasszon 1988). Apsyrtus's work included articles on diagnosis, cause and treatment of disease – mostly glandular, colic, nail care, drug formulas, magic cures. Twenty-one spells are listed in his quotations from different versions of *Hippiatrica*. He is experienced in the treatment and nutrition of war wounds. *Malleus* was used as a general term for epizootic diseases. He described intestinal and kidney rupture, and diseases of the small intestine and advocated manual removal of faeces as a routine procedure in intestinal disorders. He discussed scabies but did not mention that it is contagious. In laminitis, he named barley disease to explain the digestive origin of the problem. Eye diseases, tetanus, hoof abscesses, foot puncture are well explained. He explained castration accurately and in detail (Jones 2021; Karasszon 1988; Smithcors 1958).

Pelagonius wrote *Ars Veterinaria*,²⁴ the first Latin book on equine diseases, in mid–5th century AD. The work was translated into Greek and included in *Hippiatrica*. Injury and hoof wear were important topics. He suggested hanging amulets and talismans to protect sick horses, and many other dubious healing methods. He used the ashes of a swan buried alive for the treatment of noxious fever (possibly anthrax), and a swallow's nest for the eye

treatment. He believed in the necessity of drawing blood in the treatment (Dunlop and Williams 1996; Jones 2021; Karasszon 1988).

Hippocrates (c. 460–370 BCE) focused primarily on human medicine, but some of his humoral theories influenced early veterinary practices. Nail, eye, and digestive system problems were his main subjects. He explains the use of ants to sew up wounds and incisions, but he rarely talks about the causes of the disease, suggests taking blood, and refers to the humoral theory. Theonnestus²⁵ (400 AD) was a veterinarian (or horse lord to the king) of Roman Emperor Licinius, and a keen cavalryman in the army of King Theodoric of the Ostrogoths (Jones 2021; Smithcors 1958). It is also quoted in the *Hippiatrica*, and is notable in comparison to the others, in that there is no mention of witchcraft or sorcery. He discussed grooming and horse selection, giving importance to foot care, and provided advice for amateurs, professional riders, and equine physicians. He described a 31-ingredient tetanus drug but wrote that he cured his own horse by keeping it warm²⁶ (Crittenden 2016; Dunlop and Williams 1996).

Chiron is the author of *Mulomedicina Chironis*. In the book, although the word *malleus* denotes more than one disease, diagnostic methods are explained in detail and a number of treatments are presented. Prophylactic measures such as isolation, fumigation, and burial were suggested. It is stated that blood can be taken in the spring to clean the dirty blood accumulated in the winter. Bloodletting is described with herbs and oils, including a very complex procedure involving mustard pastes and cautery. The use of the *sagitta*, a phlebotomy instrument, is described. Differential diagnosis of fevers and different types of colic by rectal examination is explained (Dunlop and Williams 1996; Jones 2021). *Purgio capitis* was examined in detail. Rectal prolapse and its treatment with submucosal resection was described. The treatment of uterine prolapse in the mare is discussed, and castration is explained in detail. Publius Vegetius Renatus (450–500 AD) wrote *Artis Veterinariae* and *Sive Mulomedicinae* (Karasszon 1988; Smithcors 1958). He complained of the lack of veterinary education in the Roman world, and stated that a trained person who undertakes the medical care of animals should be viewed by the public in the same way as those who do human medicine. Publius discussed the equine malleus, including scabies, epizootic lymphangitis, seven types of fever, arthritis, colic, tetanus, and intestinal helminths. Treatment such as bleeding, cautery and soaking were outlined, and isolation

22 Doyen-Higuet, A.M. 1984. The Hippiatrica and Byzantine Veterinary Medicine. *Dumbarton Oaks Papers* 38: 111–20.

23 Brill, L.N.E. 2011. *Ubiquitous Mulomedici: The social, economic, and agronomic significance of the veterinarian to the Roman world*. PhD Thesis, Victoria, AUS: University of Victoria.

24 Fischer, K.D. 1981. The first Latin treatise on horse medicine and its author Pelagonius Saloninus, *Medical History* 16:215–226.

25 Hoyland, R.G. 2010. Theonnestus of Nicopolis, Hunayn ibn Ishaq, and the beginnings of Islamic veterinary science In P. Pormann, ed. *Islamic medical and scientific tradition Pt. 2*. Pp. 385–405. London: Routledge.

26 The Arabic translation, entitled *Kitab al-Baytara*, by Ibn Al Hizam in late AD 900, is attributed to Theonnestus (Lazaris 2023).

of the animal was emphasised. He discussed horse ageing, drains, medications, surgery, vertigo, heart disease, eye, lip and dental problems. Publius further explained ointments and *malagma*, dressing to soften the hard part of a wound (Crittenden 2016; Dunlop and Williams 1996; Jones 2021; Karasszon 1988; Smithcors 1958).

Hierocles²⁷ (400–500 AD) was knowledgeable in horse care. He said that the contents of the rectum and colon should be emptied manually in the treatment of intestinal diseases, and discussed the issue of horse selection and hygiene. Hierocles believed in the necessity of taking blood and explained the treatment of eyes and cysts, recommending cooling drinks, laxatives, enemas, barley oatmeal, magic in treatment. He further used vinegar as a wound and skin dressing (Crittenden 2016; Jones 2021; Karasszon 1988; Smithcors 1958).

Equine physicians had various names in the Roman world, such as *equarius medicus*, *mulo medicus*, *medicus veterinarius*, *medicus iumentarius*, *medicuspecuarius* and *medicus equarius*; although no clear definition of the role existed. The term *mulo medicus* was also used in Diocletian's *Edict* and also in the Theodosian *Codex*²⁸ (Crittenden 2016; Jones 2022; Karasszon 1988).

Equine Medicine in the Eastern Roman (Byzantine) Empire

Veterinary medicine was a respected profession in the Eastern Roman Empire. Horse physicians and cavalymen called *hippiatro* were an important part of society. The Eastern Roman cavalry army was inspired by the actively raiding cavalry of the Turks, Avars, Slavs and Persians. The strong cavalry had good veterinary support. Byzantium continued the intellectual activity of Ancient Greece. In the 10th century, Emperor Constantine commissioned writers to gather information on veterinary medicine and agriculture (Jones 2021; McCabe 2007; Wilkinson 2005).

The *Hippiatrica*

The *Hippiatrica* is a collection of Greek texts on horse medicine, later translated into Latin and influencing medieval European veterinary practices. When Eastern Rome collapsed, most books, documents, and resources

were taken to Western European monasteries. The rest in Byzantium was collected by Conqueror Sultan Mehmet, a true Renaissance ruler (Casale 2022; Karasszon 1988; Jones 2021). These works were first translated into Syriac and Arabic, and again into Latin at the end of the Middle Ages. This accumulation passed to Europe between the 12th and the 15th centuries, giving rise to the growth of the Renaissance in the west (Jones 2021). Although the *Hippiatrica* is a handbook of Greek practices in equine care, management, and diseases, it is also a work in which each author discusses a disease and its treatment. Medicines, prescriptions, massages, bath treatments and even spells are described. After its translation and publication in 1530, it had a profound impact on veterinary medicine in Western Europe at a time of revival of learning. Equine medicine established itself as the most advanced veterinary practice (Dunlop and Williams 1996; Jones 2021; Smithcors 1958).

However, in the early days of the Roman Empire, the horse was mostly used for personal riding. Oxen were preferred in farms and general transportation, and mules were preferred in the army (Jones 2021). Lameness and foot problems, especially arrow and spear wounds, yoke and saddle wounds, and treatment of skin diseases were among the important problems for army animals. Colic, tetanus, and internal parasites were also known issues. Bloodletting, cautery treatment, and many medications, mostly herbal, were used. Bleeding, cautery treatment, many drugs, mostly herbal were used (Dunlop and Williams 1996; Karasszon 1988; Smithcors 1958). Horseshoeing and farriery, which is a very important subject for horse orthopaedics, developed towards the end of the Roman Empire. The practical economy of the Romans and the veterinary expertise of the Greeks made possible an effective system of equine disease control, apart from epizootic problems. The decline of the Roman Empire was not only in the political, military and economic spheres; magic, talismans and spells became an important part of veterinary diagnosis and treatment. Thus, losses in livestock, which was an important pillar of the economy, accelerated (Belfiglio 2018a). King Francis I of France (1494–1547), collected manuscripts for the royal library, and understood the importance of *Hippiatrica*. He appointed Jean de la Ruellius, who studied medicine, knew Latin and Greek, and translated Hippocrates, Galen, Celsus and Dioscorides, for the translation of equine medicine books that would be applied to and improve the cavalry units (Dunlop and Williams 1996; Jones 2021; Karasszon 1988).

Equine Medicine in the Medieval Islamic World

In the Islamic world, veterinary medicine was not separated from human medicine, and human and animal were considered the same. As Christianity increased its influence, Muslim conquerors and Islamic civilization

27 These are the laws prepared by Theodosius II between 435 and 438. Imperial decrees issued since Constantine the Great had been collected and classified in a single compilation. The work consists of 16 books covering 2500 laws written between 313 and 437 and covers the political, socioeconomic, cultural and religious issues of the Roman Empire in the 4th and 5th centuries (Harper 2010).

28 These are the laws prepared by Theodosius II between 435 and 438. Imperial decrees issued since Constantine the Great had been collected and classified in a single compilation. The work consists of 16 books covering 2500 laws written between 313 and 437 and covers the political, socioeconomic, cultural and religious issues of the Roman Empire in the 4th and 5th centuries (Harper 2010).

similarly spread and expanded throughout the Middle East, North Africa, and Spain as a new cultural and political power. Islamic civilization has had very important effects on veterinary medicine. Muslim conquerors understood the value of the Greek veterinary treatises in the hands of Byzantium, and Muslim scholars prevented these works from being lost by translating them (Dinçer 2002; Karasszon 1988). Upon the death of Nestorian Patriarch Nestorius in Upper Egypt, where he was exiled (451), his followers took refuge in the school established in Gundeshapur. Theologians, craftsmen, physicians and printers gathered here established a medical school and hospital. This place and the scientists trained here had been an important source in the development and spread of the medical and veterinarian knowledge of the Islamic civilization. Here Muslims worked together with Jewish people who were experts in medicine, and Christians who had mastered the Greek texts. In the monasteries of the Nestorians in Syria, the Greek texts were first translated into Syriac, and over time into Persian and Arabic (Dinçer 2002; Hoyland 2004; Jones 2021; Karasszon 1988; Smithcors 1958).

The knowledge spark that started with the translations of Latin veterinary and medical texts at the end of the 8th century turned into a flame in the 12th century. Mesopotamia, Egypt, Sicily and Spain became active fields of study for Muslim scholars. Schools and libraries were established, books were written, and public lectures were given in mosques. Arabic developed in terms of words and idioms in order to express the concepts of science and philosophy precisely and clearly (Dinçer 2002; Jones 2021). Plato, Aristotle, and some neoplatonic works, all Greek culture in medicine (human-veterinary), mathematics, astronomy, astrology, alchemy and magic were translated. Sources from Iran and India were also added. While it was studied out of philosophical curiosity, it was also studied to satisfy the practical need for medicine for humans and horses. *Beytül-Hikme* (House of Wisdom, بَيْتُ الْحِكْمَةِ, *Bayt al-Hikmah*), was established in Baghdad (c. 8th century AD), and transformed from the Sultan's private library into a public academy. This rich scientific academy was destroyed by the Mongols in 1258. In addition to translations of books written in Greek, Latin and Persian in the fields of medicine, alchemy, physics, mathematics, astrology and other sciences, original studies were also published there. The destruction of *Bayt al-Hikme*, which was one of the important stops in humanity's scientific adventure, dragged the Muslim lands into a period of scientific darkness (Dinçer 2002; Jones 2021; Karasszon 1988; Smithcors 1958).

The love and passion for horses throughout the Islamic lands played an important role in the development of equine medicine (Erk 2002; Mohamed et al. 2011). Mohammed ibn Yağub, the veterinarian of the Caliph al-Motathed, wrote

in 695 a book on hippiatry based on Greek, Persian, Indian and Syrian sources. Al-Jahiz²⁹ (800) wrote the first zoological work in Arabic, *Kitab al-Hayawan*³⁰. Hunayn ibn Ishaq³¹ (808–873) wrote a handbook of ophthalmology, translated the works of Galen and Apsyrus, Indian literature, the horse studies of Hippocrates, and the Greek inspections of Theonnestus. Ahi Hizam³² wrote the first and oldest Arabic veterinary book on horse management and health in 866. He identified seven diseases that impede mobility. Al-Sahib Taj al-Din³³ (d.1307) described the use of the horse in war in his book, *Kitab al Baytarah* (Erk 2002; Mohamed et al. 2011; Jones 2021). Diagnosis and treatment sections were compiled from Indian and Armenian sources. Al-Malik al-Mujahid Ali b. Da'ub b. Yusuf al-Rasuli³⁴ (d. 1362), the king of Yemen, wrote a treatise on the management, training and health of horses. Kemal ed Din al Damiri³⁵ (1394–1405) wrote an important zoological work, describing numerous animal diseases, including rabies (Erk 2002, Jones 2021; Karasszon 1988; Smithcors 1958).

Hippiatry had its golden age in the medieval Islamic world. Horses were separated from camels and other animals, and were considered to belong in a higher class. Equine medicine was evaluated at the human medicine level (Mohamed et al. 2011). In *Nabatheen*, which is one of the oldest works translated from Aramaic to Arabic, and attributed to Shanak, horse health, welfare and diseases according to body parts, teeth, head, neck and extremities are described. Specific diseases were defined, and the term malleus was used for a number of diseases. Epizootic lymphangitis was named *kould* and treated with cautery.

- 29 Gibson, N.P. 2015. *Closest in Friendship? Al-Jahiz' Profile of Christians in Abbasid Society in "The Refutation of Christians" (Al-Radd 'ala al-Nasqara)*. The Catholic University of America Department of Semitic and Egyptian Languages and Literatures School of Arts and Sciences, PhD Thesis. Washington, D.C.
- 30 Al-Jahiz., *Kitab al-Hayawan*. 2011. In B. Muhammad, ed. *U. Al-Sud. Lebanon: Dar Al-Kotob Al-Ilmiyah*. Beirut: Scientific Book House.
- 31 Hunain ibn Is-haq. 1928. *The book of the ten treatises on the eye, ascribed to Hunain ibn Is-haq (809-877 AD): the earliest existing systematic text-book of ophthalmology*. Cairo: Government Press.
- 32 İbn Ahî Hizâm el-Huttelî. *Kitâbü baytarnâme*. İstanbul: Süleymaniye Kütüphanesi, Fatih, 3535, 1a-135a; İbn Ahî Hizâm el-Huttelî. *Kitâbü'l-fürûsiyye ve'l-baytara*. İstanbul: Beyazıt Devlet Kütüphanesi, Veliyyüddin Efendi, 3174/1, 1a-135"; İbn Ahî Hizâm el-Huttelî. *Kitâbü'l-hayl ve'l-fürûsiyye ve'l-baytara*. İstanbul: Süleymaniye Kütüphanesi, Hafid Efendi, 257, 1a-110a.
- 33 Al-Sâhib Tâj al-Dîn. 1984. *Kitâb al-Baytarah [Book on Veterinary Medicine]*. Facsimile edition (Series C-5,1-2). 2 vols. Ed. by F. Sezgin. Frankfurt: Institute for the History of Arabic-Islamic Science.
- 34 Rohma. 2008. *Contributions of Medieval Arab-Muslim Scientists to Botany and Agriculture*. PhD dissertation, Aligarh, IND: Aligarh Muslim University.
- 35 Kemâleddin Demîrî. 2018. *Hayâtül Hayevân Havas ve Esrarı*. Trans. by R. Serin. İstanbul: Pamuk Yayıncılık; Kemâleddin Muhammed ed-Demîrî. 1969. *Hayatu'l-Hayavani'l-Kubra*. Y.y: Matbaatu Mustafa el-Babi. eş-Şeyh Kemâleddin ed-Demîrî. Hayâtü'l-Hayevâni'l-Kübrâ. Beyrut-Lübnan: Dâru İhyâi't-Turâsi'l-'Arabî; t.y.

Although anthrax was well known, its pathogenesis was unknown. Coitus transmission of Dourin was understood, but control measures were not developed. Intestinal diseases, colic and diarrhoea were studied in detail (Dinçer 2002; Jones 2021; Smithcors 1958; Wilkinson 2005).

Some of the reflections of the Islamic culture, which was dominant in North Africa, the Middle East, Central Asia and Southern Europe from the 8th century to the 14th century, on the field of veterinary medicine are as follows: skincare, bleeding, and cautery were the main treatments, along with a wide range of drugs. Many materials were used, such as fox and pigeon blood, frogs, antlers, faeces, saliva, urine, egg yolk, honey, salt, alum, ash, borax, limes, saltpetre, sulphur, arsenic, zinc oxide (Yıldırım 2003; Yıldırım 2013; Yıldırım 2016). Expert veterinarians were trained in abscess opening, osteal growth resection, and cataract extractions, while castration was performed as a routine surgery. In horses, damage or cuts to the plantar surface of the hoof was repaired using metal implants. Bandage and splint application were performed in the treatment of lower limb fractures and injuries, as well as tooth extraction and filling. Cauterisation was often done by piercing, needle, or linear burning. During this period of several hundred years (8th–13th century), advances in human surgery and new techniques were quickly applied to horses (Erk 2002; Dinçer 2002; Jones 2022).

Important works have been produced in Spain since the 11th century. In the 12th century, Ibn al-Awwam al-Ishbili³⁶, in his agricultural book, described the body parts of the horse and listed more than 100 diseases. Surgical techniques, castration direction, and risks were explained (Smithcors 1958). Abu Bakr al-Baytar³⁷ (1309–1340) became the horse lord of the Egyptian Sultan al-Nasir Muhammad,

and the book he wrote for him is known as *al-Nasiri*³⁸. Horse selection, breeding, feeding, training and riding were explained. Diseases were grouped and defined according to body regions, while treatment and medications were discussed in detail. Skin diseases, wound treatment, limb ailments, movement disorders, and horseshoeing were well described. Ophthalmology, dental care, surgery, limb and foot diseases, horseshoe defects, and obstetrics in mares were emphasised (Erk 2002). Although it was accepted that eight diseases were contagious, no information was given about their aetiology. Religious taboos did not allow dissection, so no progress was made in anatomy and physiology. Therapeutic methods had advanced, medicines had become simpler and more rational (Erk 2002; Jones 2021).

A stable and successful country was established in Andalusia under the Umayyad Caliphate in the 8th century. The capital, Cordoba, was the largest and wealthiest city in Western Europe with a developed scientific culture (Jones 2021). This provided a growing relationship with European Christian scholars. Equine medicine was the most important animal and veterinary science, which was developed by a professional group of veterinarians in Christian Spain. As the Islamic State collapsed in 1492, veterinary knowledge in Cordoba and Maghreb became one of the most important and fundamental sources of veterinary science in the renaissance movements that began in Western Europe (Jones 2021; Karasszon 1988).

Equine Medicine in Medieval Europe

During the Middle Ages, which began after the fall of the Roman Empire (AD 500), the Catholic Church banned dissection and autopsy and confiscated and destroyed much of the literature on veterinary medicine. In the process, no new literature was written. During this time period there was a noticeable lull in activity in the veterinary history timeline (Jones 2021; Karasszon 1988). However, over time, the Arabs in Spain introduced the pioneering knowledge of veterinary medicine of the period. Many texts were translated into Arabic and Muslim horsemen continued their pursuit of veterinary knowledge (Guthrie 1939). At the end of the 14th century, the first medical school was opened in Salerno with the participation of Islamic scholars from Sicily (Dunlop and Williams 1996).

The most frequently studied equine diseases were hoof and limb lameness, colic, and wounds. The cures were mostly magic and prayer. The issue of contamination, hygiene and isolation of sick animals was little known. Horseshoes were produced for the movement elements of

36 Ibn al-Awwām, *Kitāb al-filāḥa*, https://www.filaha.org/author_ibn_al_auwwam.html (Date of access: 15 April 2024). Ibn al-Awwām. 1802. *Kitāb al-Filāḥa*, 2 vols. Ed., with a Spanish trans. by J.A. Banqueri, Madrid. Ibn al-Awwām 1866. *Kitāb al-Filāḥa*, *Le Livre de l'Agriculture*, 2 vols. French translation by J.-J. Clément-Mullet. Paris: Librairie A. Franck; Ibn al-Awwām. 1988. *Libro de agricultura* (facsimile of 1802 edition, ed. and trans. into Spanish by J.A. Banqueri). 2 vols. Preliminary study and notes by E. García Sánchez and J.E. Hernández Bermejo. Madrid: Ministerio de A.P.A. and Ministerio de AA. EE. Ibn al-Awwām. 2000. *Le Livre de l'Agriculture*. Trans. into French by J.J. Clément-Mullet. Paris: Sindbad.

37 In pre-Islamic society, the words baytar and mubaytir (from the Arabic root batara meaning to cut into pieces) defined people responsible for animal welfare, including blacksmithing. As the specialty developed, the baitar indicated the equine physician. The horse specialty was also called zardaḡah. While veterinarians were called “albeitar” in the West, before the establishment of veterinary schools in Catholic Spain, they were called “baytar” in Ottoman Turkey in the east (Jones 2021).

38 Weidenhöfer, V. 2007. Ninth-century AD Arabian horse medicine. The *Kitāb al-furūsiya wa-l-bayṭara* of Muḥammad ibn Ya‘qūb ibn aḥī ḥizām al-Ḥuttulī. In M.-T. Cam, ed. *La médecine vétérinaire antique (1–)*. Rennes: Presses universitaires de Rennes. DOI:10.4000/books.pur.25529

the Crusades (Smithcors 1958; Wilkinson 2005). Candle oil was used as a preventative in topical applications and by sprinkling on pastures. To protect and bless the animals, their foreheads were stamped with a church key (Dunlop and Williams 1996; Jones 2021; Karasszon 1988).

The rebirth of veterinary medicine in Europe took place in Sicily and Southern Italy. Sicilian King Frederick II (1212–1250) founded the Universities of Padua and Naples and assisted the Salerno Medical School. Even though the church forbade it, he wanted information from Spanish Islamic scholars (Dunlop and Williams 1996; Karasszon 1988). Anatomy was studied on pigs, as human dissection was prohibited, and this formed the basis of Copho's veterinary book *Anatomia Porci*. He may have had his advisor and veterinarian, Jordanus Rufus, translate the Arabic books on horses (Karasszon 1988). Around 1250, Rufus composed his own veterinary treatise, the *De medicina equorum*, which he describes in several passages as based on his own experience. His sources remain mysterious, but he may have been informed by the Arabic treatises. Rufus was the first to use a specific nomenclature system for equine diseases. His treatise circulated all over Western Europe and was translated in several vernacular languages: over 170 manuscripts in Latin, Italian, French, German, Hebrew, Occitan, etc. still exist (Montinaro 2015). Rufus organised his treatise in two parts, one on breeding, grooming, training, and equipment, and the other on diseases, their symptoms and their remedies. He listed diseases according to horse breeding, grooming, training, shoeing, bridling, and body systems. He explained lameness, limb, and foot diseases. It was a pioneering work in Western Europe, was used extensively in teaching in Italy and neighbouring countries. Rufus's treatise led to the revival of veterinary art in Europe and was used by other veterinary authors such as Theodorico Borgognoni and Lorenzo Rusio (Dinçer 2002; Harrison 2022; Karasszon 1988; Jones 2021; Prévot 1991; Poulle-Drieux 1966).

The *Reconquista*, which began with the Battle of Covadonga (c. 718 or 722), was completed in 1492 with the fall of the Nasrid kingdom of Granada to the Catholic monarchs. Although the Umayyad State no longer existed, Islamic civilization began to fade away in Spain, and the Iberian Peninsula returned into Christian kingdoms, veterinary manuscripts were discovered and began to be used. The Italian Laurence Rusius³⁹ was the most prominent of the important veterinary writers of the 14th century, authoring *Liber marescalcie equorum* (Jones 2021). He advocated treatment, surgical care, and drug use; and while he rejected experimental pharmacy, he believed in astrology. His works were used in many compilations and equine businesses. In the mid-14th century, the Catalan

Manuel Dieç wrote two books with colour illustrations on horse health, *Llibre de Menescalia* or *Libro de Marescaleria et de Albeyteria*, which discussed mouth, teeth, horseshoes, feet, limbs and lameness, bleeding, castration, fractures, topical blisters, nasal medications, equine external characteristics, and management (Dinçer 2002; Jones 2021; Karasszon 1988).

Spain thrived on the Islamic art of equine veterinary medicine, inasmuch as horses were the most important group of animals. This development, which started in Spain, with time led to a growing veterinary group in Italy. Although individual observations of veterinarians were included in veterinary records during this period, the veterinary main sources were still Byzantine texts (Dinçer 2002). Piero Andrea, Master of Horses to King Alphonso of Spain (reigned 1252–1284), wrote a treatise on the veterinary art. Although the content of the book was not original, it was free from superstitions and rational (Jones 2021). Majordomo Manuel Diaz wrote *Libro de Albeyteriapor*⁴⁰ in 1443. The study was based on Rufus's work and the Marescalia of Rusius. The work was produced at a time when the Spanish Riding School and the discipline of equine education and management were established, forming the basis of the veterinary profession. Veterinarians were called *albeitar*, from the Arabic *al-Baitor*, meaning *albeytor*, or horse healer. Seynt Albans Boke, written in 1496, was attributed to Juliana Berners. The characteristics of the good horse, its diseases and injuries were mentioned. Although it contains little original information, it was one of the first English books on the subject (Karasszon 1988; Jones 2021).

The Renaissance, the Enlightenment, and Equine Medicine in Europe

During the European Renaissance, many works were produced that feature horses and equine medicine. Leonardo da Vinci made anatomical drawings of humans and animals. Agostino Columbre⁴¹ published his book *The Nature of the Horse and How to Treat Its Diseases in Venice* in 1518. The Spanish Francisco de La Reina⁴² published

39 Smith, F. 1919. *The early history of veterinary literature and its British development*. F. Bullock, Ed. Pp. 92–98. London: Baillière, Tindall and Cox.

40 Cifuentes, L. and C. Ferragud. 1999. El Libro de la menescalia de Manuel Dies: de espejo de caballeros a manual de albéitares. *Asclepio* 51:93–127. Sáiz Serrano, J. 2008. *Caballeros del rey: nobleza y guerra en el reinado de Alfonso el Magnánimo*. Pp. 245, 247, 369–379. Valencia: University of Valencia.

41 Amici, R.R. 2001. The history of Italian parasitology. *Veterinary parasitology* 98(1–3):3–30.

42 Wilkinston, R.S. 1968. The First Edition of Francisco de la Reyna's Libro de Albeyteria, 1547. *Journal of the History of Medicine and Allied Sciences* XXIII(2): 197–199. DOI:10.1093/jhmas/xxiii.2.197. Keevil, J. J., and Payne, L. M. 1951. Francisco de la Reyna and the circulation of the blood. *The Lancet* 257(6659): 851–853. DOI:10.1016/s0140-6736(51)92372-0.

*The Book of Veterinary*⁴³ in 1522. The blood circulation was examined, and very few of the horseshoe selection and disease issues have been explained in the original (Smithcors 1958). Englishman Sir Anthony Fitzherbert also discussed equine diseases in his text on agriculture in 1523. The *Hippiatrica* was published again in Paris in 1530, and the twenty-book agricultural compendium, the *Geoponika*, in 1538 (Jones 2021). Swiss physician, chemist, philosopher Philippus Aureolus Theophrastus Bombastus von Hohenheim (1493–1541) introduced opium to Europe and researched arsenic as a cure for horses. He started the discipline of toxicology. Federigo Grisone founded the Neapolitan Riding School. He wrote *Gli ordini di cavalcare* (or the Rules of Riding) in 1550, which was translated into French, German, Spanish and English. Italian Claudio Corte's treatise on horse training and management, titled *Cavallarizzo*, was also published in Venice, France, and England (Jones 2021; Karasszon 1988). The Englishman Thomas Blundeville authored ten treatises about horses on many subjects in the 1560s. He had little practical knowledge of the horse and was repeating the mistakes of previous writers. He directly linked the preservation of health to blacksmithing. He recommended annual blood draws to clear out bad blood after winter. Even though there is a lot of incorrect and inaccurate information when viewed today, it was accepted as great works in its time in England (Birkeland 2002; Dunlop and Williams 1996; Jones 2021; Karasszon 1988; Wilkinson 2005).

During the Enlightenment, which spanned from the end of the 16th–18th centuries, there was a great need for veterinarians in Western Europe. Italian Lawyer Carlo Ruini (1530–1598) wrote *Anatomia Del Cavallo, Infermita et Suoi Rimedii* (or the Anatomy of the Horse, Diseases and Treatment) in 1598. The work was translated into French and German. The first part of the book, which consists of two parts with original content, is on anatomy and covers body systems, and the second part focuses on diseases in which Rufus's writings are reworked (Didouan, 2023). Ruini was influenced by Vesalius' study of human anatomy, which had been published 50 years prior. By presenting the first description of equine anatomy, skeleton, muscles, circulatory and neural pathways, showing the arrangement of internal organs and structures, he paved the way for proper veterinary training (Didouan, 2023; Jones 2021). Although the content of the book was not completely accurate, it was used as the main reference book in the first scientific veterinary school, which was established in the World (France, Lyon)

164 years later (Karasszon 1988; Smithcors 1958). The anatomical standard created by Andreas Vesalius was reflected in veterinary practice with Ruini. Hieronymus Fabricius (1533–1619), and his student William Harvey (1578–1657), made a breakthrough for medicine and veterinary science with the book, *Exercitatio Anatomica de Motu Cordis et Circulatione Sanguinis in Animalibus*. Although this work was accepted slowly and over time, it provided a breakthrough for both medicine and veterinary science. Numerous other studies of mammalian physiology followed. With these studies, that was creating a knowledge base that would enable the start of scientific veterinary education (Karasszon 1988; Jones 2021).

Although not a veterinarian, William Cavendish (1592–1676), devoted his life to horses and equestrianism, and was an experienced observer and writer. In his book containing 43 illustrations, he discussed European equestrian history and equine diseases from his observations (Karasszon 1988; Smithcors 1958). English horse breeder Thomas de Gray wrote, *The Compleat Horseman on breeding and the Expert Ferrier*, full of superstitions and misleading drugs, in 1639. Thomas Browne (1608–1682), a physician and scholar, wrote a book against superstitions called *Pseudodoxia Epidemica* (1646), and used the English word “veterinarian” for the first time. This was a turning point and the profession had now earned a new title (Jones 2021; Karasszon 1988).

French Jacques Labessie de Sollysel (1617–1680) studied horse riding and followed developments in physiology and chemistry. Although a good observer and thinker, he believed in astrology and was superstitious, such as the bite of a shrew. In 1664 he published *Le Parfait Marechal* in two parts. In the study, many original observations are included in which he discusses blacksmithing, selection, reproduction and bleeding, diseases and treatments. Different types of colic; introduced different parasites, described bleeding and laxative use. He made sensible suggestions for wound treatment, thinking that inflammation was a fermentation (Jones 2021; Karasszon 1988; Wilkinson 2005). King Charles II's veterinary consultant, Andrew Snape Jr., a visionary and good clinician, wrote the field's first English-language book, *The Anatomy of a Horse*. He quoted Renaissance scholars and took 22 of the 49 paintings he used from Ruini. He copied Ruini in describing the non-existent collarbone in horses. The 17th century was when veterinary medicine began to evolve into a definitive discipline. Founded in the 1660s, the French Academic des Sciences and the British Royal Society were organisations that paved the way for reason and scientific method (MacKay 2009). William Gibson (1680–1750) was a surgeon in the British Army who worked with horses. He established his own veterinary

43 de la Reyna. F. 2012. *Libro de Albeyteria*. Santander: Colegio Oficial Veterinario de Cantabria, Santander. Introducción: D. Benito Madariaga de la Campa, Valencia. https://centrodeestudiosmontaneses.com/wp-content/uploads/DOC_CEM/BIBLIOTECA/EDICION_CEM/BMADARIAGA/Libro-de-Albeyteria_2012.pdf

practice in central London. His books, *The Farrier's New Guide*, *The Farrier's Dispensatory*, and *The True Method of Dieting Horses*, were published before he had practical experience. Thirty years later, as a clinician and observer, he wrote *A New Treatise on the Diseases of Horses*. The content of the book on nutritional disorders and foot diseases is weak. He has written on horse feeding and care, and recommended training for farriers on equine diseases and management (MacKay 2009; Smithcors 1958).

Cavalry Captain William Burdon⁴⁴ published *The Gentleman's Pocket Farrier* in 1730. He said that the business of animal diseases and treatment is the domain of educated people, not of ignorant farriers (MacKay 2009). Stephen Hales (1677–1761) worked on physiology, chemistry, botany, hygiene. He was the first to experimentally study blood pressure. He conducted experiments on arteries. In his work with horses, he thought blood rises and falls with the heartbeat (Eknoyan 2016). The Englishman Jeremiah Bridges published a book on equine foot anatomy in 1751. He also added a section on diseases and treatment. He said that good care and well-being should replace excessive drug use (MacKay 2009; Smithcors 1958). J. Bartlet was a veterinary surgeon. His first book, *Gentlemen's Farriery* (1753), was a collected work. He made suggestions for the training of farriers. His second book, *Pharmacopeia Hippiatrica* (1764), was a surgical retelling of his first work (MacKay 2009). La Fosse, the farrier of the King of France, wrote in 1754 the first research work in which experimental studies in veterinary medicine were recorded. He discussed the control of bleeding in the great arteries, the mistakes of farriers to peel the soles and hoofs, and their poor and ineffective practices (Smithcors 1958).

William Osmer was a surgeon working as a veterinarian in London. In his first book, *A Dissertation on Horses* (1756), he discussed the breeding of thoroughbred horses. In 1759 he published a treatise on blacksmithing, lameness, wounds, and diseases (Karasszon 1988; MacKay 2009). Englishman John Wood wrote a review of ancient treatments. In 1758, a request to open a hospital for horses in London with five farriers was refused. It was the first public request for such a facility in the UK (MacKay 2009; Smithcors 1958). Surgeon Thomas Wallis published *The Farrier and Horseman's Dictionary* (1759). The book was written as a compilation of 18th century

British veterinary practice. Artist-anatomist Englishman George Stubbs published a book on equine anatomy for veterinarians, comparative anatomists, horse owners and breeders in 1766. He had an excellent mastery of technical drawing, which increased the basic understanding for anatomy awareness and veterinary knowledge (Guthrie 1939; Jones 2021; MacKay 2009; Wilkinson 2005).

Establishment of the First Veterinary School and Claude Bourgelat⁴⁵

The Enlightenment was also a leading light for equine medicine. However, this light was burned at the end of the period in which many epidemics caused large numbers of horses to fall ill. From 1704 to 1798, 13 major epidemics broke out in Europe, some of which lasted up to 10 years, including influenza, anthrax, *impetigo erysipelatode*, equine influenza, American horse flu, and scabies. In these epidemics, Germany, Belgium, Netherlands, Poland, France, Hungary, Russia, Latvia, Italy, England and Denmark were seriously affected (Jones 2021). In the 18th century, medicine began to be appreciated from the clinical point of view. Some doctors and surgeons tried to find solutions to animal diseases. Although names such as William Cavendish in England, Jacques Labessie de Solleysel in France, and George Simon Winter in Germany wanted to establish a veterinary school, they could not do so because they lacked financial support and patronage (Jones 2021; Jones and Koolmes 2022).

The Frenchman Claude Bourgelat (1712–1779) also had such a will, as well as influential connections. Coming from a wealthy and noble family, Bourgelat studied law. He became a cavalryman in the army with his interest and love for horses, recognized by King Louis XV and Emperor Frederick the Great as an outstanding cavalryman (Barber-Lomax 1964). In 1740, he became director of the Lyon *Academie d'Equitation* and was appointed to the royal staff. He studied the works of famous equestrian masters and learned horse anatomy, physiology and pathology with the help of surgeons. He published his three-volume horse anatomy book (1750), *Elemens d'Hippiatrique*, and mentioned the importance of opening a veterinary school in this work. He became a member of the *Academie de Science de Paris* in 1752 and the Berlin Academy in 1763 (Dunlop and Williams 1996; Karasszon 1988; MacKay 2009). He published six more books on horses. Inspector General of Finance Henri Leonard Bertin (1719–1792), a friend

44 MacKay, M.H. 2009. *The Rise of a Medical Specialty: The Medicalisation of Elite Equine Care c. 1680–c.1800*. PhD thesis, York: University of York. Burdon, W. 1730. *The Gentleman's Pocket-Farrier; Shewing how to use your horse on a journey and what remedies are proper for common misfortunes that may befall him on the road*. London: S. Buckley Printers.

45 Voltaire wrote to Bourgelat about the opening of the first veterinary school in 1775, saying: "Before you opened veterinary school, horned animals were butchers' toys; and their horses had no Hippocrates other than farriers. Even in the most advanced countries, there was no real aid to animals. You finally gave up on this ugly disgrace" (Erk 1978).

of Bourgelat (Barroux 2011), was responsible for the medical care of horses at the military school near Paris. The terrible animal epidemics that France experienced created awareness of developing preventative measures among intellectuals (Jones 2011; Karasszon 1988; MacKay 2009; Mitsuda 2007; Wilkinson 2005). Bertin was one of these intellectuals, and he knew the importance of controlling these problems. He proposed to the king that, under Bourgelat, a school be established in Lyon to teach veterinary arts. His proposal was accepted, and on August 4, 1761, the Council of State issued a decree giving Bourgelat “Authority to establish a school for teaching the knowledge and treatment of diseases of all pets”. *L'Ecole Veterinaire* was opened in Lyon in January 1762 with limited facilities. In 1764 it was taken under the protection of the Crown. Bourgelat wanted to open a second school to train more students, and in 1765, the Alfort Royal Veterinary School was established under his own responsibility. In both schools, teaching was focused on the horse (Dunlop and Williams 1996; Jones 2021; Jones and Koolmes 2022). The King was so pleased with the new schools that he appointed Bourgelat as Inspector General of all veterinary schools to be established in the Kingdom, and of all the horse breeders in France. He remained in these posts until his death in 1779. The reputation of the schools spread rapidly, with large numbers of students from outside France receiving scholarships from their governments. These students worked to establish their own national veterinary schools, for example Peter Christian Abildgaard in Denmark in 1773, Peter Hernquist in Sweden in 1769, and Johann Gottlieb Wolstein opened veterinary schools in Vienna in 1777. In 1791, “The Veterinary College London Committee” was established under the chairmanship of Granville Penn. The committee began teaching as a school in 1792. Over time, it turned into a completely horse-oriented school. A brilliant student, William Dick opened a veterinary school in Edinburgh in 1820 after graduation (Barber-Lomax 1964; Dunlop 2004; Jones 2011; Karasszon 1988; MacKay 2009; Mitsuda 2007).

James Clark was Professor of Veterinary Medicine in Edinburgh. He believed in the importance of post-mortem examination. He wrote three books and focused on horseshoeing. He recommended cleanliness, balanced food, and clean water in barns. *First Lines of Veterinary Physiology and Pathology* (1806) was written as a textbook for the veterinary school in Edinburgh. He saw the need for veterinary schools. After the London School opened in 1791, he wanted a school for Scotland as well (MacKay 2009). English surgeon William Taplin raced and hunted horses and described himself as an equine physician. He built a facility on Edgware Road in

London, planned with space for sick horses. It also housed a farrier, and was stable of horses for sale. A dispensary for the sale of drugs was later added (Jones 2021; MacKay 2009). Edward Snape (1728–1813) also sold drugs of his own making. Like Taplin, he wanted to advance veterinary medicine. In 1766, he published a plan for the establishment of a Hippiatric Infirmary, and originally aimed to add a veterinary school. Snape opened the first veterinary school in England in 1778, thirteen years before the London School in Knightsbridge, but the school closed soon after. In 1791 he published *A Practical Treatise on Farriery*, with a list of “barbaric and unreasonable treatments”, so-called by the author himself (Jones 2021).

Because this period developed with the industrial revolution, the need for animals increased sharply in the transportation of raw materials, developing trade, and in wars (Jones and Koolmes 2022). Taking the French schools as an example, 30 veterinary schools were opened in Europe through 1825. Veterinary schools were established in Egypt in 1831 with French teachers, and in Istanbul in 1842 with the Prussian Veterinarian Godlewsky. In 1853, they opened in Mexico, and later in the British Empire, including in India and Canada. Veterinary schools were founded throughout the Western hemisphere, as well as in Australia, South Africa, New Zealand, Kenya, and elsewhere (Erk 1972; Jones 2011). Although train transportation began with steam locomotives in the 1800s, horse transportation was still necessary to bring people and goods to and from train stations, which greatly increased the number of horses at the end of the century. Although the 20th century brought the automobile, the fate of World War I was determined by horses (Jones and Koolmes 2022). There was terrible loss of life due to the poor care of horses and mules, which were so important for the transport of food, medicine, weapons and ammunition. The ‘Great War’ also marked the end of the age of horses.

As the horses were removed from the streets, the flies followed them, and a cleaner city life began (Morgan 2002). Horses around the world were still faced with outbreaks of animal diseases that travelled quickly on ships and railroads. But veterinary researchers contributed a great deal of knowledge and evidence to bacteriology as well as in the new sciences of immunology and virology in the new age. In light of these developments for veterinary medicine, new therapies and tools, such as antimicrobials and vaccines, greatly increased the ability to control animal diseases. These changes were not driven primarily by the new therapies and tools, however, but by changes in the roles of animals in societies (Jones 2021; Jones and Koolmes 2022). The equine-oriented veterinary profession in the mechanising nations had to adapt quickly as their

most important patient population disappeared. In addition to new treatments and tools, the role of horses in society changed. Its use as a working animal decreased greatly and the horse became an animal owned by wealthy elites, and used for recreation and in sport. Much more care has been taken for their treatment, care and nutrition, and the most advanced technological facilities of veterinary medicine are now at the service of horses (Birkeland 2002; Jones 2021; Jones and Koolmes 2022; Wilkinson 2005).

Conclusions

We have overviewed the history of equine medicine until the beginning of the 20th century. As in the past,

equine medicine is one of the most distinguished branches of veterinary medicine today. New diagnostic and treatment methods developed in the fight against viral and bacterial diseases, and many vaccines and drugs have enabled the prevention of many epidemic diseases. New imaging methods and safer anaesthetic preparations make surgery in horses safer every day. The saying “No hoof, no horse” is becoming history with more successful orthopaedic surgery. While advances in gynaecology have made it safer for elite horses to continue their bloodlines, technologies such as cloning seem to be ground-breaking in the preservation of horse breeds.

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Hippophagy

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The consumption of horsemeat, or hippophagy, has been practised by many societies throughout time. This section explores the advantages of horsemeat and secondary horse product consumption, zooarchaeological methods for identifying hippophagy, the history of horse consumption and development of taboos against it in Europe, and a broader global view of modern hippophagy.

Nutritionally, horsemeat and milk have advantages for human consumption over more common types of animal protein. Modern studies have shown that regular consumption of a moderate level of horsemeat can elevate iron levels and improve the lipid and cholesterol profiles in individuals (Bò et al. 2013). It is estimated that approximately 30 million people worldwide regularly consume mare's milk or Koumiss, an alcoholic beverage produced through the fermentation of mare's milk (Malacarne et al. 2002). Mare's milk is similar to human milk in a number of important ways, including overall fat content, proportion of polyunsaturated fatty acids, and protein content (Barreto et al. 2020; Malacarne et al. 2002).

Zooarchaeologists employ many different methods to identify and understand hippophagy in the past. Butchery marks or splintering for marrow extraction are the most common indirect evidence to suggest that horses were consumed by the human population at an archaeological site, such as at the Lower Palaeolithic site of Boxgrove, West Sussex (Pope et al. 2020). A population mortality profile, which includes analysis of sex, age-at-death, and body part representation of horses at an archaeological site, can provide evidence for how horses were either hunted or raised for meat exploitation (Fernandez and Legendre 2003). Biomolecular methods such as organic residue analysis of ceramic vessels can also identify non-ruminant adipose fat tissue, which can suggest that horsemeat was cooked and consumed (Casanova et al. 2022; Outram et al. 2009). Outram and Rowley-Conwy (1998) created utility indices for horsemeat and marrow exploitation to understand the yield of each skeletal element. They found that horsemeat is generally concentrated at the cervical and thoracic spine as well as the pelvis. There is minimal meat yield from lower limbs and lower yields of marrow compared to other similar sized mammals, like the reindeer.

Humans hunted wild horses and consumed their meat prior to domestication. Levine (1998) hypothesises that the fatty acid composition of horseflesh as well as the usefulness of soft horse fat in early human weaning may have been a vital component to Pleistocene diets. Zooarchaeological evidence for mass-kill and butchery sites in the Upper Palaeolithic have been identified across Europe, with age profiles showing that whole herds were targeted at once in organised, systematic hunts (Svoboda et al. 2020; Hoffecker et al. 2018; Straus 1995; Olsen 1989). The ubiquity of horse depictions in parietal cave art and perforated horse teeth as personal adornment arguably supports importance of horse hunting to Upper Palaeolithic groups (Sauvet 2019; Straus 1995; Leroi-Gourhan 1982), famously interpreted by Breuil (1952) as a type of sympathetic hunting magic. Evidence from Bluefish Caves (Yukon Territory, Canada) demonstrates that the earliest likely settlers



M^{re} Martinet, 172, r. Rivoli et 41, r. Vivienne

Lith. Delaunay 28, r. Paradis P^{re}

UN BANQUET D'HIPPOPHAGES

— Vont ils se régaler, ces savants, vont ils se régaler!
— Moi j'ai laissé les fers à mes pieds à la poulette j'ai voulu leur prouver que je ne les trompais pas et que c'est bien du cheval.

Figure 1: A horsemeat banquet from 'News of the Day', published in *Le Charivari*, March 29, 1865. Artist: Honoré Daumier. Available from the Metropolitan Museum of Art Collection Open Access API under Creative Commons Zero license.

of North America were following, hunting, and consuming wild horses as early as 23,500 years ago (Bourgeon and Burke 2021).

Studies on Eneolithic horse keeping in Kazakhstan have provided evidence for early exploitation of horses for secondary products and the keeping of horses for meat consumption. Lipid analysis evidence suggests that early domesticated horses were both milked and their flesh consumed (Casanova et al. 2022; Outram et al. 2009). Hunting of wild horses continued during this early period,

possibly aided by mounted hunting parties (Olsen 2003; Anthony and Brown 2000).

Horse consumption was widespread across Eurasia in the Bronze and Iron Ages, although it typically played a minor role in subsistence (Taylor et al. 2020; Galindo-Pallicena et al. 2017; Bertolini and Hohenstein 2016; McCormick 2007). In some instances, horse remains with evidence of butchery and consumption were also related to ritual sacrifice and/or deposition (Taylor et al. 2020; Cross 2011). Roman populations had a cultural aversion

to horseflesh, which then contributed to the decline of hippophagy in later prehistoric Europe with the expansion of the Roman hegemony (Simoons 1994). For example, there is evidence for horse butchery and consumption in the Bronze Age through Iron Age levels (c. 2000–50 BC) at Lyon, France, but the practice abruptly ceases with the establishment of the Roman colony *Lugdunum*, only to recommence in the Middle Ages after the collapse of the Western Roman Empire (Argant 2017).

Evidence for hippophagy in Iron Age and early medieval Europe is present in historical sources and archaeology, but species-profiles from archaeological sites suggest that horsemeat was never a significant portion of the diet. In the early historic period, religious and royal prohibitions against horse consumption decimated the cultural practice of hippophagy and the economic market for horsemeat in much of Europe. In the Jewish tradition, horse is not included in the list of the ten authorised animals for consumption (*Deuteronomy* 14:4–5). Although there is no specific biblical prohibition against eating horse, as there is with cloven hoof species, the Christian church enacted strict policies against the consumption of horse, particularly for newly converted pagan populations with traditions of ritual horse consumption or sacrifice (Bourgeois and Dierkens 2017; Poole 2013; Aðalsteinsson 1998).

Poole (2013) demonstrates that butchered horse bones were present, particularly on rural sites, during the entire Early Medieval period in England, but overall made up a small percentage of the skeletal assemblage. Theodore of Tarsus writes that the Anglo-Saxons, for example, “do not forbid horseflesh, nevertheless it is not the custom to eat it” (*Penitential*, II.xi.4; trans. McNeill and Gamer 1965:208). The spread of Christianity in Europe correlated with the decline of horse consumption in most populations. After converting a population, Medieval Christian authorities prohibited horse consumption. Pope Gregory III instructed St. Boniface to bring “enlightenment” to the Germans in a letter dating to 732 AD, which included imposing food taboos:

You say, among other things, that some have the habit of eating wild horses and very many eat tame horses. This, holy brother, you are in no way to permit in future but are to suppress it in every possible way, with the help of Christ, and impose suitable penance upon the offenders. It is a filthy and abominable custom (trans. Emerton 2000:36).

Pope Zacharias, also writing to Saint Boniface, repeats similar food prohibitions in a letter dating to 748 AD, “First to birds – jackdaws, crows and storks: these are absolutely forbidden as food for Christians. Beavers, hares and wild horses are still more strictly prohibited” (trans. Emerton 2000:161). These papal prohibitions coincide with a decrease in horse butchery on English Middle Saxon sites that date to the

post-Conversion period (Poole 2013). Evidence for early medieval horse consumption was not confined to Germanic groups. Meens (2002) reviewed evidence for hippophagy in Ireland around 700 AD, and found that Irish law codes severely punished hippophagy, which carried a higher penance than even bestiality. Prohibitions were adopted in post-Conversion Scandinavian contexts with varying levels of success, such as in Iceland and Norway (Maraschi 2019).

Despite centuries of religious and legal prohibition, modern European societies such as France, Belgium, Italy, the Netherlands, Germany, Sweden, and Iceland retain a culture of hippophagy (Jobling 2013). The late 19th century saw an unsuccessful push for the legalisation and popularisation of horsemeat in the United Kingdom (Otter 2011). France legalised trade in horsemeat for human consumption in 1866 (Figure 1), which had been previously prohibited since Pope Gregory III’s edict. Popularity of horsemeat soared during the siege of Paris in 1870 when food was otherwise scarce (Drouard 2011). Horsemeat was relatively cheap and considered beneficial for the treatment of several common ailments, including anaemia, diabetes, and tuberculosis (Gade 1976). Horse was an accessible protein source for the lower classes, until the mechanisation of agriculture and transportation decreased the supply of horses for slaughter. Horsemeat became unaffordable and the popular consumption of horsemeat essentially ceased (Drouard 2011). In the past 50 years, the French horsemeat market has declined and is today considered a specialty market; in 2017, for example, only 9.5% of households in France had purchased horsemeat in the past year (Lamy et al. 2023).

In other parts of northwestern Europe, particularly the UK and Ireland, the modern European cultural standard against hippophagy remains strong. This taboo is attributed to the status of the horse as companion animal afforded personal names and human relationships, rather than an enduring religious prohibition (Sahlins 1976:174–175). In 2013, horsemeat was identified in meat commercially available in supermarket chains in Ireland and the UK (*Guardian* 2013). The backlash was swift, suggesting that Irish and British consumers retain a strong cultural taboo against hippophagy. In the past decade, DNA and proteomic techniques have been developed and deployed by food safety organisations to identify horsemeat in commercial meat products (Bargen et al. 2013; 2014; Claydon et al. 2015).

Whilst hippophagy taboos persist in parts of Europe and former British colonies like the United States, global horsemeat consumption continues. In some instances, the persistence of hippophagy in ethnic communities can be a group signifier for diaspora populations (Svanberg et al. 2020). There is a strong culture of horse consumption in much of central and east Asia, such as in Russia, Kazakhstan, Kyrgyzstan, Mongolia, China, and Japan (Leteux 2012). The largest global producer of horsemeat is China, producing 181,688 tonnes in 2017, or 32% of the global market (Balji et al. 2020). Modern pastoralists and

herding societies commonly consume horsemeat and milk, and other societies hunt and eat related equid species, such as the zebra (Levine 1998). The Tyvan herding society in Western Mongolia, for example, consumes horsemeat regularly, but also conducts specific and highly controlled rituals around the slaughter and consumption of 'beloved horses', a spiritual statement to keep the individual animals always present in the community (Peemot 2017).

Conclusion

Archaeological research on the early consumption of horsemeat and secondary horse products continues. This research will continue to benefit from scientific advancements, such as organic residue analysis. The

consumption of horsemeat was common in the past and may become more common globally in our future. Some researchers argue the commercial market for horsemeat should be expanded because of lower methane emissions associated with horse rearing and the nutritional profile makes horsemeat a useful alternative to beef (Belaunzaran et al. 2015). However, despite the potential benefits of horsemeat, the historical view of hippophagy shows that the cultural taboo against horse consumption has persisted in parts of the world for centuries and has proven resistant to change. Regardless, the consumption of horsemeat and horse products is an important facet in the intimate relationship between humans and horses throughout time.

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European Women in the Sideways and the Side-saddle

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During the past two and half millennia, a form of horseback riding reserved exclusively for women gradually evolved and established itself in Europe: riding aside, or with both legs on the same side of the horse. Until recently, historiography has tended to neglect women, so reliable sources on horsewomen from before the nineteenth century are indeed rare. References to the history of female horsemanship in Europe can be found from the late eighteenth century onwards (e.g., Berenger 1771:105–106; Pellier 1897; Tavad 1975), but they are mostly written for entertainment. The authors draw from legends and popular lore but only occasionally from historical sources, which are then made to fit the prevailing image of women in the late eighteenth and nineteenth centuries. These texts are still quoted to this day. The critical evaluation of primary text and image sources, archaeological finds and saddles from museum collections provides a more nuanced picture, will be discussed on the following pages.

Safely riding aside requires the use of special riding equipment, whereas riding astride can be done even without a saddle. In essence, there are two types of women's saddles for riding aside: the sideways saddle and the side-saddle. In the sideways saddle, the rider sits on the mount facing to one side or slightly forward as if sitting on a chair. The side-saddle on the other hand features at least one saddle horn (pommel) providing support for the rider by using a special riding technique. In this case, the rider sits facing forwards. With both saddle types, the rider's legs are on the same side of the horse, usually the left side.

Early History and Antiquity: the sideways saddle

The earliest depictions of horsemen riding sideways date back to the second millennium BC. Votive figures and other pictorial evidence from the eastern Mediterranean and Near East (Crouwel 1981:51–52; Voyatzis 1992; Karageorgis 2006) suggest that the sideways saddle, presumably in the semi-rigid form, was widespread in the region as early as the first half of the first millennium BC.¹ The first images of humans on sideways saddles depict Assyrian and Neo-Hittite male rulers from the 8th–7th century BC (Keil-Steentjes 2020: Figure 1). From the fifth century BC onwards, the sideways saddle is shown exclusively used by women. This riding style and its specific female riding gear most likely arrived in northwestern Europe in the late Roman Imperial period (Keil-Steentjes 2020).

Depictions of female deities sideways on horseback run through many cultures. They are found in the Mycenaean (Crouwel 1981:51–52; Voyatzis 1992; Karageorgis 2006) and the Colchis cultures (Lordkipanidze 2001:25), among others. In Western Europe, the Gallo-Roman deity Epona is well known (Euskirchen 1993: Figure 2), and with Christianity the

1 A semi-rigid saddle is a saddle construction consisting of a riding cushion combined with rigid saddle bows/arches on the shoulder and rear back area of the equine (semi-rigid saddle type: cf. Stepanova 2014).



Figure 1. Karatepe-Arslantaş relief NVI 2. c. 700 BC, Karatepe-Arslantaş (Kadirli, TUR). Photo: Klaus-Peter Simon 2011.



Figure 2. Bas-relief of the Romano-Celtic goddess Epona. 2nd or 3rd century AD, Dalheim (LU). Nationalmuseum um Fäschmaart. Photo: Carole Raddato, CC BY-SA 2.0 via Wikimedia Commons.

biblical motif of Mary, Mother of God, riding sideways during the flight to Egypt became a widespread pictorial representation from the sixth century onwards.

The latest research shows that, as early as the Bronze Age, women were among the riders in the Pannonian Basin – but they rode astride (Kanne 2022). Nevertheless, the prehistoric and early historical sources are still full of gaps. Chariot burials of women became more common in the Iron Age (Metzner-Nebelsick 2009). However, they only indicate the high social status of these women and do not allow any conclusions as to whether women rode horses or mainly used the chariot.

Early and High Middle Ages

Riding aside spread from the Frankish Empire to other parts of Europe in the course of Christianisation. Two early medieval grave finds are currently known in Germany (Wesel-Bislich and Aufhausen-Bergham [Stadt Erding]) (Figure 3), which can be interpreted as women's sideways saddles (Keil-Steentjes 2020). An itinerant court required the wives of the rulers to be mobile and able to perform official duties, even when pregnant. This may have played a role in establishing this riding style, as well as the traditional imagery of Mary, Mother of Jesus (in the Flight into Egypt) symbolising fertility, protection and motherhood may have had an influence. In the further course of the Middle Ages, riding sideways became the typical riding style of the noble, Christian, married woman (Keil-Steentjes 2018, 2020).

The Middle Latin term *sambuca*, for a saddle or a richly decorated saddle cover exclusively reserved for women, was probably used as early as the sixth century (Zeumer 1882:5). From this, the French term *sambue* evolved in the High and Late Middle Ages (Scheler 1879:45; Du Cange 1886:249–250; Meyer-Lübke 1935:568–569) as well as the Spanish term *jamuga* (Gómez Ortín 1991). In Old High German, the term *sambūh* (cf. Schützeichel 2004), traditionally meaning sedan chair or women's carriage, may also have referred to a woman's saddle in certain cases (Keil-Steentjes 2020).

Although European written and pictorial sources highlight riding sideways as the accepted riding style of women of high rank (cf. Ammianus Marcellinus 1794: 31–2, 6; Petrus de Eboli 1994: fol. 96r, 111r, 124r, 128r, 138r; Ordericus Vitalis XIII 1793:17, 238–241), there were several reasons for women to ride astride. These could be due to circumstance or their marital status. Written sources document this for the (unmarried) daughters of Emperor Charlemagne (747–814) who participated in a royal hunt (Karolus Magnus et Leo Papa 1966:75–79). The Empress Matilda of England (1102–1167) was forced to flee her enemies in 1141 and had to change from riding sideways to riding astride (Florence of Worcester 1964:134; William Marshall 2002:13). Women who took part in the Crusades rode astride at least partly (Geldsetzer 2003:122–123). Difficult travel conditions such as crossing the Alps could

also have been a reason why a lady of rank rode astride (Codex Balduini Trevirensis 1965:67).

The importance of horseback riding for the representation of high social status and the resulting claims is shown by female equestrian seals, common in France and the Rhineland (Germany) from the late twelfth to the early fourteenth century (Stieldorf 1999:271–282). The motif shows a female rider sitting aside on horseback with a falcon on her arm (Figure 4). It corresponds to the common seal motif of male heirs and refers to primogeniture. And indeed, some of the women can be identified as hereditary daughters. In some cases, women sealed (and ruled) in the name of their minor sons. Only in very rare cases are these women depicted riding astride, possibly due to widowhood.

A saddle find from a Frankish woman's grave in Wesel-Bislich from the early seventh century is an early example of a woman's sideways saddle (Keil-Steentjes 2020). It consists of two approximately identical, comparatively high and wide saddle arches, and was probably equipped with a footboard (Figure 3). Later in the Middle Ages, pictorial evidence also shows women's saddles with one or two stirrups on one side. The sideways saddles of this period do not have a backrest attached to the side. Earliest proof of this, can be found in manuscript illustrations from the fifteenth century onwards.

It is generally assumed that women riding in the sideways saddle were led at a walk (Pellier 1897:13; Mitchell and Creaton 2019:8), but a contemporary source of the early 13th century indicates that they also rode independently (Thomasin von Zerclaere 2004:32). As such, they are often depicted facing forward, a detail referred to in the previously mentioned source (Thomasin von Zerclaere 2004:32). This riding position was indispensable for the control of the mount. It appears that the rider's position with the rider's legs to the left was used more for independent riding, while the rider's position with the legs to the right was preferred when the mount was led by an escort (Keil-Steentjes 2020). These escorts may be seen as an expression of wealth or high status and need by no means be understood as a sign of helplessness.

Mules were used by women in Western Europe as early as the seventh to eighth centuries (Giesler 1996; Keil-Steentjes 2020). They were considered comfortable and sure-footed mounts. Pacing and ambling horses, confirmed in Europe from the ninth century onwards (Wutke et al. 2016), also seem to have been preferred by women (Herbert-Davies 2018).² Special gaits, such as the flying pace and tölt, are faster gaits than walk and allow higher travelling speeds while still comfortable for the rider.

The Sandulf's Cross-Slab is a tenth century gravestone on the Isle of Man. It shows the deceased on horseback

2 Pace and tölt (four-beat lateral ambling) are smooth gaits whose foot sequence and beat differ from the common gaits walk, trot and canter.



Figure 3. Reconstruction of the 7th century saddle from Wesel-Bislich (DE). LVR LandesMuseum Bonn. Photo: Jürgen Vogel.



Figure 4. Seal of Hedwig von Ravensberg. 1290/91, Germany. Photo: Keil-Steentjes 2025.

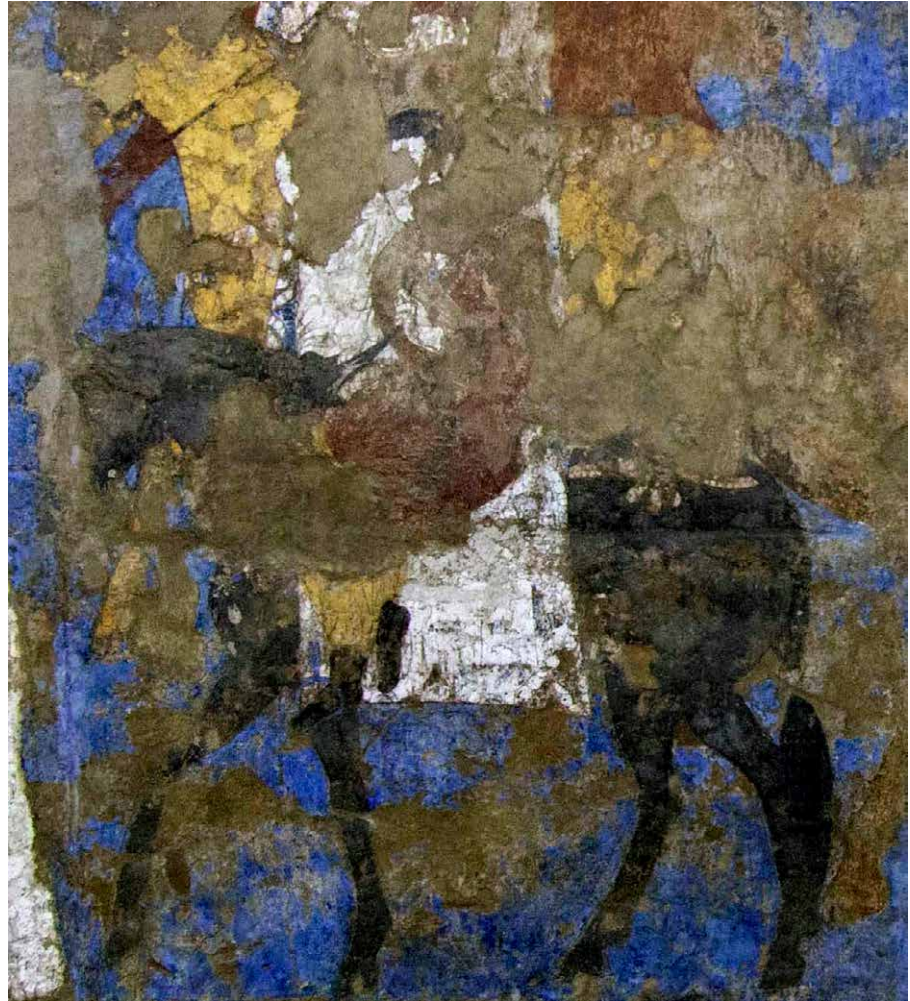


Figure 5. Afrasiab South Wall. 7th century. Photo: northeast Asian history foundation, public domain, via Wikimedia Commons.

in a sideways saddle and is an indication that with Christianisation the female riding style was also adopted by the Vikings (Keil-Steentjes 2020). The saddle find from the women's double burial at Oseberg ship's burial (Norway) from the ninth century, on the other hand, is an astride saddle, also called a cross-saddle. DNA studies of the skeletons have shown that one of the buried women originated from the Black Sea region, present-day Iran or Iraq (Gansum 2016). Historical written sources with references to the riding habits of Eastern European women consistently confirm the use of only the cross-saddle. There is hardly any evidence for the spread of riding aside in Asia. However, a fresco in the palace of Afrasiab (Samarkand, Uzbekistan, Figure 5) from the seventh century show three horsewomen riding aside on horseback and taking part in a procession (Silvi Antonini 1989:129).

Late Middle Ages

Illuminated manuscripts, which were increasingly produced in the thirteenth century, are among the most important pictorial sources of evidence for women on

horseback. Early versions mainly show female riders in the cross-saddle but few in a sideways saddle. The analysis of the texts accompanying the illustrations shows that unmarried girls are often depicted riding astride, while the highest-ranking lady rides aside (Lancelot 1344: Folio 65v). In the manuscripts of the late fourteenth and fifteenth centuries, women and girls are shown riding aside regardless of their marital status, with rare exceptions, indicating the increasing practice of this riding style.

The women's sideways saddle was a piece of exclusive female riding equipment and thus a prestigious status symbol. Sources from the late Middle Ages attest to the high material value of some women's saddles, which is shown by the use of precious metals, gems and valuable fabrics (cf. Du Cange 1886:249; Inventaire Clemence de Hongrie 1874:85–86). The connection between the sideways saddle and the status as a wife can be confirmed by dowry inventories of women of the high nobility. They often contain references to women owning saddles and horses for personal use (e.g., Maria von Burgund 1967:59–60). Women of high rank, such as Margaret of Flanders (1350–1405),



Figure 6. Evolution of the side- and the sideways saddle (from left to right): 6a. sideways saddle with footboard (Spain, 19th century); 6b. side-saddle showing central pommel (Garsault-saddle, France, 18th century); 6c. side-saddle with an English crutch (France, 1820–30). Photo: Keil-Steentjes 2023.



Figure 7. Pillion saddle. Snowhill Manor and Garden, Gloucestershire (GB), NT 1338474.1. Photo: CMS_SNO00505 Collections – Public © National Trust / Claire Reeves and team 2010.

even maintained their own stables and studs, independent of those of their husbands (e.g., Philippe le Hardi 1906:32).

Until the late Middle Ages, the ceremonial entrance was an important part of a ruler and his wife's, demonstration of their status. For the lady, it was a statement not just about herself, but also about her husband and family. Making a grand entrance into a town which was part of the ruler's territory was as important to project her standing as a coronation or a wedding, which usually served a diplomatic and dynastic purpose. Riding aside was obligatory for these occasions. It emphasised the female role model and

underlined the qualities expected of a woman, such as gentleness, Christianity, benevolence and motherliness.

A regional phenomenon of the Renaissance was the *triumphal procession* of the bride on horseback, which was part of the wedding ritual of wealthy bourgeois families in northern Italian cities such as Florence and Siena (Witthoft 1982:47). Remarkably, during the sixteenth to nineteenth centuries, similar customs can be identified among the peasant population of certain European regions in Scandinavia, Spain, France and Switzerland. The *bride's saddle* or the *bride's horse* were established terms (Salomon von Orelli 1794:495; Person 1956). Apart from travelling and

the representation of status, the aristocratic privilege of the hunt was another reason why women rode on horseback. For this sport, the sideways saddle was less suitable, which is why the ladies of the Middle Ages are usually associated with the more gentle falconry, or they participated astride (Almond 2012).

Modern Times: the side-saddle

In the late fifteenth century, a new saddle type emerged: the front arch of the sideways saddle was now replaced by a central saddle horn or pommel (Figure 6b). This enabled the rider to wrap one leg around the pommel and to use a new riding technique with which she could actively gain a firm hold in the saddle. This feature distinguished the side-saddle from the sideways saddle and improved women's performance on horseback.

In 1531, Andrea Alciato (1531:112) equated the skills of a good horseman with the expected skills of a ruler in his work *Emblematum liber*. In 1566, Pasquale Caracciolo (1566:133–134), in *La Gloria del Cavallo*, went a step further by devoting several pages to the history of women on horseback, and he unequivocally equates the good riding skills of the women described with the (male) greatness of character that enables them to rule. This universally understandable equation of riding and ruling, explains the traditional design of the imperial seals of the English kings. These were always shown on horseback on the reverse side of the seal. The English queens beginning with Mary Tudor (1516–1558) followed this tradition albeit in a sideways and later a side-saddle

This new type of saddle allowed women to keep up with men in the various forms of hunting on horseback. Since hunting was not just a pleasure but a courtly ritual of great social importance, this also increased women's participation in social and political life. The new style of riding spread from princely court to princely court through marriage politics and can first be traced to the countries of the Habsburg monarchy as well as France and England. Some women, however, continued to prefer the use of the sideways saddle. The mule or ambling horse as a ladies' mount for travel was gradually replaced by the carriage from the sixteenth century onwards (Ginzrot 1981:117–119; Furger 2009:47–51).

The improved performance on horseback now also required specific riding instruction. But whether girls were taught to ride depended strongly on the family tradition. While Elisabeth Charlotte of the Palatinate (1652–1722), for example, according to her own account, only learned to ride after her marriage in France in 1671, Maria Anna of Bavaria (1660–1690), who married the heir to the French throne nine years later, was prepared for her role as queen from an early age and familiarised with riding. Queen Christina of Sweden (1626–1689), when heiress to the Swedish throne, was raised like a crown prince on her



Figure 8. Franz Leopold Schmittner (engraver), Maria Theresia (with the Crown of Saint Stephen) on horseback. c. 1741. Wien Museum (AT), Inv.-Nr. 169850/2. Photo: CCO (<https://sammlung.wienmuseum.at/objekt/394946/>).

father's instructions. Her great equestrian skills, notably in the side-saddle, are mentioned several times by diplomats in letters and reports (Hallström 2010; Keil-Steentjes 2018).

The seventeenth and eighteenth centuries show a general increase in interest in the systematic training of riders and horses. Aristocratic women on the continent now also began to hone their riding skills in the cross-saddle. At the same time, the first written riding instructions for women riding astride were published (Breuil Pompée 1669; Prizelius 1777). Riding exercises usually took place in private, which was facilitated by the growing number of enclosed riding houses at the courts of the nobility (Skalecki 1992). In public, ladies usually rode side-saddle, with a few exceptions. As the cross-saddle was suspected of causing infertility (e.g., Winter von Adlersflügel 1678), young wives of childbearing age such as the later Tsarina Catherine II of Russia (1729–1796) and Marie-Antoinette of France (1755–1793) were severely criticised when they used it (Keil-Steentjes 2018). This did not apply to young girls and unmarried women (e.g., Winter von Adlersflügel 1678).



Figure 9. Evolution of the side-saddle (from left to right): 9a. side-saddle with English crutch and leaping head showing slipper stirrup (France, c. 1840–50); 9b. side-saddle with leaping head and the remains of the third crutch (J. M. Mayer, Munich, Germany, 1894); 9c. side-saddle showing trapezoidal heads (Mayhew, London, England, 1910). Photo: Keil-Steentjes 2023.

In addition to hunting, the sources also report more frequently on promenade riding as a befitting occupation for women at the time. The old-fashioned sideways saddle was still used for this (Figure 6a). Most women of more modest background rode only to get from one place to another. In England in particular, sitting sideways on the horse's croup behind the male rider was common, a riding style that had been considered rather romantic among the nobility in the fifteenth and sixteenth centuries and which had given rise to its own type of saddle, the pillion cushion (Gilmour 2004: 75–76, Figure 7).

The Tsarinas Elizabeth (1709–1762) and Catherine II of Russia are known to have occasionally ridden astride. It is significant that they had themselves purposefully portrayed astride and in uniform. In this way, they expressed their command over the army, which was of great symbolic significance for both women, since they had attained rule on their own initiative. This was not the case with the heiress Maria Theresia of Austria (1717–1780), who completed the traditional coronation ride to become the *Rex Femina* of Hungary with a drawn sword in her hand, but in a side-saddle, and had herself portrayed in this way (cf. Serfözö 2017: Figure 8).

Society's expectations and pressures to respect the *natural* or *God-given* gender norm were a decisive factor when choosing the riding style. Ever since Aristotle, these views had been based on the assumption of the physical and intellectual inferiority of women as well as the polarity of the sexes (Daston 1987/88; Connell 2021) and was also expressed, among other things, in the riding style (e.g., Oebischelwitz 1766:166). Textual sources condemning *unfeminine behaviour* have been a tradition since antiquity. In every period, they form the basis for the widespread criticism of female riders in the cross-saddle (e.g., Niketas Choniates 1984:35).

Empress Maria Theresia had prepared intensively for the aforementioned coronation by taking riding lessons and had become enthusiastic about equestrianism (Iby et al. 2017:320). In January 1743, she organised a *carousel*, exclusively for ladies. The carousel was a courtly equestrian game that had evolved from the medieval jousting tournament. Women traditionally took part only in carriages or sleighs (Watanabe-O'Kelly 1990). Empress Maria Theresia went further by planning a ladies' carousel at the Winter Riding School, where ladies were to compete on horseback riding astride. However, the first signs of pregnancy and



Figure 10. Louis Alphonse de Brébisson: Madame de La Broise. c. 1860, hôtel de Brébisson, Falaise. Musée: Charenton-le-Pont (FR), Médiathèque de l'Architecture et du Patrimoine, Numéro d'inventaire: BRB00059. Photo: Ministère de la Culture – Médiathèque du Patrimoine, Dist. RMN-Grand Palais / Louis Alphonse de Brébisson

fears of criticism and comments that riding in a cross-saddle would endanger her unborn child, prompted her to change her plans and compete in a side-saddle. After that, she made no further attempts to promote female equestrianism in the cross-saddle (cf. Keil-Steentjes 2018).

At the end of the seventeenth century, a new form of side-saddle emerged in England, probably in connection with the growing popularity of the English thoroughbred. This breed had a different conformation and faster movements compared to the type of horses used until then. In the so-called *side-saddle with the English crutch* (Figure 6c), the central horn was replaced by a crescent-shaped fork into which the rider placed her right leg (when sitting with the legs to the left). The right side of the crutch could also be used as a handhold. The English side-saddle became a fashion trend and spread throughout Europe, though initially not in France. There, various alternative forms of side-saddles emerged in the eighteenth century (Figure 6b) but gave way to the English side-saddle after the French Revolution (Keil-Steentjes 2018). Another technical innovation, the invention of the so-called leaping or hunting head in the early 1830s, facilitated jumping over obstacles by providing additional support for the left leg (in the case



Figure 11. Souvenir photo with tourists at Drachenfels Castle. c. 1929, Drachenfels (Siebengebirge, DE). Photo: Virtuelles Brückenhofmuseum Königswinter DS 4475.

of riding with both legs to the left) and greater safety for the rider (Greenwood 1839:60–61) (Figure 9).

Both the sideways saddle and the side-saddle were exported over time to other parts of the world as part of the European way of life. They were imported by settler colonists to North and South America, and to Iceland and Georgia. There, local variants of the women's saddle developed that differed technically and visibly from the European models (e.g., Knopp 2018:217–222). In the course of the eighteenth century, continental women's riding evolved further with the increasing use of the cross-saddle. This was not the case in England. By the early nineteenth century, the situation on the continent reversed again with the social reorganisation gripping the whole of Europe and changing women's rights (Sorge 2015). While riding aside had previously been a status symbol of the married aristocratic woman in Europe, it now became a fashion among the wealthy bourgeoisie (Keil-Steentjes 2018).

Women, who had to live in the patriarchal society of the nineteenth century without male protection, did not have many opportunities for employment. Circus rider was a profession that was considered *demi-monde*, but offered chances for social advancement. Among these women were several who made a reputation for themselves as outstanding riders and who set new standards of equestrianism (Vaux 1891). However, the greatest ambassador of women's equestrian sport was Empress Elisabeth of Austria (1837–1898). Through her prominence, she became a role model for a generation of women who now discovered equestrian sport for themselves and gained affirmation, self-determination and a certain degree of freedom (Munkwitz 2021, 2022). This is reflected in riding fashion. Since its emergence in the seventeenth century, women's equestrian fashion tended to follow male styles albeit with clear feminine accents, such as the overlong, bouffant skirt worn in the mid-nineteenth century, which almost reached the ground when mounted (Figure 10). In the 1870s, the



Figure 12. Modern side-saddle rider in traditional habit.
Photo: Keil-Steentjes 2010.

skirts were shortened and ended at the horse's belly. This was much more practical and safer, eliminating the danger of getting caught on an obstacle. Sporting women could now also wear a spur, which improved the rider's control. Previously, the long skirts had prevented this. Spurs had also been a traditionally male attribute with high symbolic value (Ellis 1995:124). Representing social status now became a matter of riding skills rather than simply showing expensive clothing and equipment (Schoenbeck 1904:16).

Parallel to the side-saddle, the sideways saddle experienced a renaissance in the nineteenth century. The growth of tourism in particular gave rise to a form of saddle known today as the *selle fermier*, which allowed inexperienced women to ride in the mountains or on the beach. It was used in tourist places well into the twentieth century (Figure 11).

In all eras, Western European men rode side-saddle only in exceptional cases: as horse trainers, to train ladies' horses or for health reasons. Throughout time, there have always been women who rode aside at least some of the time, either for practical, personal, or cultural reasons. At times, it was unacceptable for women to ride astride in public, such as in the nineteenth century. During the last decade of the nineteenth century, however, astride riders began to appear in the metropolises of Western Europe, thereby triggering public debate. The most common arguments in favour of the side-saddle and against the cross-saddle were primarily concerned with safety and health (The Times 1914). In the nineteenth century, the

side-saddle was regarded as the saddle that offered better support and thus protected against falls. An argument that has absolute justification, since the cross-saddles of the era gave the rider little support. In addition, the view that the female body was less suitable for the riding saddle persisted into the twentieth century. Women's *shorter legs and rounder thighs* were cited, as well as the faster tiring of the (weaker) female muscles (e.g., Mazzuchelli 1805:294; Fillis 1902:24). However, many textual sources dealing with the controversy over the choice of riding style show more or less directly that a conservative mindset regarding the gender norm played a significant role in the initial strong rejection of women in the cross-saddle (e.g., Schoenbeck 1904:18–39). So did a general sense of aesthetics that rejected women riders wearing breeches, even though breeches concealed under the riding skirt had been the norm for over a hundred years and probably much longer (e.g., Nicholas l'Estrange 1974).

In the cross-saddle, women were much less dependent on assisting personnel, thus making the equestrian sport more affordable. Horses trained especially in the side-saddle, additional staff and costly equipment and clothing were no longer required. The First World War changed the social structures in the western world and with the revival of horse shows in the 1920s, women began competing in both saddles. Side-saddle riding then reached its sporting peak (Musy 2009). At the same time, the possible effect on the horse's well-being caused by the asymmetrical and heavy side-saddle came under discussion (Nelson Evening

Mail 1905:2; Maddison 1923:4; Seunig 2011:275). In terms of athletic performance, a riding style which eliminated the function of a rider's right leg could, in the long run, only lose. Irmgard von Opel's (1917–1986) victory in the Hamburg Jumping Derby (1934), one of the world's most demanding jumping competitions, clearly proved that, in the cross-saddle, women could compete with men at all levels. After the Second World War, equestrian sport was slow to pick up again. In 1952, the Olympic Committee allowed women to compete in dressage with the first medals going to women (Olympic Equestrians 2024; Newsum 1988:97–98). Ever since, the equestrian sport has been one of the few Olympic disciplines in which women compete directly against men. Now only a small group of women in Europe uses the side-saddle, most of them in the UK.

In the 1970s, interest in side-saddle riding as a sport and leisure activity increased again. The first associations were founded in Great Britain and the USA (Skelton 1988:53–57), followed by others throughout Europe, Australia and in Japan, setting themselves the task of reviving and preserving the riding style. In parallel, written riding instructions emerged that attempted to bring the riding style into a more modern context (Cabaud 1986; Skelton 1988; Faltejssek 1998, Figure 12). Other authors dealt with the history of women in the side-saddle (Pellier 1897; Fleitmann-Bloodgood 1959; Toboesch 1970; Hermsdorf 1998; Lagier 2009) or devoted a chapter to the subject (Chenevix-Trench 1970:272–290; Tavard 1975:243–272; Newsum 1988). In doing so, they often largely adopted the information that had already been circulated in the nineteenth century. Since the 2010s, texts have increasingly begun to appear which give the impression that in past centuries riding astride was considered shameless and that the side-saddle's purpose was to preserve virginity (Knopp 2018:217). These statements cannot be confirmed by historical textual sources, but they do have a literary antecedent: by omission and the use of pejorative wording in translations and quotations, certain authors of the late eighteenth century voiced their rejection of women riding (and behaving) like men. Frequent quotation and use of such statements by other authors lent them unwarranted credibility. Further interpretations by current authors led to further distortion. Only recent years have seen an increase in the number of works approaching

the history of the European woman in the saddle critically and with scientific methodology, thus helping to revise false assumptions and fill in knowledge gaps.

Concluding remarks

The formal way of riding sideways, with its enthroned appearance, has its origins in the depictions of gods and the status representation of early male rulers. The increasingly military use of the riding horse in the first millennium BC, for which riding sideways was generally unsuitable, created a general understanding that riding in a man's way symbolised martiality and a claim to power. Furthermore, in the course of Antiquity and the early Middle Ages, societies changed across Europe where the distribution of tasks between men and women became clearly defined, a separation, resulting in the assumption this was the foundation for any functioning community. Riding astride, embodying typically male attributes such as vigour, strength and vitality now stood in contrast with the sideways rider's position which represented typically idealised female characteristics such as passiveness, gentleness, obedience, and motherly care.

Since the Early Middle Ages, legal texts have shown that women of childbearing age were more highly valued than others. It is hardly surprising, therefore, that the side-saddle, with its feminine image, became the privilege of high-class married women while for girls, single women and widows it was acceptable to ride astride. This attitude prevailed for centuries. It was only during the nineteenth century, when riding became accessible and fashionable for a wider section of the population, that the symbolism of the side-saddle changed. Previously, the privilege of married women, it now paradoxically became a tool for young or unmarried women to showcase their qualities as future wives. As the female emancipation movement progressed, riding aside not only lost its meaning but also its positive associations, to the point of even being seen as a symbol of female oppression. Today, side-saddle riding is increasingly gaining in popularity again, and this for a number of reasons: interest in tradition and history, joy of expressing one's femininity and of course sporting challenges to name but a few – but nowadays gender norms no longer play a role.

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The Horse in Literature: From Status Symbol to Companion

Anastasija Ropa and Cristina Oliveros Calvo

Introduction

Historically, equids have been means of transport and labour, but also conveyors of symbolic messages. They were often status symbols at times when owning and using horses and other equids was expensive and would have been a means of conveying one's socioeconomic value. In literature, we find horses and equids in close relation to their owners and riders, about whom the horses impart information such as their social position, gender, age, and personality. Horses further are used to describe and critique difficult social issues.

In this chapter, we will examine the corpus of literature that can be broadly described as fiction, thus excluding practical literature, such as agricultural, veterinary and hippiatric treatises on the one hand, and letters, charters and other administrative documents on the other hand. We have adopted a comparative diachronic approach and concentrate on selected historical periods and genres, looking mostly at European sources. We recognize that, in different historical and cultural contexts, the representation of horses and other equids and their relations with human agents may have differed significantly.

The first part of this chapter focuses on horses in medieval chivalric romances. Subsequently, we discuss horses in early modern literature, with a particular emphasis on Elizabethan drama. This section sketches the gradual transition of the horse from status marker to a companion in autobiographical writings and the prose novel, which took place between the seventeenth and the nineteenth centuries. Lastly, we concentrate on modern literature and the rise of children's fiction, where the horse or another equid is the child's partner, such as Anne Sewell's *Black Beauty* and Enid Bangold's *National Velvet*.

Equestrianism in Medieval Literature

Medieval chivalric literature focuses on the adventures of a knight who usually has to depart from the court of his sovereign in search of adventure, to fulfil a certain mission or to achieve the goal of a quest. Naturally, he does so on the back of his warhorse. The equine companion, although more than merely a means of transport, hardly ever merits a notice. Where the horse is mentioned or described, there is some reason for it: for instance, Gawain's Gringalet in *Sir Gawain and the Green Knight* is the hero's famous mount. Its turnout, described in some detail, contributes to the portrayal of its rider. In other cases, the horse, another mount, or an alternative means of transport is mentioned because of the discrepancy between what the rider should have ridden and what he actually rides (Ropa 2019a). This is the case of young Perceval in Chretien de Troyes' romance and its other



Figure 1. Sir Lancelot riding in a cart. From the British Library, Additional 10293, fol. 054r.

versions in German, Welsh and English, where the hero often rides a horse that is improper for a knight. Another, more extreme example, is that of Chretien's Lancelot in *Lancelot, or the Knight of the Cart*, where, to save Queen Guinevere, Lancelot travels in a cart, which, as the poet notes, is normally used only for transporting prisoners (Figure 1), though it is likely that Chretien invented this explanation himself (Zink 2003, 2018).

In literature outside of medieval Europe, we find the association between the warrior and his warhorse as well. The famous pre-Islamic warrior poet, 'Antarah, is a good illustration of the tendency to project some of the rider's qualities on his mount. 'Antarah ibn Shaddād has the same status in Arabic culture as King Arthur does in Europe; little is known about his actual life, but the corpus of poetry ascribed to him has survived the test of time and has been reshaped and rewritten, offering new details about the hero (Montgomery 2018:xxxvi). There was even an epic written that attempts to trace the biography of the poet, using his poetry as a guidance. Today, 'Antarah is the hero of cartoons and children's books. However, in the earliest poems that

are ascribed to him, we see 'Antarah mounted on his camel while travelling or on a warhorse while on campaign. Some of his poems are even dedicated to his horses. Remarkably, one poem extols his mare. In contrast to the European knights, the nomads of the Arabian Peninsula also rode mares and geldings, even though stallions seem to have been the warhorses of choice among the Islamic military elites. Thus, in *Jostled by horses*, he writes: "Jostled by horses / I aimed my mare's / star-front toward / a rider skewered / in a thicket of spears" ('Antarah ibn Shaddād, 2018:198).¹

Another poem is an elegy, mourning the death of the poet's faithful stallion, who is presented as 'Antarah's loyal companion on the battlefield: in the title already, the poet possessively claims the warhorse as his, "My horse Blaze". But Blaze is not just his property, it is his cherished companion, his fellow warrior: "God, reward / my horse

¹ All quotations in this article are from Montgomery's translation. The original Arabic edition is available from the Library of Arabic Literature. https://www.libraryofarabicliterature.org/ar/books_ar/أنشيدالحرب Accessed October 8, 2020.

Blaze! / He was a true / comrade, shielding me / with muzzle and shoulder / when we plunged / through fires of War” (‘Antarah ibn Shaddād 2018:103). Indeed, Blaze is often more reliable than fellow humans, as ‘Antarah emphasises that “Our raids sometimes / failed but Blaze / often helped / the skilled warrior / conquer the spite / of foes and gain / his spoils.” (‘Antarah ibn Shaddād 2018:103).

Elsewhere, the poet expresses his care of the horses, to the extent of feeding them choice foods, such as milk, which is denied to ‘Antarah’s wife. In yet another poem, he scolds his compatriots for not feeding their colts properly and caring only about themselves. These poems appear to provide examples of the poet’s love of horses, both in general and of individual equines. It is undeniable that the poems reveal genuine care and affection for the equines, but at the same time they convey a certain image of the author as a good warrior, a man who can take care of his horses, and, by extension, of his tribe, because the presence and good condition of the horses are essential for the welfare of the tribe (Ropa, forthcoming).

Translation of Medieval Equestrian Texts

Piño Graña (1995) warns translators about the difficulties of approaching a medieval French text when they need to give a modern translation to a medieval concept or term. Among historians, according to Boniface (2015), there is a debate over the definition of different concepts regarding horse types to define how horses were viewed. There is still no consensus. Boniface proposes an interesting idea referring to this fact: “this is because their significance [horse types terms], both literal and literary, is not static” (Boniface 2015:5–6). Therefore, terms cannot be considered only as linguistic units with a fixed meaning.

Furthermore, Piño (1995) highlights one of the main problems when dealing with *realia*, i.e., all the words and expressions that define concepts specific to a culture (Vlahov and Florin 1980). One of these problems is a translator’s lack of knowledge of the *denotatum*, the concept or reality behind the language, which escapes from the linguistic level. In other words, *denotatum* refers to the background knowledge of the culture that people of that culture hold. Furthermore, the different terms were not static and evolved as time went by, becoming even more codified and, as a result, there is a wide spectrum of possible interpretations, adding an additional challenge for the translator.

Piño indicates the importance of not letting the “circularidad texto-diccionario” [“text-dictionary cycle”] overtake translations. We should not frame our interpretations within the dictionary definitions, which are mainly based on repetitive schemes of the language (*chansons de geste* formulas in her case). Instead, Piño insists on the key role of the context and the extralinguistic elements to think outside the box and not rely only on dictionaries. In this

sense, Oliver Frade (1995) talks about language knowledge and intuition whenever a translator is facing a medieval text. In his view, the lack of any of these two becomes an issue. Translation is an act of communication between the extralinguistic elements, the text and the translator. This can be extended to any researcher or person dealing with texts of any kind, not only translators.

This is worth bearing in mind when we find a word that has a particular position in a sentence or is uncommon to see in a synonym cluster. Piño points out another important fact: the creativity of the poet to introduce new linguistic schemes to break the repetitions already established in the *chansons de geste*. To illustrate this idea, she presents the verse 2484 from *La Chanson de Roland*. In ancient French, “Noz chevalz sont las e ennuiez” [“our horses are worn out and foundered”] (*The Song of Roland* 2018:127). Apparently, *ennuiez* and *las* refer to a state of fatigue so, at first sight, they are another synonym cluster to intensify what is taking place. Nevertheless, Piño shares an interesting view on this: if we look these words up in the dictionary, they are categorised as terms to describe human feelings. However, the background information says something else. These human feelings are attributed to horses. In conclusion, Piño states that *ennuie* and *las* are still framed within the semantics of feelings due to the background information in the text. This background information suggests that horses were being considered as companions and different from other animals.

Piño also mentions the use of *teste* (head) and *chef* (head) for both humans and horses in *La Chanson de Roland*, which is quite significant as another hint of horses being considered differently from other animals. Le Gentil (1950) affirms that *teste* is mainly used for war or violent atmospheres. On the contrary, *chef* is used to express a calmer atmosphere or to show respect and sympathy. He concludes that they both express different psychological nuances and, therefore, these were used by the poet to give strength to the narration. Furthermore, horses are once again upgraded to a different status, as animals that are feeling as their owners do. The collocation of these words can be due to rhythm purposes.

Maíllo Salgado (1982) contributed to the diachronic study of the terms *jinete/ginete* (jennet style rider; the meaning later evolves to designate only a “person who rides a horse” or “a skilled rider,” according to the Spanish Language Dictionary) and *jineta/gineta* (jennet riding style). He bases this translation upon law texts and chronicles, but he also takes the background information from the period into account to define how the “the significance, both literal and literary” (Oliveros Calvo 2021) of *jinete* and *jineta* has evolved from the Middle Ages to the modern era.

In conclusion, approaching a medieval text to define any equestrian or horse-related term is not easy. There are a lot of facts to consider. We should try to think outside

the box and not take words at their most basic level. Every term is always attached to a particular cultural information. However, these extralinguistic elements are set in a specific time in the past, which adds extra difficulty to the matter because concepts and mindsets are not static. The knowledge of both the language and the extralinguistic elements of a concrete civilization or period are determinant to understand the significance of equestrian and equine concepts.

The Transition from Horses as Status Markers in Elizabethan Drama to the Relationship of Care in the Autobiography and the Novel

In contrast to the novel, the drama relies on the gesture, the costume, and a few words to tell a story and build a character of the story. The playwright needs to use these props, and especially the word, to the best effect. The Elizabethan drama was no exception, and the sixteenth-century English playwrights often used references to horses to evoke certain emotions in the audience, e.g., alluding to the “Galloway nags” in the certainty that the spectators would have a certain image of the “Galloway nag.” Cryptic as these allusions are to a reader or spectator today, they were meaningful to the sixteenth century audience, and historians of the horse can gain insight into attitudes to horses and horsemanship by studying Elizabethan drama. Bibby (2020) argues persuasively that the Galloway nag was prized for its speed and endurance both in medieval and early modern England. In the Shakespearean drama, she shows how the few references to the breed are used to elicit recognition in the spectators and place the character in terms of social status and regional identity (Bibby 2020, 235).

In the seventeenth, eighteenth and nineteenth centuries, with the rise in prominence of autobiographical writing in the form of the memoir and the prose novel, a different model of the representation of equestrianism emerged. Alexandre Dumas harkens back to the horse as status identifier in his *Three Musketeers* (1844). D'Artagnan's ride on the yellow horse is preceded by the author's discussion of how in those days (the sixteenth century), all observers had good knowledge of horseflesh (something that Dumas's contemporaries implicitly lack) and could make value judgements about the rider based on their mount. Despite his father asking D'Artagnan to take good care of the trusty yellow gelding, he has no second thoughts about selling the horse. Overall, the musketeers' attitude towards their horses is very pragmatic, at times bordering on outright cruelty. The only contrast is seen in the *Twenty Years Later* continuation, where the horse of the English King Charles is the only creature to come up to his master after the unfortunate king is captured by Cromwell. This exceptional instance of outlining the special relationship between the rider and his steed serves to stress the lack of loyalty in

the English subjects and has no bearing on the overall lack of emotional engagement between humans and horses in the trilogy.

However, the nineteenth century also marks a turn in the representation of the relationship between the horse and the rider, a transition from utility to companionship, which is evident in autobiographical literature. Two Russian autobiographies, both by members of the military, testify to this trend. Peshkov's journey, and Durova's *Memoirs of a Cavalry Maiden* appear as transition points from horses as status identifiers to the internalisation of a relationship between the horse and the rider.

Nadezhda Andreyevna Durova (17 September 1783– 21 March 1866), also known as Alexander Durov, Alexander Sokolov and Alexander Andreevich Alexandrov, was an officer of the Russian army during the war with Napoleon. Later in her life, she published a memoir, *Memoirs of a Cavalry Maiden* (Durova 1812, 1988). Her story was well-known in her lifetime and later on (A.S. Pushkin was among the early admirers of this vivid account of female daring and patriotism) and led to a subsequent adoption for the juvenile audience by a famous Russian children's writer, Lidia Charskaya. Published in 1908, after Durova's death, *Courageous Life* foregrounds Durova's relationship with her first horse, Alkid (Charskaya 1908). This relationship is likewise at the centre of the early part of Durova's own memoir: after she leaves her home, Alkid becomes the last thread connecting the two parts of Durova's life – before and after her departure. Alkid, a lively Karabakh stallion, is Durova's first horse, whom her father managed to dominate through force, skill and experience, and whom Durova as a girl tamed through her kindness and lots of treats. Eventually, her father gave the horse to Durova and she used it to escape her house and join the army, disguised as a young man. After Alkid died in an accident, Durova was devastated. However, the memoir also mentioned other horses she rode, revealing that she was not a stereotypical sentimental “horse girl” and showing that she could be very demanding, and at times even cruel, by today's standards, with her subsequent and less gifted horses. But by the standards of her time, as the memoir shows, other officers often saw her obsession with her horses' well-being as odd. At the end of her career, Durova finally obtained a horse to her liking, a quality and hot-blooded, energetic mount. An addendum to the memoir describes the author's childhood before her escape from home, and an interesting vignette shows little Durova taking care of other pets, including a lapdog and a wild bird, both of whom she tragically lost. These episodes demonstrate Durova's love for a variety of animal companions – Alkid was for her a companion and a comrade more than a quality mount – and the longing of an unloved girl from a dysfunctional family to find a creature who would love her unconditionally. Durova's

story was popular not only in Imperial Russia but also in the Soviet Union, which witnessed a rise of patriotic feelings after the Second World War. A musical comedy and ballad, *The Hussar Ballad* was made especially for the 150th anniversary of the Battle of Borodino (1941). The premiere of the film was held on 7 September 1962, the day of the battle. The screenplay for the film was based on the play *A Long Time Ago* by Alexander Gladkov.

A somewhat lesser-known figure today is Dmitri Peshkov (Figure 2), a young Cossack officer, who on 7 November 1889, “set off to ride alone from Blagovechtchensk by the Sea of Okhotsk in the far east of Russia to St Petersburg on the Baltic, a distance of 8283 versts (5491 miles/8836 km)” (Brownrigg 2022). His mount was his little grey cavalry horse, and the journey took 234 days (194 days of travel); in May 1890, he was received in St Petersburg by the Emperor. Peshkov later published a journal of his travels, which was known in his own time but has fallen into obscurity since, probably because it is plain boring to read (Peshkov 2008). He includes only practical information about the roads, the quality of food and fodder, etc. Throughout the journal, his care for his horse’s well-being is visible, and it goes beyond pragmatic: there is a sense that the officer, apparently a rather unemotional man, was very attached to “The Grey”. The American journalist Stevens (1891) described Peshkov and his mount as follows:

The Cossack turned out to be a small, wiry man, twenty-seven years old, with a pleasant face of almost mahogany darkness from the long exposure of the wintry winds of Siberia. His horse was a big-barrelled, stocky grey pony about fourteen hands high. The horse was well chosen for his task. He was all barrel, hams, and shoulders. His pace was a fast, ambling walk that carried him over the ground at five miles an hour and left the big chargers of the Czar’s honour guard far to the rear.

But this was not the end of Peshkov’s fame. French author Jean Louis Gouraud, who himself rode from Paris to Moscow in 1990, wrote the screenplay for a film “*Serko*” (Russian for “Little Grey”), which was based on Peshkov’s journey. Gouraud made a French edition of Peshkov’s journal, together with a translation of Stevens’s book, *La Russie à Cheval. Récits croisés d’un cosaque et d’un reporter (1889–1890)*.

Meanwhile, both the status and the relationship aspects can be foregrounded in literature. The aspect of relationship may be important for the horse owner or rider, but external observers would tend to notice the social and economic implications of owning and riding a particular equid, as in the case of one Montana trail travel diary (Herndon 1902), analysed by Teggin (2022). Sarah Raymond Herndon (7 September 1840–20 March 1914), travelled with her



Figure 2. Peshkov on horseback. Public domain.

family from Maryland to Scotland County, Missouri, after the death of her father Daniel in 1850. Whereas travellers would have normally ridden in wagons drawn by horses or oxen, Sarah had at her disposal a pony named Dick, who offered her companionship and a way to relieve the fatigue and moral tension created by the arduous journey. The emotional relationship between the two was such that, when she had to sell the pony at the end of the journey, Sarah was dejected:

It was scarcely daylight when that hateful man was here again after Dick. I had just finished dressing when Hillhouse came to the wagon and said: ‘Shall I let Dick do?’ ‘Do as you think best.’ And I threw myself on the bed for a good cry. I had not stopped crying when he came back, and throwing a buckskin purse into my lap, said: ‘There is your pony.’ There was one hundred and twenty-five dollars in gold dust in it. I sobbed out loud. Hillhouse looked at me with contempt in my expression but said nothing. I could not help crying. I know he would never sell anything that he loved, and I love that pony. I let the purse roll out of my lap down into the bottom of the wagon, and have not touched it yet (Herndon 1902: 250–251).

However, to the external observers, her possession of a riding pony would have seemed a privilege and a mark of certain economic independence, albeit the woman herself does not appear to be aware of this. Thus, Teggin notes that,

The Raymond family can be described as distinct from the majority of emigrants through their possession of a luxury such as Dick, him being a personal belonging of Raymond not the outfit, and they were further differentiated in Virginia City when Raymond was critiqued as an aristocrat ‘going to teach school and play lady’ by her new neighbours (Teggin 2022:147).

Horses in Children's Literature

We focus on the twentieth- and twenty-first-century literature, starting off with an analysis of *Black Beauty*, examining how this horse character evolved throughout history until today, from Anna Sewell's original character to the most recent interpretations of *Black Beauty*. We will then talk about some of the most representative books in modern times, focussing on children and their equine friends as the main characters in Spanish and French literature.

Black Beauty is British author Anna Sewell's only novel, published in 1877. It tells the story of a "well-bred gelding with a good deal 'of the racing blood' in him" with a "character as perfect as his appearance" (Chitty 2007:211). It is told from his own point of view, kicking off when Black Beauty is just a foal and continuing until his old age. He lives a gamut of experiences with other horses and owners, who treat them with either kindness or cruelty, foregrounding the emotions of the narrator: the horse himself. As *Black Beauty* uses first person narrative, it can also be framed within the *animal autobiography genre*. This genre is characterised by the fact that animals who have a close relationship to human beings are the protagonists and narrators of their own stories. In addition, in this genre, there is a moralising intention in order to raise awareness about a problem. In the case of *Black Beauty*, the issue is animal abuse (Cosslett 2006).

In the first instance, Anna Sewell's goal was "to urge people to treat horses with more kindness" (Collins, 2010, VI). At the same time, she criticised the working conditions during Victorian England. As explained by Chitty (1971:217), Sewell's biographer, "stablemen were the lowest of the low". Anna Sewell, being a deeply religious woman, condemned all kinds of cruelty and vices by making value judgements related to good conduct and solidarity. In fact, Crossley (2003:35) states:

Sewell, with her *Translated from the Original Equine*, also revealed that as an author she had a playful side, but once into the body of her text she expected to be taken seriously, for she had serious issues to discuss. There is a great difference between a talking horse, like Pot Black, and a horse with a voice, like Black Beauty. One is an unnatural, imaginary animal, and the other is an animal whose nature has been imagined. The difference is in the subtlety of the writer's style.

Lansbury, as cited by Crossley (2003:8) believes that *Black Beauty* is also a reflection of Sewell herself because whenever Beauty narrated "the persona was not human. Anna felt free to speak her mind and feelings in ways that would have been consciously censored had she written as a woman". Ganzauge and Burke (2004) suggest that it can be confirmed that when it comes to a person expressing

an unpopular opinion, there is a tendency to use animals as a means of communication, and that is the case of *Black Beauty*. The role horses play in *Black Beauty* is to distance readers emotionally and mentally so that they can have a critical eye on an issue that arises throughout the plot, in this case animal abuse.

In this categorisation, we can also fit a French title: *Milady* by Paul Morand from 1936. He uses the horse to criticise the evolving twentieth century society where the story takes place through the abuse the mare Milady has to suffer. This is highlighted by French scholar Guirard de Camproger (2022), going through different French horse stories where the horse is portrayed as a victim of humans, being able to testify and make the readers wonder about the consequences of their own acts towards animals. It also reflects the awakening of a society and the subsequent change towards animal abuse, considering the horse as a living creature and not an instrument, which was a recurrent social aspect throughout the nineteenth and twentieth century literature focusing on horses. Guirard underscores how authors tended to depict their knowledge on horses to convey a more realistic message. In the case of Anna Sewell, it was unfeminine to have such knowledge about horses because most horse stories were written by men and for men.

The impact *Black Beauty* had in the USA was larger than in its birth country. *Black Beauty* was once related to *Uncle Tom's Cabin* by Harriet Beecher Stowe and categorised as *antislavery narrative* (Blossom 2008). An enthusiastic Boston lawyer called George Thorndike Angell founded the Massachusetts Society for the Prevention of Cruelty to Animals in 1868 after he learned about the passing of two horses that were driven to death after a forty-mile road race. He also created *Our dumb friends*, the first animal protection magazine in the world whose aim was to prevent abuse through education. He organised contests to look for a book that could "have as widespread and powerful influence in abolishing cruelty to horses as *Uncle Tom's Cabin* on the abolition of human slavery" (Blossom 2008:33). In 1889, the *American Humane Education Society* (AHES) was founded. In 1890, Angell received a copy of *Black Beauty*. He was so fascinated by it that he began a campaign to spread Anna Sewell's message everywhere, which aligned with the values that the AHES promoted. He was determined,

to print immediately a hundred thousand copies... to give away thousands of these to drivers of horses – and in public-schools – and elsewhere...to send a copy, post-paid, to the editors of each of about thirteen thousand American newspapers and magazines... to put a copy in every home in America (Blossom 2008).

Angell retitled *Black Beauty: His grooms and Companions* to *Black Beauty: The Uncle Tom's Cabin of the Horse*. Gavin

(2004) explained that he Americanised some English terms for tack such as *check-rein* instead of *bearing-rein*, italicised some important passages, and added an introduction about the AHES. Angell promoted most *Black Beauty* translations into several languages, starting with French (*Prince Noir*) in 1888, and then German (*Schön Schwarzhärchen*), Italian (*Belmoro*), Spanish (*Azabache*), and others such as Greek and even Japanese. Based on the Translation Quality Assessment (TQA), some aspects of the Spanish translation and subsequent audio-visual adaptation for children of *Black Beauty* are underscored by Oliveros (2017). One of the main points challenges some specific equestrian terms such as *bearing rein*. Analysing different sources, both literary and audio-visual, she finds that the term is not accurate enough or is even made-up.

A translator often gets to transfer a gamut of texts with different themes. Specialisation in translation is directly related to the knowledge the translator has about a specific field. Before translating, there must be a process of information retrieval in order to get familiar not only with the vocabulary and grammar more commonly used but also with the topic the text is about. When the translator is seasoned in the field, this process will be quicker; there is a debate on whether this is considered specialisation. Most translators are instructed on only languages and the translation process itself, which includes information retrieval. Yet, they are trained to evaluate the resources they are consulting so that they filter the information and avoid noisy data (excess information), in order to deliver a good translation. Often people are experts in a determined field, and they decide to translate texts about the field they know. Is this training enough to convey it properly into another language without the pertinent linguistic skills and tools? There is no consensus on where the boundaries of specialisation in translation are, so the evaluation of translations must incorporate these issues.

Each project the translator faces requires a quick turnaround. The information retrieval can take longer than expected and, sometimes, if the translator does not come up with a good equivalent, has to make it up in order to make it understandable in the target language. Examples include the aforementioned term *bearing rein* and its translations into Spanish, and the problems in Spanish on account of the name of the famous black gelding (Oliveros 2017). A translator is able to deliver a good translation by having enough time to research the topic and find the proper way to convey the message by solving terminology and semantic problems, bearing in mind other important factors such as the target audience, the format (literary, audio-visual, etc.) and above all, the background information.

A Children's Classic and its Evolution Over Time

Gavin (2004) states that Anna Sewell did not intend *Black Beauty* to be a children's story. Spanish translator Morales (2008) and Burke and Ganzauge (2004) agree that the concept of childhood had evolved over time. Throughout the 18th century and by the end of the 19th century, children were regarded as "mini adults". They had to work and had little time to enjoy children's activities. However, by 1840, the middle class appeared, and childhood became a key phase where personality was forged through games and education. The 1870 Education Act in Britain made school free for everybody and by 1880 school was compulsory for children under 10. Sewell, as Gavin (2005) affirms, had envisaged a school edition before publishing the novel. When *Black Beauty* was published in 1877, it "was timed ideally to meet expanded crops of child readers". Chitty (1971) affirms that the "economy with words" and the "pared to the bone" descriptions are key features to consider it a classic suitable to juvenile readers. The first-person narrative helps children imagine how they would feel if they were horses. Chitty (1971:245) finds that it is a "partisan book", where you can see evil and kindness and also a "cathartic book that purifies through pity and fear". She considers it to be very straightforward and handy because it shows practical tips for horse care such as grooming or treating diseased hooves, and what to do in case of a fall. Its lack of sentimentalism makes it very enjoyable, a feature that was not common in Victorian literature.

Black Beauty continues to evolve, adjusting to modern society. Gavin (2005) remarks that most films and series about *Black Beauty* have nothing to do with the book. They mainly focus on the relationships between the horse and some of its masters. Chitty (1971) suggests that a deeper analysis on the evolution of the character of *Black Beauty* is important. Oliveros (2017) sketches a brief analysis of how *Black Beauty* is currently regarded in other countries such as Spain, and how it evolved over time. The most recent adaptation was the Disney film in 2021, which turns the gelding into a mustang mare who befriends a troubled girl, foregrounding the controversial problem of mustang management practices in the USA.

The Evolution of Children's Horse Literature and Examples Worldwide

Haymonds (as quoted in Ray and Hunt 2005:357), finds there is a wide spectrum of stories regarding horses that can be divided into four main categories: *anthropomorphic horse stories*, *wild horse stories*, *pony stories* and *adventure stories that include ponies*. Pickel-Chevalier and Greffe (in Leroy Ducardonnoy and Vial 2018:109–128) offer a more updated classification with mind maps and archetypes depending on the role the horse plays in the plot. Guirard de Camproger (2022) addresses the return of horses

as *psychopomps* (mythical creatures who guide spirits and souls of the dead to the afterlife) in nineteenth and twentieth century French literature: a horse can transport its rider through different worlds. This is seen, for example, in the Spanish children's story *Danko, el caballo que conocía las estrellas* [*Danko. The Horse That Met the Stars*] by José Antonio Panero. Danko was born with magical powers and knows how to read the stars. He is responsible for guiding Grigor, the protagonist, in order to overcome the obstacles they come across. He is presented as a wonder of nature when he is born, because he is immediately clean and is capable of standing up proudly with a white star on his forehead. Danko mirrors the courage of Grigor, following the horse's role within the *Modèle 2. Le cheval-voyage initiatique*, from Pickel-Chevalier and Greffe (2017). The friendship between the boy and the equine is key to make the child's personality unfold as the horse embodies the protagonist's values. Yet, the boy is the leading character, and the horse is overshadowed.

Both classifications (Haymonds 2005; Pickel-Chevalier and Greffe 2017) agree that Anna Sewell's *Black Beauty* was a starting point for setting a standard for the different genres that later appear. In the 1920s and 1930s, people became especially interested in riding, which contributed to the main features that characterised the equestrian literature genre for children. Namely, the respect towards animals and the love for nature, and judging someone on how they treat animals, regardless of social status or money, play a major role. *National Velvet* marks an important stage in the development of literature about horsemanship, whereby it becomes youth literature, predominantly for girls. The model of female horsemanship presented in the novel and the 1944 film continues to influence the way female equestrians are perceived by the public and, even more significantly, represented by the media. This can have an adverse effect on the female equestrians' acceptance in professional sport, because the model offered by Velvet Brown foregrounds affection and lack of professionalism (Ropa and Shamkova 2018). Velvet is presented as a horse-crazy, dreamy girl, who is brave but inexperienced and completely impractical. Her dream is "to ride before the King and the Queen," but, once the ride is over, she has no idea how to capitalise on her resounding victory. Offered to go to the US with her winning horse to be filmed, she refuses, because she believes that her horse, Pie, may not enjoy the journey. Indeed, studies into the perception of female workers in the horse racing industry, including jockeys, exercise riders and other assistants, reveal that women are thought to be more caring, good at dealing with

nervous and difficult horses, but lacking in competitiveness and motivation (Ropa 2019b). This is the case with Velvet, who buys a horse that no one else can master, "a devil of a horse," and is the only one who is able to ride him to victory. Women are also believed to be more persevering, willing to work overtime and for lower wages: this is the downside of the myth created by the Velvet Brown model, because, as a result, women in the racing industry are *expected* to do these things, contrary to male professionals. In more than one sense, the stereotype of a female equestrian builds on the trope of imagined chivalric romance – the tropes of Victorian Arthuriana – and of the model offered by Velvet Brown as played by Elizabeth Taylor in the 1944 eponymous film (Ropa 2022).

Other books, like *The First Horse I see* by Sally M. Keehn, portray the female determination to face the challenges of training a traumatised horse. These aspects have been inherited from *The National Velvet*. *Gallop'g gals* is a short, animated film by Hanna-Barbera Productions produced in 1940, depicting young fillies at a Derby; most of them are beautiful. On the opposite side, we find Maguie, a filly with hay fever. The rest of the fillies make fun of her due to her lack of attractiveness. Nevertheless, while in the race, she can come first because the rest of the racers are worried about the photo finish. Maguie, the "odd one", is the one to overcome difficulties and focus on the objective. In the end, we find that the message conveyed in this short, animated film is for women to overcome the difficulties in life, arising from the fact of being a woman; just as Anna Sewell did, when she decided to write a book about horses in the nineteenth century when most books were written for men by men.

Conclusion

In this diachronic retrospective of European equine fiction, we have demonstrated how the horse has undergone a change in meaning in literature. In most medieval chivalric romances, the horse is mainly regarded as a sign of wealth and social status, whereas in the seventeenth to twentieth centuries they are mostly seen as companions. Language helps to trace the different stages in the evolution of the meaning of the horse. For analysis of modern literature, we decided to focus on juvenile fiction, as this became a literary field where horses are portrayed to convey different meanings. On the other hand, as we are dealing with language, it is important to highlight the role of the translator, who plays a key role in disseminating the concept of the horse across boundaries and throughout centuries.

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Equestrian Sports through the Ages

Anastasija Ropa

Equestrian sports are diverse and have evolved over the centuries since the horse was first domesticated. The idea of games or playing on horseback, whether as recreation or as training for some work involving horses, such as fighting on horseback or in a chariot, ploughing the field, transporting goods or messages, must have emerged very early on. However, for prehistoric periods, it is very difficult to find evidence that would confirm the existence of equestrian sports. Generally, the bull-leaping fresco, a motif from the palace at Knossos in Crete and found elsewhere in the Aegean and on mainland Greece, is widely accepted as an early depiction of gymnastics and can be classified as either ritual or sport – or both (McInerney 2011). The issue of defining equestrian sport(s) is thus our first task.

For the purposes of this chapter, equestrian sports are defined as all activities that involve horses, whether ridden, driven, or used in any other way, for recreation or training, codified, and practised following certain rules. Most of the equestrian sports that are well-known and popular today, including racing (both on horseback and in harness), mounted games, such as polo and polocrosse, mounted archery, as well as dressage and jumping, were already known, in one form or another, in pre-modern societies. To date, there is no single academic monograph devoted to the history of equestrian sports, because of the daunting scope of the subject, but these sports have been studied as part of the sporting culture in a given society (Decker 1992; Golden 2008), as well as on their own, in articles and monographs dedicated to the development of a particular equestrian sport within a specific context or over a more extended period (cf. horse racing in Bell et al. 2020, and others in the references).

Chariot driving is one of the earliest forms of driving. Depictions of chariots and other wheeled vehicles have been found on early petroglyphs from Eurasia (Novozhenov 2012). Chariot racing has been popular in numerous ancient and medieval cultures, starting with ancient Egypt (O'Daniel and Cantrell 2011), as well as Greece (Mann and Scharff 2020; Willekes 2016), Rome (Bell 2020), and, later, in the Byzantine Empire (Parnell 2020), to mention but the best-known ones. The earliest known treatise on horse care and training for harness was authored by Kikkuli (fl. c. 1450 BCE), a Mitanian author (Raulwing 1996, 2009). Another important and better-known source on early horsemanship is Xenophon's *The Art of Horsemanship*, which touches on riding in military contexts, but also in hunting (Morgan 1979).

Interestingly, females, both human and equids, have been systematically excluded from participation in racing, or their opportunities were limited. However, Carolyn Willekes (2022) has presented evidence for the use of mares on the hippodrome in ancient Greece, as well as of the fact that certain women could participate as owners and trainers of chariot racing teams. For medieval Byzantium, we have the evidence of literary sources and archaeology (Akyürek 2021; Bassett 1991; Giatsis 2000), including

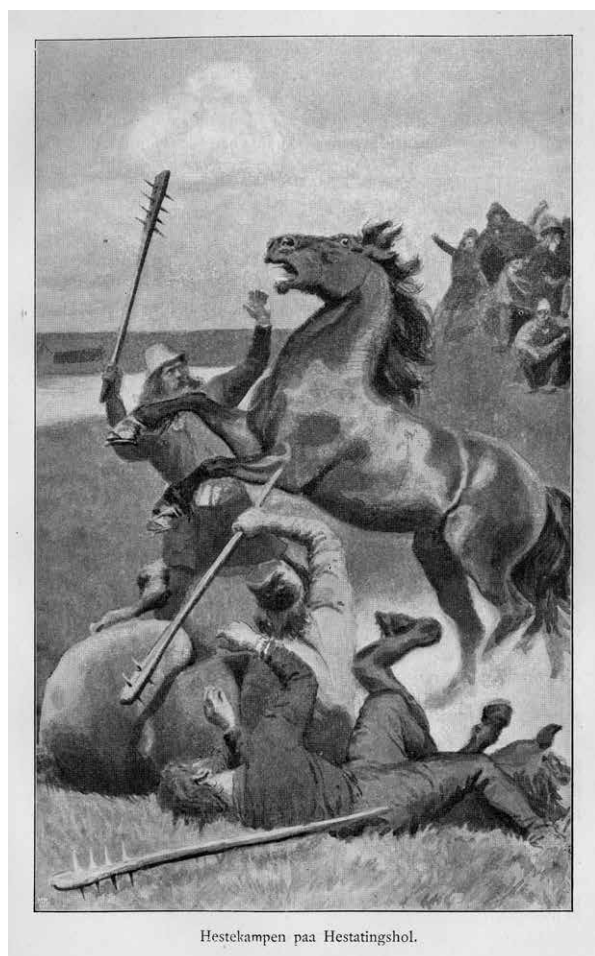


Figure 1. A romantic representation of Hestavig by Andrea Bloch (1898). Public Domain, via Wikimedia Commons: <https://commons.wikimedia.org/w/index.php?curid=18508295>.

hagiographies and chronicles (Stamouli 2020, 2022, 2023), but few visual depictions of the hippodrome, except for the partially damaged frescoes in Hagia Sophia in Kiev (modern Ukraine) (Boeck 2009). Harness racing also seems to have been practised in ancient and medieval Ireland, though there is little evidence to go by as to how the competitions were conducted (Poppe 2015).

Racing on horseback provided a lively spectacle, and, at times, a high-cost enterprise. In the ancient world, bareback racing was a spectacle enjoyed in ancient Greece (Bell 2020; Willekes 2016). In Arabic societies, racing was so ingrained in the culture as to have allegedly caused historical feuds, such as the one between the tribes of 'Abs and Fazarah in the middle of the sixth century AD (Montgomery 2018), while the Irish myth of Macha in *Tain Bo Cuailnge* provides an early reference of a human (in this case, a woman) racing against horses (Poppe 2015). *Skeid*, which involved horse racing and horse fighting, has been part of religious rituals in Scandinavia and survived as a folkloric event

into the twentieth century in some parts of Norway. Kaliff and Oestigaard (2020) trace its beginning as far back as the Iron Age sacrifices, and, in Icelandic medieval sources it appears under the name of Hestavig (Figure 1). They also note that, by the seventeenth century, in Sweden and parts of Norway, the *skeid* became a race to St. Stephen's well organised during Christmas (Kaliff and Oestigaard 2020).

In Renaissance Italy, racing "Barb" horses was a courtly practice, which required considerable investment that entailed breeding and training horses for the sole purpose of racing – a luxury in which only the wealthy magnates could indulge (Duncan 2020). In this context, the Barb is not a modern breed but a proto-breed or landrace. The first breed in the modern sense of the word, that is, a breed complete with a studbook, is the English Thoroughbred (Cassidy 2002), even though certain Italian magnates started using studbooks recording the sires and dams of the foals for their own studs (Cooley 2023). The practice of Italian *palio* racing continues today: the *palio di Siena*, also known simply as *Il Palio*, is held on 2 July and 16 August (Jaser 2020). The jockeys ride bareback, and the horses make three circles on the Piazza del Campa, where a thick layer of turf is laid on the occasion. Interestingly, unlike in most other modern races, in *Il Palio*, the horse is not required to have a jockey to finish the race, and, indeed, it is common for jockeys to be thrown off horseback during the sharp turns (Figure 2).

The best researched, and the best known, type of racing today, is, of course, Thoroughbred racing, with many publications devoted to the rise of the sport in its modern shape in the eighteenth century and its recent development (Cassidy, 2002, 2007, 2013; Huggins 2003; Fairfax-Blakeborough 1951, 1973; Wilkinson 2003). The reluctant acceptance of women as jockeys and trainers started early on, with Susanna Forrest (2018) documenting the lives of several early riders active in the 19th century, while several studies have been devoted to female jockeys in the 20th and 21st centuries and their representation in media (Adelman and Moraes 2008; Adelman and Becker 2013; Butler 2014; Hedenborg 2014; Ropa and Shmakova 2018; Ropa 2019).

Regional histories of horse racing, as well as of those whose participation has been less well studied, have also been examined. Brenda Wahler (2019) published a history of racing in Montana, including the Indian relay racing. Mitchell (2020) described the difference and importance of horse racing in various Indigenous societies in North America. Moreover, the engagement of African American jockeys (Massey 2000; Mooney 2014), and Indigenous Australian jockeys (Maynard 2002, 2013), has been an emerging and important research field in recent years.

Indeed, women's involvement in equestrian sports has been the subject of much research, which is linked to the prominence of women's studies in scholarship in general.



Figure 2. Horse racing at the *palio di Siena* on the Piazza del Campo. Photograph by Mirco, CC BY-SA 2.0 via Wikimedia Commons.

For example, the history of the sidesaddle is inextricably connected to women's involvement in equestrian sports, especially hunting, since the sixteenth century onwards (Mitchell and Creaton 2019; Munkwitz 2021, 2022). As Munkwitz (2021) highlights in her studies, English noblewomen actively participated in foxhunting from the very emergence of the sport, and it was the activities of riding and fox hunting that "promoted personal (if not social) emancipation well before other sports or political progress" from the mid-nineteenth century onwards (Munkwitz 2022).

Foxhunting developed in the sixteenth and seventeenth centuries in England, in contradistinction to *manege riding* (the ancestor of the modern sport of dressage) in Italy and, later, in France (Sargent 2022). Eventually, the sport has come to be viewed as a solely aristocratic pursuit and as a questionable practice from the perspective of animal ethics, leading to its eventual ban, though riding with hounds is still practised. In this, the evolution of fox hunting is very different from that of dressage, with classical dressage becoming recognized as part of intangible cultural heritage by UNESCO. The Cadre Noir de Saumur's "Equitation in the French tradition" was listed in 2011, and the Spanish Riding School's application was approved in 2015 (Pickel-Chevalier 2020, 2017; Sargent 2016). Sargent (2022)

describes the history of both sports and the reputational changes that led to fox hunting becoming viewed as ethically suspect while classical dressage became popular due to its history and the frame of ethical and cultural values associated with it.

Other equestrian sports have taken a surprising trajectory over the course of history, and the development of mounted games, particularly polo and polocrosse, are a case in point. The game of polo, involving two teams of riders with mallets who hit a ball over a field to score goals, has been played across Europe, Asia, and Africa in different forms for millennia. Polo likely developed among southern or central Asian nomadic peoples, with its origins considered to be in Persia from the 3rd century AD, from which the game spread along the silk road, becoming a feature in royal courtly and military life across Asia (Parrish 2018; Chehabi and Guttman 2002). Archaeological evidence even attests to elite women playing polo on donkeys in 9th century China (Hu et al. 2020). Other studies have been devoted to the game of polo practised among Arabic military elites, such as the architectural landscape of medieval Cairo, which is dominated by *maydans* (riding grounds), hippodromes, and stable palaces (Carayon 2022). The game was immensely popular for training for war, and for leisure, with the modern



Figure 3. Knights jousting, from a manuscript dated c. 1445–1450. London, British Library, Harley 4205, fol. 24.

game developed in India (see Chandra, this volume), which diffused via colonialism to England, and then to the Americas in the 19th century, eventually featuring in two Olympic Games (Parrish 2018). The game has continued wide participation in nearly 80 countries around the world, from amateur to professional tournaments, played both in the arena and on grass, with women and men of all ages participating (Laffaye 2009).

Badger and Dawson (2022) trace the game of polocrosse to the Roman *tzykanion*, an equestrian game that included a ball and rackets among its equipment. The game was practised in ancient Rome and survived into twelfth century Byzantium, where it was, alongside horse racing, the prerogative of the Factions. They believe that the game disappeared after the Fourth Crusade in 1204, to experience a spectacular comeback in the 1930s. Captain Waldene Edgar Bredin, a descendant of the Irish gentry, who had served with the Royal Irish Regiment in the First World War and became the head of the National School of Equitation on the outskirts of London later. The first game of polocrosse was attested in 1932, and it was viewed as an exercise for amusing children and giving them exercise with their ponies. After the Second World War, references to polocrosse petered out in Britain, but the game became popular in Australia, where it grew in popularity to return

to Britain in the 1940s (Badger and Dawson 2022). Dawson, based on his experience of reconstructing medieval combat practices using experimental archaeology methods, argues that a trained polocrosse or polo horse is an asset in fighting on horseback (Badger and Dawson 2022). Another Byzantine sport that constituted an exercise for soldiers was javelin or dart games, a descendant of the Roman *hippika gymnasia*, which survives today as the modern Turkish sport of *jirid* (Dawson 2009). This confirms the hypothesis that the game of *tzykanion*, like many other pre-modern sports, was originally conceived as military practice.

Mounted archery is both a sport and a historical military practice (see Bühler, this volume). It has been practised by numerous nomadic and post-nomadic ethnic groups, including the Mamluks (Carayon 2022), the Hungarians (Berthon et al. 2021), the Mongolians and many others. Revived as a competitive sport today, it has its own national and international associations; the British Horseback Archery Association has published a comprehensive handbook of the sport outlining the rules, as well as providing some historical background (Sawyer and Sawyer 2020).

Like mounted archery, jousting is a medieval sport that has experienced an unexpected comeback. Jousting first developed as an occasion for knights to practise their

combat skills on horseback (Figure 3). Mock cavalry battles, known as *mêlées*, started in France in the eleventh century (Gassman 2014). Practice battles held before the Emperor were standard in the middle period of the Byzantine Empire, and, according to Dawson (2009:28), may have contributed to the evolution of tournaments in Europe, who notes that “one of the earliest recorded tournaments was an encounter at Antioch between members of the imperial court and Franco-Norman retinue of the ruler of the Crusader Principality of Antioch, in 1137”. Initially, no specialist equipment was required, but hollow lances, which would shatter spectacularly once engaged, became the norm by the fourteenth century. Jousting with sharp weapons, known as joust à outrance, to the utmost, as opposed to jousting à plaisance (for pleasure) with courtesy weapons was still practised, though it was less common. By the Renaissance period, however, jousting had developed into a popular sport and source of public entertainment, with special equipment (armour and lances) designed to meet the demands of security of both the horse and rider (Barber and Barker 1989; Fallows 2011; Murray and Watts 2020). Some jousts were even built around the theme of a quest or an adventure (*pas-d’armes*). Noel Fallows (2011), in *Jousting in Medieval and Renaissance Iberia*, argues that, by the fifteenth century, the set of rules and special equipment made jousting remote enough from the actual military to qualify as a sport.

The nineteenth century was characterised by romantic revival, with all things medieval coming into fashion. In this context, a mock-medieval tournament was staged at Eglinton Castle in Ayrshire, Scotland (Holder 2021). The organiser was Archibald Montgomerie, 13th Earl of Eglinton, at whose estate the event took place. The costs of participating in the event were considerable, and only 13 joustiers were able to meet them. It is likely that prohibitively high costs, which involved armour, weapons, horse armour and costumes for the pages and men-at-arms, prevented the tournament from becoming a regular sporting event, as has been envisaged originally. Thus, it has been estimated that Viscount Glenlyn, George Murray, competing as “Knight of the Gael,” spent the equivalent of £90,000 in today’s money on the equipment for himself and his company. Albeit the weather interfered, with a violent storm on the second day out of four meaning there was to be no jousts on that day, the event was still a success, with an estimated 100,000 people coming to watch it during the three days when it was run (Holder 2021; Girouard 1981).

While the Eglinton tournament did not lead to the establishment of regular sporting events, the re-enactment movement of the twentieth century led to the establishment of several organisations staging jousts and tournaments, such as the International Jousting League and the International Jousting Association. American-style jousting is practised by the Knights of Mayhem, whose

style is showy and more oriented towards entertaining its audience. An opposite tendency is demonstrated in the historical solid lance jousting movement, where the annual jousts are conducted with solid lances complete with metal tips. The lance shafts are dried for a year to ensure they would snap if stuck.

Equestrian vaulting could have started as soon as early riders gained enough familiarity on horseback. Vaulting as entertainment has been recorded in both the ancient and medieval Mediterranean (Stamouli 2022), while its value as military training is mentioned by both Dom Duarte and Pietro Monte in fifteenth-century Portugal and sixteenth-century Spain, respectively (Forgeng 2016; Monte 2018). In the early modern period, equestrian vaulting became an art that was prerequisite for every accomplished gentleman (Stokes 1641). Duarte likewise proposed other horseback activities that could be practised as preparation for war, but also as a sport, including the throwing of the javelin on horseback (Forgeng 2016). Both Duarte and Monte also refer to wrestling on horseback, which was clearly performed as a competitive activity, but which could be useful on the battlefield (Forgeng 2016, 2018). Horseback wrestling is still common as part of national games across Asian countries, including Turkey, Kyrgyzstan (known there as *Er Enish* or *Oodarysh*), Kazakhstan and Mongolia (Tuzcuoğullari and İskender 2017).

Dressage, or riding a horse in figures and performing exercises of varying complexity, is an ancient art. References to riding in an aesthetically pleasant way are found all the way to the ancient authors, most notably Xenophon. In the Middle Ages, Dom Duarte gave advice to riders who wanted to look good in the saddle (Forgeng 2016), while in Arabic culture, in the *furusiyya* treatises, when discussing riding and fighting on horseback, likewise provided tips on looking good before the ruler (Bashir 2008). Jennifer Jobst (2020) explored how riding manoeuvres that emphasised elegance and skill in the saddle developed into the art of manege riding in the sixteenth century. In the early modern period, riding before a prince became an art, with airs on the ground and airs above the ground designed to win the favour of patrons and advance one’s career (de Lugny 2019). These performances were often orchestrated, producing veritable ‘ballets’ (Ravehofer 2015).

The histories of show-jumping and eventing, companions of dressage in the modern Olympic Games, are relatively less researched. Having emerged from the practice of hunting, where the hunters had to jump over hedges, fences and ditches, and cavalry training, it branched out into eventing, which takes place in simulated natural surroundings, and show-jumping, which takes place in the



Figure 4. Kyrgyz stamp featuring an Oodarysh contest.

arena. However, the activity of jumping on horseback is much older. For instance, there are references to show-jumping in Smithfield in the Middle Ages. Smithfield was a major English horse market in the medieval and early modern periods, and, according to Hyland (1996), jumping, as well as racing, could have taken place to show the horse to potential buyers (Clark 2004). Likewise, Dom Duarte refers to staying in the saddle while jumping – something that would have been of use in military situations and while hunting (Forgeng 2016). Equestrian sports became a part of the Olympics in 1912, first as a military test and later as a trio of events of show jumping, eventing, and dressage (The Olympic Study Centre 2023).

Para dressage is the only equestrian sport included in the Paralympic Games. The first disabled rider to compete in the Olympic Games was Liz Hartel, a rider with poliomyelitis, who won a silver medal in the Helsinki Games in 1952, competing with able-bodied riders. In 1953, Pony Riding for the Disabled Trust was founded in the UK – an organisation that provided disabled people with an opportunity to ride (Ropa and Malahova 2021). In 2006, para dressage and para driving were recognized by the FEI (Fédération Equestre Internationale). The FEI, or International Federation for Equestrian Sports, oversees six disciplines of horse sport: dressage and para dressage, driving and para driving, endurance, eventing, jumping, vaulting, and reining (<https://www.fei.org/>).

Most of the modern equestrian sports have a long history. They started off as practical training exercises for the purposes of warfare, hunting, messenger services, and working with other animals, particularly cattle. Today, many of these traditional occupations became obsolete, as machines have taken the place of cavalry and information can be transmitted via email and post rather than through

a mounted messenger. At the same time, certain equestrian sports were losing connection with their original, practical employment already in the previous centuries. For instance, by the sixteenth century jousting became different from mounted warfare, necessitating distinct sets of armour as well as purpose-trained horses (Barber and Barker 1989; Fallows 2011). Likewise, the *palio* races of Renaissance Italy had nothing to do with training horses and riders for messenger service but were a matter of pride and prestige for Italian magnates (Jaser 2020). Today, equestrian sports are practised in professional, recreational and health-promotion contexts (e.g., riding for the disabled), but also as part of cultural traditions. Mounted archery is traditional in many cultures, including Hungary, Iran, Mongolia, and Japan, where it is cultivated as part of the nation's cultural heritage.

This brief and selective overview leaves out such important disciplines as western riding, endurance, tent pegging, other Indigenous mounted sports in the Americas, and around the world, and many more. The histories of some of them are yet to be written, yet it is important to bear in mind that pinning down the exact point when training for performing a service with a horse becomes a sport is extremely challenging. The existence of codified rules and purpose-made equipment can provide a clue, though, but it is also true that many sports also originated with a ritual or ceremonial purpose – the prime example being the Olympic Games. In this case, trying to make a clear-cut distinction between training for a purpose, horse-related activity in a ritual setting, and pure sport can be artificial and even counter-productive. Overall, the knowledge of sport history is an important part of ensuring the preservation and development of equestrian sports, which can also help to enhance its appreciation among the public.

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Horses as Cultural Heritage: The Cretan Horse

Vera Klontza-Jaklova

Probably none of us would connect the island of Crete with horses. Bronze Age Minoan civilisation or tourist resorts are more likely to be the first associations. However, Crete has developed a specific breed of horse, which is, in the literature, referred to as the Cretan Horse or Messara Horse (after the eponymous plain in the south of the island), and which the locals call the *Yorgalidiko* horse. The example of the Cretan Horse is intended to illustrate why the domestic horse (i.e., virtually the entire horse population living on earth) should be understood as cultural heritage, a cultural animal, and as a historical source.

The Cretan Horse and its Specifics

Breed Description

The Cretan Horse (Figure 1) is a small, pony-sized horse breed (Table 1). It has a rough, “wild-horse-like” head, which is rather heavy and wedge-shaped. Small ears, lively eyes, narrow shoulders and chest are typical marks of this breed. The back is shallow (straight) and the torso (ribs) narrow, features that also occur in many other less intensively bred and ridden horse types. The overall body shape is rather rectangular, with long and slim legs. The hoof is hard but small, usually black or dark grey. The body shape is similar to that of Arabic breeds. The mane is typically thick, while the high-rooted tail is thin. The raised tail when running is also characteristic. The hindquarters are rounded and strong. Coat colours range widely, but dark bay to smoky black, or black, are very common; grey to blue roan horses can also be seen. There are some chestnut tones too, but dun, palomino, and tobiano are not recorded. Some individuals have a dark dorsal stripe. The horse is sure-footed and has plenty of stamina, able to pace steadily over long distances in rugged and extreme terrains (Klontza-Jaklova et al. 2023; 2024a, b, including detailed bibliographies for each aspect of the breed).

Cretan Horses are natural pacers (Figure 2). The local breeders were aware of this specific trait and created terms for each gait, which have remained part of the Cretan dialect. The light trot is *παχβάν* [rakhvan], meaning pacing; the word has a Turkish origin. The pace reaching up to about 20 km/h is called *ταχτάνι* [takhtani]. Again, this is a Turkish word, meaning a wooden board, probably describing a smooth movement that is comfortable for the rider. The fastest gait – *δυνατά ζάλα* [dynata zala], meaning strong steps – is a flying amble with a speed of about 30 km/h or higher (Klontza-Jaklova et al. 2023).

The pacing ability is one of the criteria used by local owners to identify purebreds. This gait is determined by a mutation in the *DMRT3* gene. It is a permissive gene which means an individual must be homozygous to be a pacer. While investigated for well-known gaited breeds such as the Icelandic Horse, there are no genetic studies of the *DMRT3* gene in the

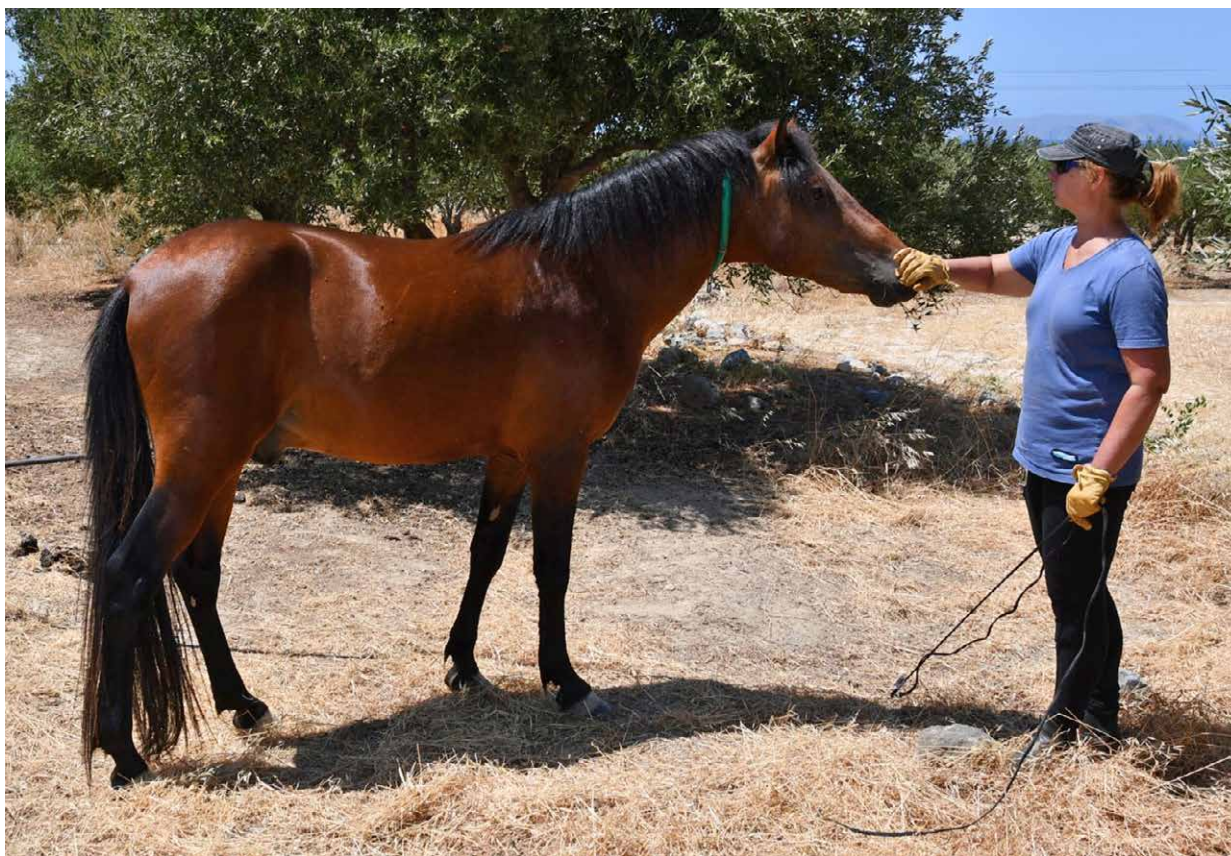


Figure 1. Typical Cretan Horse with V. Klontza-Jaklova: Herakles, stallion, 5 years old, Kokkini Chani, dist. Heraklion, owner: Manolis Chatzis. Photo: M. Chatzis.



Figure 2. Six months old female foal pacing (Vayia, Kentri, dist. Ierapetra, owner: Michalis Genniatakis), Photo: V. Klontza-Jaklova.

Cretan horse, but long-term breeding efforts to eliminate the individuals who are not pacers or do not produce pacers from breeding stock, suggest that the Cretan Horse is homozygous for the ‘Gait keeper’ mutation (Kristjansson et al. 2014; McCoy et al. 2019). Such gaits (pacing, ambling) are comfortable for riders, and the horse can maintain these for long periods of time. They seem to be suitable for rough and difficult stony terrains, but they can also be used for pulling a carriage.

History of Horse Breeding in Crete

The history of the appearance, breeding, and use of horses, alongside reconstructions of the development of the relationship between humans and horses, is essential for understanding the current relationships people have with horses. This chapter aims to summarise the information on horses and human society in Crete from early prehistory to the Early Modern Period. Evaluating when horses first appeared on the island is challenging, as is discerning what types of horses were present, what precise roles they had in society, economy and cosmology, and how the breeders were approaching the users’ needs. To reconstruct this complex picture over such a long time span, we use archaeological finds such as animal bones, horse depictions, harness and

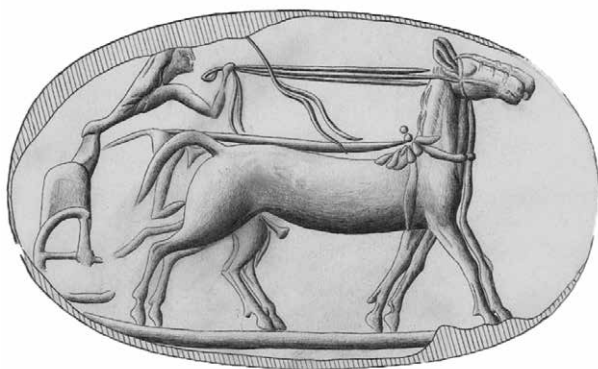


Figure 3. Chariot pulled by two horses: drawing of a sealing ring imprint in clay, size: 3x1,85cm, found in Sklavokampos (Platon 2016: II.6, 260).



Figure 4. Knossos, Horse and foal tablet (Ca895). First Line: Horses; five mares, four (full-grown) horses, x foals. Second line: Asses: three females, two foals, four males (Ventris and Chadwick 1973).

other equipment related to horses, architecture (stables, hippodromes) and written sources for historical periods (Neils 2022:29–31). However, the picture is fragmentary, and the available sources are not a simple 1:1 mirror. Iconography, written, archaeological and osteological evidence must be evaluated contextually by considering the factors which played a role in depicting a horse or placing their remains within a particular context. When evaluating iconography, many factors – such as symbolism, the target group of spectators, etc. – could play a role and must be taken into account. The osteological evidence is limited by the scarcity of horse remains in domestic refuse and small number of horse burials.

Equidae bones are rare in Crete, suggesting that horses, mules, and donkeys were rarely eaten on the island. *Equidae* were present on Crete as early as the Late Neolithic (4000–3300 BCE); however, it is likely that, until the Late Bronze Age (1750–1000 BCE.), these were exclusively donkeys.¹ This fits the context of the wider

1 In many cases, due to the significant fragmentation of the bones, it was not possible to distinguish horse and donkey bones. Earlier research could not separate horse and donkey skeletons at all.

Withers height	Up to 148cm for males, up to 134cm for females
Colour	Any, but palomino, dun, and tobiano not recorded
Head	Wedge-shaped
Ears	Small
Shoulders	Narrow
Torso/ribs	Short, roof-like shape in section
Back line	Straight, shallow
Hindquarters	Rounded and small
Legs	Dry, slim, with small joints
Hooves	Column-like, narrow
Tail	Poor, high rooted
Mane	Any
Dorsal stripe	Allowed
Origin (blood-horse)	Both parents

Table 1. The breed characteristics (after Klontza et al. 2023).

region. Domestic horses arrived in the Balkans and the Near East around 2000 BCE (Librado et al. 2021, 2024). In comparison to other animals, horse depictions are rare, even during all of the Bronze Age (3300–1000 BCE). Similarly, horse bones represent only a small proportion of animal bones from archaeological contexts in that period.

From the Neopalatial Period (1750–1470 BCE) onward (the beginning of the Late Bronze Age), horses begin to appear in elite contexts. During the following centuries (Final and Postpalatial Periods), finds related to horse culture become more frequent in both the iconographic and osteological records. The principal source of information are depictions of horses on objects from elite sites, mainly seals (Figure 3) associated with the centralised palace administration. Later, in the Mycenaean period (1450–1150 BCE), specialised characters for horses, stallions, mares, foals, donkeys and sleds appear in Linear B (Figure 4). Bones come mostly from refuse pits, but only in small numbers. Some exceptional depositions can be interpreted as ritual burials of horses (e.g., Archanes, Knossos).

The appearance of horses in Crete chronologically matches the spread of horses from the western steppes into the European continent (Anthony 2018; Librado et al. 2021, 2024). The rise of equine evidence during the Late Bronze Age supports the assumption that horses were an important part of the so-called elite package for palatial aristocracy. An analogous situation existed in the Near East, in the Hittite Empire and in Egypt (Recht 2022), but also in the Eastern Asian steppes (Taylor et al. 2017). The Aegean region belonged to the Near Eastern cultural circle. As in other regions, horses were an attribute of the warrior class in Iron Age Crete.

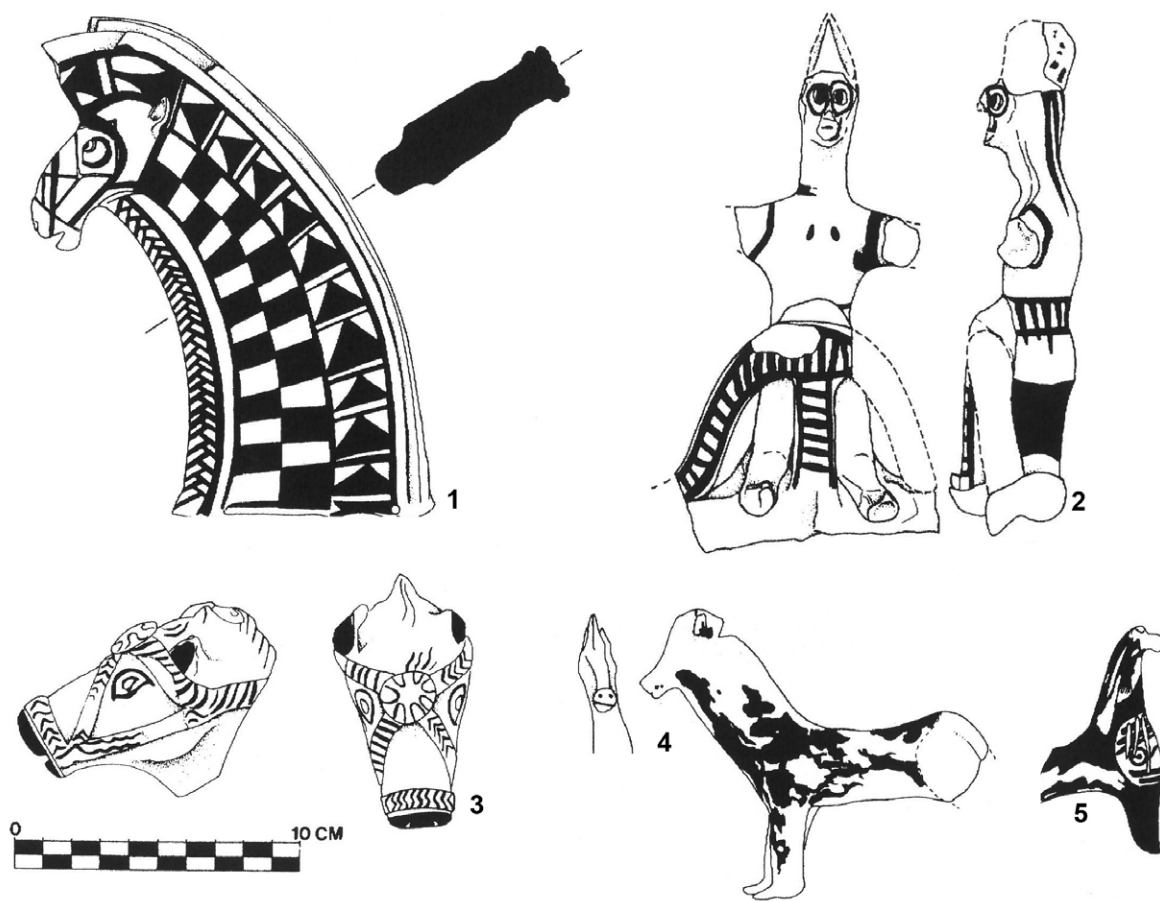


Figure 5. Clay horse figurines (*Vrokastro*): 1: Painted lid handle, 2: Painted figure of a charioteer, 3: Horse head, 4: Painted horse torso, 5: Painted horse torso (after Hayden 1991: Figures 10,11).

Greek *poleis* arose during this period, and in some, an equestrian class appeared. The ability to handle horses became part of ruling class knowledge. This can also be observed in Crete, where the number of depictions and finds of skeletal remains increased during that time. At Pressos, for example, horses (and dogs) were buried together with their owners. Bronze and ceramic horse figurines are very common (Figures 5, 6) and the temple relief at the Prinias site is also very representative (Figure 7). Horses are a fairly common motif depicted on painted and relief pottery from the late 7th to the 3rd century BCE (Figure 8). The finds clearly show that the horse was part of the elite culture, although it was not so widespread as in the mainland's ancient cities (Klontza-Jaklova et al. 2023). However, depictions of sporting events and finds of harness elements are missing from Crete. The same can be said for the Roman Period (1st century BCE–4th century AD), both Byzantine Periods (4th century–AD 824, and AD 961–1244), and the Emirate of Crete (AD 824–961). For the Late Antiquity, Byzantine and Arabic periods, we assume a professional interest in horses. They are periods when literature on horse breeding was produced (*Hippiatrika*, *Furussiya*) and horses were

an important part of the war machinery, but also of the racing business and as symbols of prestige. These sources are absent from Crete, however.

Unfortunately, we do not know what the horses used on the island looked like in the past. Iconographic representations are not very eloquent in this regard, and osteological analyses dealing with the height and robustness of horses are scarce. The few published data suggest that horses were several centimetres smaller than their contemporary descendants. Wall-Crowther (Coldstream et al. 1996:707) gives 133.67cm and 132.97cm withers heights for two analysed individuals dated to Early Iron Age (early first millennium BCE) Knossos, while Harris (2014:184) estimates a height of 131cm for an individual found in Chania and dated to the Late Bronze Age.

From the medieval period, we lack the osteological material due to the traditionally narrow focus of archaeology in Crete on the Minoan Bronze Age and classical antiquity, so we have to rely on iconography and written sources only. The evidence indicates that at least the elite and the learned people of the Venetian period (AD 1204–1669) were part of the horse culture of Europe; representations of horses,



Figure 6. Bronze horse from Temple "B" at Kommos; length 13.3cm
Provenance and Copyrights holder: Heraklion Archaeological Museum, Hellenic Ministry of Culture and Sports-Hellenic Organization of Cultural Resources Development-HOCD, Catalogue number: AMH X4511; Permission number 254670/06-06-2022; Photo: V. Klontza-Jaklova).

preserved mainly in manuscripts, correspond to the types of horses bred in Europe at the time. These are already larger horses of the Spanish and Italian types (Figure 9). Depictions of horses, for example, on icons and walls in churches, reflect the artistic style of the time, but nevertheless it can be stated that in rural churches, decorated by local artists, the horses depicted were mostly smaller, graceful horses (Figure 10).

At last, during the 18th and 19th centuries, a horse type specific to Crete is mentioned by international travellers. Tournefort in 1701 and Sonini in 1778 described the Cretan horse as a Berber horse with a very distinctive body type. Sonini gives a detailed description, saying that the local horse moves effortlessly and is flexible and sure-footed in rugged terrain (Tournefort 1717; Sonini 1801). In 1895, the Ottoman administration of Crete forbade horse export and cross-breeding since it was considered a specific breed, with a specific gait (*rahvan* or pace) which should be protected and preserved. Before 1895, the only information about horses on Crete we have are testimonies and scattered statistical data (Panagiotakis, n.d.).

Throughout the 20th century, equids were a common element in the Cretan countryside. Even very low-income

families owned a donkey. Middle-class farmers owned a few donkeys and a few mules. They liked mules for their ability to transverse extremely difficult terrains, their strength and obedience. However, to produce a mule, a horse mare is needed. Local priests were usually (highly) involved in horse breeding and frequently owned good mares or stallions; mule production was one source of their income. In more favourable areas, such as central Crete (Messara, Pediada, Heraklion districts), the Isthmus of Ierapetra, and the Chania region, horses were more common and systematically bred. From locals in East Crete, we learned that horse breeders travelled from village to village with a herd of horses of various ages and sexes, but mainly foals. Mule foals were also included. For example, horse traders who traditionally brought animals to Kritsa, one of the largest villages on the eastern part of the island, originated from Arkalochori in central Crete. The locals then would choose particular animals according to their needs and budgets. Note that even the pioneers of archaeological research in Crete, including women such as Edith Hall Dohan (Figure 11) and Harriet Boyd Hawes, used horses for their everyday needs of transportation. Until the 1960s, equines were in most cases

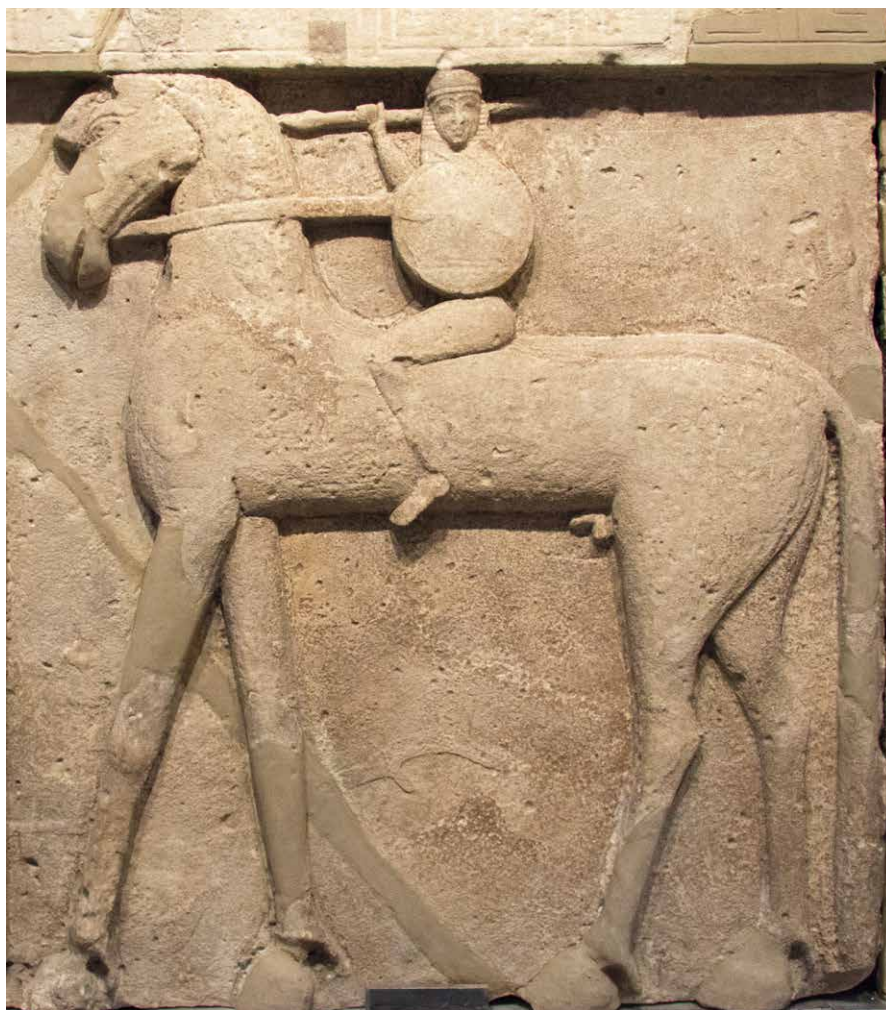


Figure 7. Part of frieze with horsemen from Temple A at Prinias, sculptures of the Daedalic period, 650–600 BCE (Archaeological Museum of Herakleion, https://commons.wikimedia.org/wiki/File:Frieze_with_horsemen,_Prinias,_650-600_BC,_AMH_Gamma_232,_145378.jpg, CC BY-SA 4.0).

the only means of transport. At the beginning of World War II, horses were requisitioned for the needs of the army and only a small number remained on the island.

In the 1960s, when tourism and motorised transportation began to conquer the island, people were keen to acquire the latest accoutrements of civilization, and horses, as a means of transportation and energy production, were abandoned. There were 329,000 horses in Greece in 1962, while in 1988 their numbers were radically reduced (complete statistics in Klontza-Jaklova et al. 2024a). With the industrial and tourist boom (1960–1980), many horses were sold to Italian butchers.

In 1985, the Veterinary Inspection of Crete (Επιθεώρηση Κτηνιατρικής Κρήτης) completed the first proper research on the Cretan Horse. Only eighty horses were documented across the island then. The breed's destiny remained in the hands of individual owners. Some owners provided exceptional stallions and mares for breeding at no cost in order to promote horse breeding. Nonetheless, Cretan Horses were also sold to other Greek regions, mainly to the

Peloponnese. In some cases, other breeds were traded as Cretan Horses (Klontza-Jakova et al. 2024).

A second census of Cretan Horses was undertaken by archaeologist and breeder Nikos Panagiotakis in February and March 1992. Ninety horses shared among 62 owners were documented across the island (Table 2, Figure 12). The list, along with a detailed letter, was sent to the General Directorate for animal production in the Ministry for Agriculture. These actions resulted in a presidential decree that accorded the Cretan Horse (and other Cretan animals such as Cretan cattle and the Cretan dog) the designation of “typical local breed”. This categorisation meant that breeders of Cretan Horses were entitled to a subsidy.²

At the same time, local ecologists established the Association for Cretan Fauna Protection. The major focus of its activities was the Cretan Horse although in recent times few projects have been undertaken. In 1987, N. Panagiotakis founded the Pancretan Association for the

² Currently, no subsidies are granted for local breeds.



Figure 8. Orthi Petra, Eleutherna: Amphora A92 (after Kotsonas 2008, Figure 71).



Figure 9. Typical horse of Georgios Klontzas (1535–1608) (after Paliouras and Klontzas 1977).

Protection and Rescue of Local Fauna (PAPRLF), a voluntary group also largely devoted to preserving and protecting the Cretan Horse, which was officially recognized by the Greek state as an association in 1993.

In 1994, PAPRLF sponsored a research project on Cretan Horses and the results were presented at the conference, “Conservation of the genetic material of agricultural animals” in Athens the following year. The main conclusion of that conference was that the majority of local agricultural animals

were close to extinction. This provided motivation for PAPRLF, which, on 11th June 1995, organised a show of Cretan Horses and other domestic animals in the Cretan capital Heraklion.

Finally, on 8th September 1997, an official agreement, setting up a Rare Livestock Support Program, was signed between the Ministry for Agriculture and the Ministry of Economics. This action was governed by the agro-environmental document 2078/92 of the European Community. However, problems in undertaking a census



Figure 10. Saint George on a white horse: Panagia Kera church, Kritsa, 14th century (Photo Vera Klontza-Jaklova).

of local livestock quickly became obvious. No studbook existed and horses were not officially documented. Many horse owners, and owners of other animal species, were drawn in by the financial support connected to the efforts of preserving local breeds. Many Cretan Horses “mysteriously” appeared at that time (Klontza-Jaklova et al. 2024a).

In the autumn of 1997, researchers of the Aristotle University of Thessaloniki, with substantial help from N. Panagiotakis, listed all horses declared by their owners to be Cretan and 133 horses were documented. Panagiotakis testified that many of the reported horses were not Cretan but rather Peloponnese imports. Following this, all horses were sampled for genetic analysis from blood and hair. In a

subsequent publication (Apostolidis et al. 2001), the results of around two dozen DNA samples were presented. How samples were chosen is not defined in the study. Genetic analyses were carried out using the RAPD test and the results showed that the Cretan Horse is a highly homogenous group differing from other Greek breeds which were also tested. However, the method is problematic, and the lack of information concerning the sampling choices reduced the value of the published research.³

3 A new genetic study is currently underway under the direction of the author using current methods in collaboration with internationally leading institutions.



Figure 11. Archaeologist Edith Hall Dohan (1877–1943) on a Cretan Horse (Muhly 2000:10, Figure 4).

The Present State of Breeding

Presently, the number of Cretan Horses is unknown. We estimate that there are about a hundred individuals. They are kept by private owners, who, with a few exceptions, usually have only one horse. There are a few associations but not all owners are organised anywhere and stay independent. Most of these owners have no training in horse keeping, transporting and breeding, or even riding, and many of them are first-generation owners. They are, however, indubitably dedicated to their horses. Their main ambition is to train a successful racehorse. Unfortunately, such an amateur or experimental approach is reflected in the state of the breed.

Horse races maintain a great degree of improvisation: a racecourse may be established on any suitable flat space, anyone can take part and dress is casual. No type of bridle, saddle, jersey or protective equipment is mandatory. Although helmets are mandatory now, these do not have to be of the equestrian type. There is one strict race rule: the horse must pace. If the gait is broken by a few steps of gallop, the horse and rider are disqualified from the race.

Any Cretan Horse is generally thought to be a pacer. Breeders know that they need to look for both parents to have such a natural gait, otherwise this ability is easily lost. A horse that does not pace is useless for racing and further breeding. Traditional breeders had knowledge of which stallions and mares produced pacers. In this way, heterozygote pacers were almost eliminated. But they also experimented with individuals of unknown origin

and numerous cases have been documented where unscrupulous traders imported horses from other Greek regions and sold them as Cretan.

Although breeding is neither organised nor properly documented, it is still possible to obtain a subsidy from the Greek Ministry or EU for local livestock protection. At present, any animal can be presented as a Cretan Horse to Ministry for Agriculture officials. A Studbook has not yet been established and owners do not keep written records of their horses' parentage. The breeding practice itself is straightforward and involves minimal handling. The owner introduces the mare to the chosen stallion and leaves both animals together for a few days. They are left free, and the copulation takes place without any assistance.

Buying and selling a horse is an individual operation between two owners. The prices run between 1500–2000 euros for a foal, and 3000–4000 euros for an adult horse. But the price depends on the owner's reputation and if the horse's parents (or at least one of them) are famous. There are also more and more owners who, under the pressure of the economic situation, are looking for quick solutions to get rid of excess horses they cannot take care of. Such desperate owners then sell the horses very cheaply, into unsuitable conditions, to inexperienced buyers. In extreme cases, the horses are neglected, abandoned or euthanized.

Cretan Horses are typically named from mythological references (e.g., Hera, Dias, Herakles, Odysseas), marine references (e.g., Kapetanios, Piratis, Koursaros⁴), and in some cases human names typical in Crete are used (e.g., Manos, Valentinos). Central documentation of horses and their owners is currently (again) underway. Each horse receives an identification chip. However, this is purely administrative. Horses are formally certified by the Ministry of Agriculture and some financial support is given, but there is no scientific examination to prove whether or not the declared individual is truly a pure-blood animal. Almost any horse may be presented to the state administration as a Cretan Horse. There was supposed to be a continuous recording practice but the documentation process slowly ground to a halt after 2013, when the state support ended due to the Greek financial crisis and the so-called Memorandum circumstances. Currently, equids in Greece are being documented by the regional authorities, but individual breeds are not distinguished.

Modern-day landscapes on Crete are less favourable to horses: extended olive groves, intensive fencing and greenhouses limit the space where horses can survive in a manner close to their natural conditions. Horses are often bound on an iron chain or thick rope on a collar, firmly fixed behind the ears and under the jaw with limited possibilities to move freely or to maintain necessary

4 Captain, Pirate, Corsair, respectively.

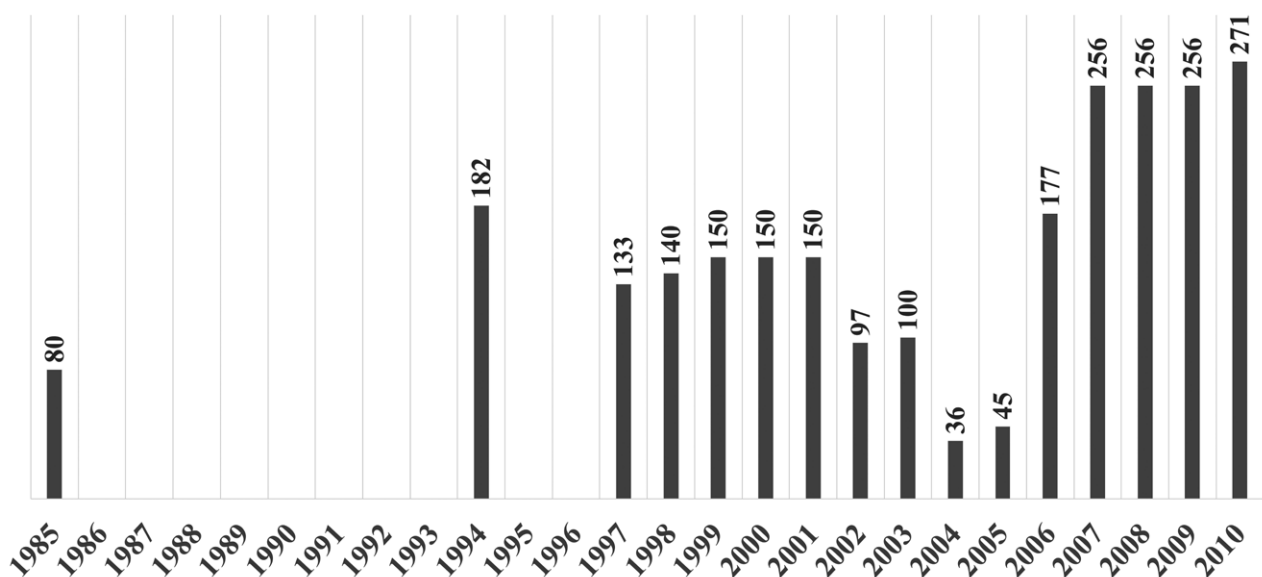


Figure 12. Maximum number of Cretan Horses through time.

	Equines	Cattle	Buffalo	Sheep	Goat	Pig	Fowl	Beehives	All animals	Horses vs. all animals (%)
1914	46,305	42,788	650	357,514	166,306	38,625	283,270	69,959	1,005,417	4.6
1929	56,148	45,411	350	239,682	166,773	28,992	245,829	42,881	826,066	6.8
1961	78,329	35,058	43	393,793	251,751	27,519	649,204	73,922	1,509,619	5.1
1971	67,553	20,550	0	571,602	306,158	49,495	1,158,561	86,647	2,260,566	2.9
1981	43,218	15,270	0	713,602	329,123	95,388	1,659,901	105,204	2,961,706	1.5
1991	21,470	2,669	0	1,113,435	457,941	62,959	1,349,801	110,720	3,118,995	0.7
2005	3,942	2,069	0	1,316,426	637,181	637,185	1,030,486	154,795	3,782,084	0.1

Table 2. Domestic livestock in Crete from 1914 to 2005 (after Arvanitis 2011).

social contacts. They eat what is within their reach, get various extra foodstuffs, and sometimes access to water is a problem. There are no meadows on Crete, and rare and expensive hay is mainly imported.

Modern equine welfare (Benedetti et al. 2023; Lempisple 2020) is guided by a number of principles that stem from the basic needs of the *Equus caballus*:

- Plenty of freedom of movement in the pasture, or at least enough hours spent in the paddock,
- Permanent access to food and water,
- Social contact within the herd,
- Veterinary care that includes regular check-ups, hoof care, vaccinations, dental care, parasite elimination, and
- Communication to promote trust and peace of mind for the horse (Romero 2022).

Cretan horses usually lack this type of care. The traditions of the past, when the people were aware of the labour value of the animals and were making an effort to maintain them as well as possible, are gone. When a family returned home from the fields, the first to be fed and watered were the animals. Families were highly dependent on their animals, including equids, for their ability to work hard. Saddles (*somari*) made from light wood, supported by soft woollen covers, were used to support the horses, but physical welfare of the animals could not always be prioritised. Older people tell stories about animals that ran away when they felt that the workload was too heavy. Donkeys were not bridled, but horses wore hefty bits resembling the various types of western bits (grazing, S-shank curb, correction, or Pelham-like bits). They were made from solid iron and heavy. Shank-bit bridles, often home-made without knowledge of the mechanics of their effect, are



Figure 13. Typical Cretan bit found in Kato Chorio, Ierapetra (Photo: Vera Klontza-Jaklova).

used nowadays. Based on my observation, the use of such bits is very often insensitive. The understanding of the function of the bit is limited. Users are not aware of the increase in force of the bit on the horse's jaw depending on the length of the shanks, etc. The usual result is a very nervous, hard-mouthed horse (Figure 13).

In Crete, the tradition of characteristic, typical equipment for horses and riders is missing or has been discontinued. Some descendants of the Cretan horse breeders keep unique specimens of old saddles at home. They have two separate panels on either side of the horse's back, held in place by an external cover (Figure 14). This arrangement is well suited to pacing horses, and the saddle flaps and seat resemble an English military saddle. The old Cretan saddles show the influence of the saddles that were used during the development of modern equestrianism in the early modern era (16th–18th centuries), i.e., the Venetian period in Crete. As far as we know, there is no one on the island today who continues the tradition of the old saddlers. Today's owners buy saddles of any type, often without proper knowledge of the principles of gentle horse saddling.

The Horse as Cultural and Historical Heritage

When researching the Cretan Horse, our starting point is archaeology, a holistic discipline employing all available methods and scientific techniques to decode the dialectics of our past. Horses reflect the needs of humans in different periods and different regions, as well as the environment that shapes them and vice versa. In Crete, this relationship between people and their environments was in equilibrium for a long period.

Therefore, horses and equestrian culture in Crete provide unique insight into a complex system of island nature, culture, and history. The horse, then, has to be approached as a part of cultural heritage, especially when facing the danger of extinction. For the Cretan Horse, its rescue signifies saving more than just one element of the island's biodiversity: the history of the island is closely tied to the horse and the Cretan Horse in particular. Their body shape, abilities, and genetic heritage mirror past cultural and natural developments; and there are well-known examples of loop feedback mechanisms linking landscapes and horse culture. This was noted by UNESCO experts in 2019 when they declared the cultural landscape of Kladruby nad Labem in the Czech Republic with its indigenous horse breed (the Kladruher horse) to be a World Heritage. As Crete is subject to the pressures of the Anthropocene, the Cretan Horse may be destined to only survive as a zoo animal outside as it is not possible to breed the Cretan Horse outside of its natural habitat. Therefore, its preservation is interlinked with the preservation of the Cretan natural and cultural landscape.

Conclusions

From the above, it can be postulated that the Cretan Horse (or any horse breed) is something like a "time capsule" containing diachronic information about human needs for labour, transportation, warfare, and self-representation. The Cretan Horse is a specific breed, and it is very close to extinction. The main problems hindering the development of the breed are the fragmentation and anarchy of breeding: the individual selection criteria of private breeders, small scale breeding, crossbreeding with various other breeds, and



Figure 14. Typical saddle used by riders nowadays (Photo: Vera Klontza-Jaklova).



Figure 15. Author's clinics on natural communication tools (Kato Chorio, summer 2022, Photo: G. Tomadakis).

the lack of documentation. Perhaps even more problematic are the conditions in which these horses are bred, kept and trained. The current way of breeding is partly a remnant of the traditional way of farming, which has largely been interrupted by the expansion of tourism, and the abandonment of traditional agriculture in favour of olive monoculture creating landscapes unfavourable for horse breeding.

The care given to horses and hybrids on Crete cannot be compared to modern-day welfare standards. Most Cretan

Horses are outdoors year-round, but their usual living space is a circle outlined by a rope tied around their neck at the level of the first and second vertebrae. The horses are often tethered in isolation so they can only see or be aware of each other but have no physical contact. Crete is rich in vegetation and in such conditions the horses usually have access to grazing, but this is generally decimated very quickly. An all-too-common picture is of a horse with rope abrasions, standing in its own excrement, without food or

drink. Keepers normally feed and provide water twice a day. The rest of the day the horse is usually left without the opportunity to relax by even just sniffing some hay. An alternative is to enclose the horse in a small stable for the entire day. It is fed on straw, dried clover and various pellets. The owners may also supplement, at their discretion, with kernels, beet pulp, but also, for example, corn. Daily manure collection is not a common practice. The horse is usually alone all day. Contact with both other horses and humans is very limited. Another practical problem is hoof care. The prevailing, and incorrect, opinion is that the hoof must be high because it is less prone to damage. This results in tall, columnar hooves. Such hooves quickly develop podotrochlosis (or Navicular Syndrome) and other painful deformities (author's observation). Local grooms and farriers are usually self-taught, or people who have learned from someone else; there is no school or other certified facility.

Given that the Greek state has recognised the Cretan Horse as belonging to a specific local fauna, some systematic support could be expected. After several partial attempts, the state has finally recognized the local breeds in the context of the difficult economic situation of the second decade of the 21st century. For all these reasons the author initiated and established the Cretan Horse Research, Rescue and Horsemanship Center, a non-profit organisation,

which aims to study the history of horse breeding in Crete, specifically to help current breeders with both practical problems and their education (Figure 15). It also includes a stable and an asylum for abandoned horses. This initiative is fully funded by non-state resources.

Conclusions on Current Status

Contemporary Cretans see the Cretan Horse as part of their specific culture, as an integral element of rural life. Such awareness is essential for further activities related to preserving and developing this local breed on the island. Despite disruptions to breeding traditions (caused by industrialisation, the boom of motorisation and tourism, especially in the 1960s and 1980s), the lack of state intervention and a clear concept, and the enormous economic pressures, promising animals are still being bred on the island. Owners are trying to organise themselves to hold joint meetings. The CHRRHC mentioned above has been set up. Apart from specific initiatives (clinics, seminars, support for breeders), awareness is also being raised among the international hippological community about this horse with its exceptional temperament and endurance. There is, therefore, hope that the breeding of the Cretan Horse can not only be maintained but also developed based on the most modern principles of welfare and top scientific hippiatric knowledge.

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