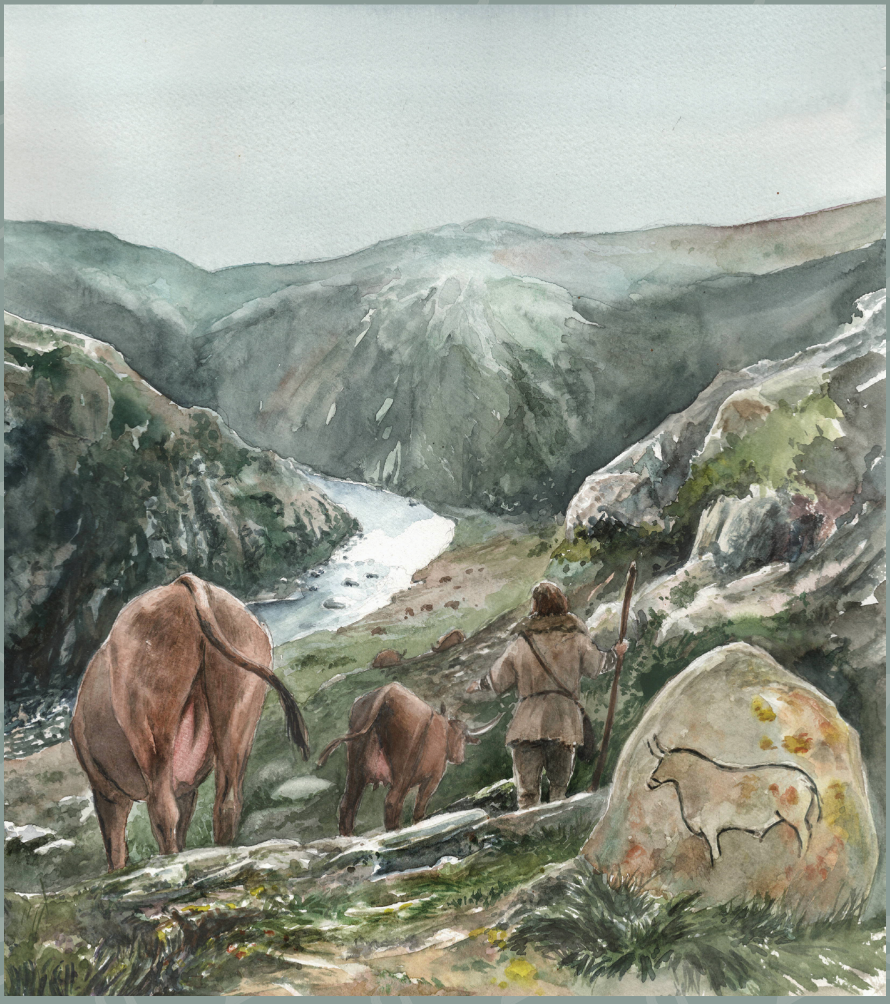
Archaeobiology 4

Cattle and People

Interdisciplinary Approaches to an Ancient Relationship

edited by Elizabeth Wright and Catarina Ginja



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Archaeobiology

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Sarah Whitcher Kansa
Justin Lev-Tov

Number 4

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PREFACE

We set out on the road that led us to this book in 2018, when we decided to organize a session at the International Council for Archaeozoology meeting in Ankara, entitled "Understanding Cattle-Human Interactions: Interdisciplinary Approaches to an Ancient Relationship." We had both been working on ancient cattle for much of our careers, although with different methodological approaches, one of us being a geneticist and the other a zooarchaeologist, and we saw this as a great opportunity to bring together colleagues working on past cattle-human interactions using a variety of different techniques.

The session had a fairly wide geographical and temporal scope, although the majority of papers were focused on Europe, and almost all covered the (relatively short) time span from the Neolithic to the Roman period. All of the contributors to the session were invited to submit a paper for the edited volume, but additionally we approached a number of other colleagues in order to try to fill gaps in our coverage. In particular we wanted to include some more chapters on the aurochs and early human-cattle interactions, as well as some from the continent of Africa. The result is that approximately half of the final version of the volume is made up of papers from contributors to the conference session, with the other half from new ones; a balance that we are actually quite pleased with. There are, of course, still some gaps in time and geography, which is frustrating but relatively unavoidable in a volume of this kind.

During the editing process we tried to constantly have in mind the representation of women, early career researchers, and colleagues from the Global South, and it became clear (unsurprisingly) that a truly intersectional and decolonized volume is incredibly difficult to achieve (also bearing in mind that we are both white women based at European institutions). A number of potential contributors that we approached representing areas or profiles that are underrepresented in archaeology were unable to contribute, or had to withdraw from the process for various reasons. Added to this is the precarious situation that many of us find ourselves in. A number of potential contributors could not be involved because they had no income for their archaeological work, or needed to instead dedicate their time to highly sought after high-impact papers and grant applications in order to have a chance of finding employment in the longer term. These issues also affected us as editors—both of us undertook this work while on fixed term contracts, one of us moved institutions twice during the lifetime of the book and the other spent most of this time struggling for her contract to be renewed. These are by no means new issues in archaeology and archaeogenetics, but we do feel that it is important to reflect on the atmosphere in which we are working. At the moment archaeology is facing a particular crisis, in that academic departments are facing increased threats of closure.

In the end our attempts to include a wider variety of contributors did mean that it took longer to deliver the book than we had hoped, and also that ultimately the volume does not have the wide-ranging coverage we would have liked. One might argue that this was therefore a failed approach, but there were many successes: all but two of the papers in the book have at least one female author, and a notable proportion of the papers were written by early career researchers without permanent academic positions. (It is not unsurprising to us that there may be a correlation between these two things, as men tend to occupy most permanent professorships the world over.) Although most of the papers are still Europe-focused, there are a number of contributions representing other areas of the world including northeastern Africa, Zimbabwe, China, Mongolia, and India, and although we would have liked even more areas to be included, we are fairly happy with this achievement.

After we started work on the book, the global Covid-19 pandemic hit. This of course provided a number of challenges to the completion of the volume; care-giving responsibilities increased, particularly for women, and the situation became even more precarious for early career researchers, but it also highlighted to us the importance of our work on the relationship between humans and animals in the past. It is so vitally important to have a better understanding of the process that has led us to this place, and we hope that these papers will help us to do that.

While working on this project each of us lost a parent. Fiona Wright and Jorge Ginja, this volume is dedicated to you.

Lizzie Wright and Catarina Ginja

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The editors would like to thank Sarah Kansa and Justin Lev-Tov for their patience and advice while we were working on this volume, and to Idoia Grau-Sologestoa and Umberto Albarella for their advice at various stages of the project. Thanks also go to Gwilym Lawrence and Joe Edwardes-Evans for their English language editing of a number of the papers, and to Pedro Salvador Mendes for the wonderful illustrations representing each of the sections of the book. Special thanks also go to Simon Davis for writing the Foreword.

The editing of this book was supported by funding from the Portuguese FCT-Fundação para a Ciência e a Tecnologia (project UIDB/50027/2020, Catarina Ginja); through the Project grant LEAP-AGRI 326 LEAPAgri/0003/2017 – OPTIBOV (Catarina Ginja); and through a European Commission Marie Skłodowska-Curie European Fellowship (Elizabeth Wright 2018–2020, grant no. 792076).

Much of the preparation of this book took place during the global Covid-19 pandemic, which of course added extra challenges to the process, and to the lives of all of our contributors. We are very grateful to all of the contributors, reviewers, our book series editors, and the publisher for bearing with us through this crazy time.

FOREWORD

From *Bos primigenius* to the Durham Ox: Some of the Things We Have Done to *Bos*

Simon Davis

Bos primigenius, the aurochs or wild cattle, a very large and no doubt beautiful animal known to the Romans as the Urus, is now sadly extinct. The last one died in eighteenth century Poland. It was supposedly descended from the north Indian *B. planifrons*, which probably first appeared some two million years ago (Auguste and Patou-Mathis 1994). However, around eight or ten thousand years ago, probably in the Near East, the aurochs was domesticated by Neolithic people. Whether this event happened only once or was repeated independently in other places remains one of the great enigmas confronting aficionados of the bovine world. Another wild bovine, *Bos primigenius namadicus*, also descended from *Bos planifrons*, once inhabited India and was the ancestor of the humped Indian zebu.

Today cattle (domestic aurochs) are one of our most important farm animals—they provide us with milk, meat, fat, and dung. Moreover, they have for long been an important source of power both for transport and plowing, not to mention their bones, horns, and skin used for making various kinds of instruments and clothing. There are well over a billion cattle worldwide and according to the FAO commission on genetic resources assessment (FAO, 2015) these form over 1,000 breeds.

Zooarchaeologists ask not only when and where aurochs were first domesticated, but once domesticated, how they were spread across the globe. In Europe and the Near East at least, the possibility that these early domesticated animals may have crossed, purposefully or accidentally, with local aurochs makes archaeogenetical studies all the more complicated.

In this book edited by Catarina Ginja and Elizabeth Wright the reader will find much food for thought. Topics like the dwarf Sicilian aurochs, the south to north size increase of European aurochs in accordance with Bergmann's rule, the presence of these animals right across North Africa during the last Ice Age, are just some subjects that the reader may discover concerning the wild form of *Bos.* The especial treatment these animals received in central Anatolia in Neolithic times and genetical evidence for an African ancestry in our modern European cattle are also discussed.

Their domestication and subsequent evolution and even ritual practices form the subjects of many of the chapters. Mongolian and Chinese cattle are also considered. In Africa it seems cattle spread slowly from the north to the southern cape where they only appeared a mere 2,000 years ago!

Another area of investigation that is of great interest is the improvement of cattle in different places in the course of time. The Romans, for example, are often credited with improving cattle with substantial size increases being recognized in the archaeological record. But this long-held view is now being revised as more, and larger, samples of archaeological animal bones are studied. It seems that improvements may have preceded the Romans. Following a post-Roman decline in cattle stature, recovery occurred in many parts of Europe in medieval or postmedieval times. The late Eric Kerridge's (1967) suggestion that agricultural improvements in England happened much earlier than had been previously thought are corroborated here. One truly amazing giant was Charles Colling's famous "Durham ox" born in 1796 and which weighed well over 1,000 kg when it died.

There is much of interest in this collection of articles and it should prove a useful source for bovinophiles for many years to come!

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INTRODUCTION

People and Cattle: A Long History

Elizabeth Wright and Catarina Ginja†*

Introduction

Humans have a long history of interaction with cattle. Cattle have been hunted, domesticated, exploited for their meat and other products, and have had symbolic importance for many different human groups. Cattle domestication, which occurred approximately 10,000 years ago, alongside that of the pig (*Sus domesticus*), sheep (*Ovis aries*), and goat (*Capra hircus*) was a pivotal moment in human subsistence which saw a shift from foraging and hunting to agriculture—a process often referred to as the Neolithic revolution.

The history of our relationship with this animal is studied by people from many different research areas, including archaeology, history, genetics, and anthropology, and we now know an awful lot about the evolution of our relationship with this animal across time and space. A field in which a considerable amount of work focuses on this relationship is zooarchaeology—the study of animal remains from archaeological excavations. Zooarchaeologists collect data from ancient cattle bones and teeth, which provide information about how humans were interacting with them. Through this work we know that not only have cattle and their products been an important part of the human diet for hundreds of thousands of years, but also when and where they are likely to have been domesticated, the varied ways in which different communities have lived with and managed them, and the symbolic role that these animals may have played for many different people. It makes sense, then, that this volume was conceived at an international zooarchaeology conference where we were sharing our work on these animals from across of the world. The chapters in this volume highlight the important work that zooarchaeologists are doing on the history of the human-cattle relationship, as well as the valuable collaborations with other fields that enhance and contextualize our work. This introductory chapter provides a description of the different themes covered in this volume and considers how the papers published here are taking us forward in our quest to understand cattle and people in the past.

Earliest Cattle Interactions

It would not be right to have a book on human-cattle interactions without any chapters focusing on the aurochs (*Bos primigenius*), the wild ancestor of domestic cattle. This species was present across much of Europe, Asia, and Africa from the Middle Pleistocene onward, and was widely hunted by humans both before and after its domestication. It even continued to live in the wild in some areas of central and eastern Europe until relatively recently—AD 1647, when it finally became extinct. Chapter 1 of this volume (Wright) focuses on the presence and body size of this animal in Europe from its first appearance until the end of the Mesolithic period, and provides some background on its origins and taxonomy.

The aurochs clearly formed a part of the diet of humans during the Paleolithic and Mesolithic periods. Their remains are found in Europe at sites with

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Acheulean technology as far back as Marine Isotope Stage 16 (Pereira et al. 2015), but the nature of the relationship between humans and this animal at this time is still quite unclear, with question marks around when our hunting of the aurochs first began, as opposed to scavenging, for example. But the aurochs were not only important in terms of diet, it likely had a deeper meaning beyond this, as indicated by its regular appearance in European Paleolithic cave art (Sauvet and Wlodarczyk 2000). This is the topic of chapter 9, in which Carole Fritz et al. explore the potential symbolism behind these depictions.

Domestication

The domestication of cattle was revolutionary for human diet and economy, but also represents a transformation in human-cattle interactions. There were at least two independent domestications of cattle worldwide; one that led to the European humpless *Bos taurus*, which took place in the Near East approximately 10,000 years ago, and another that produced the humped zebu cattle (*Bos indicus*) of Asia and Africa, which took place on the Indian subcontinent a couple of millenia later (Chen et al. 2010; Loftus et al. 1994; Troy et al. 2001).

The ability to distinguish between the bones and teeth of wild and domestic cattle is key to our understanding of the domestication process; however, this is often not easy, due to an overlap in size between aurochs and domestic cattle, and few morphological differences. A large body of work has focused on this issue over the past 60 years or so, and in particular a study undertaken by Magnus Degerbøl (1963; Degerbøl and Fredskild 1970) on the Danish aurochs has formed an important baseline for this. In this work measurements from aurochs and domestic cattle from sites in Denmark were presented, and the difference between the wild and domestic forms as well as the sexual dimorphism in the wild form was clearly demonstrated.

Geneticists and archaeologists have worked together to explore cattle domestication, and our understanding of this complex process is now much clearer. Previous analysis of mitochondrial DNA retrieved from archaeological remains indicated that, following the primary domestication of cattle in Anatolia, their expansion toward Europe occurred without significant maternal interbreeding with local aurochs (Scheu et al. 2015). However, maternal lineages only tell us about half the story, and during the last decade there has been an enormous increase in genome-wide data available for domesticated animal species, including cattle (Frantz et al. 2020). Recently, a genome-wide study of cattle remains from the Near East revealed regional variation and admixture that could not be inferred simply by analyzing the genomes of extant cattle (Verdugo et al. 2019). These authors also reported that a widespread male-mediated zebu introgression was initiated in the Late Bronze Age about 4,200 years BP, much earlier than previously thought. The phenomenon was likely associated with climate change and is consistent with archaeological evidence for westward human migration. The affinity observed between ancient Levantine cattle and the single North African aurochs for which genomic data is available suggests a possible origin for African taurine cattle in the southern Fertile Crescent (Verdugo et al. 2019).

Several chapters in this volume present data on some of the earliest domestic cattle. In chapter 2 Emily Johnson et al. describe a case study from the early Neolithic European Linearbankeramik culture. In chapter 3, Joséphine Lesur describes some of the earliest evidence for cattle herding in northeastern Africa, and in chapter 4, Arati Deshpande-Mukherjee and Pankaj Goyal provide a case study of a potentially very early cattle-based economy predating the Indus Valley Civilization in northwestern South Asia. The various human groups described in these chapters were dealing with very different cultural and environmental conditions, yet they all chose cattle to be an important part of their economy—demonstrating the versatility, resilience, and reliability of this animal for many different uses in a wide variety of contexts.

Use of Secondary Products

Domestication allowed for a degree of control over livestock animals that meant they could be exploited more easily for certain products beyond their meat, and there is now clear evidence for the use of these so-called secondary products such as milk, dung, and labor shortly after the establishment of domestic cattle within human economies. In Europe, for example, dairy is now considered to have played an important part at many sites dated to the early Neolithic Linearbandkeramik culture (Gillis et al. 2017; Kovačiková et al. 2012). Cattle remains can give us some insights into the types of products that were used at different sites, and mortality profiles—built using information on bone fusion and tooth eruption and wear—are of particular use for this (e.g., Legge 1981). Chapter 2 (Johnson et al.) in this volume presents a case study from the Polish Linearbandkeramik site of Ludwinowo 7, which brings together butchery, fracture, and fragmentation analysis with mortality data, in order to provide a picture of consumption practices at this site.

Other types of evidence can also be used to explore for which products cattle were being used. In chapter 3, Lesur describes the early evidence for milk exploitation in northeastern Africa from the fifth millennium BC, which includes depictions in rock art, as well as pottery residue analysis. Similarly, in chapter 15, Tuvshinjargal Tumurbaatar and Cheryl Makarewicz show how Bronze Age petroglyphs in Mongolia have provided important evidence on the use of cattle and yak for riding and carrying loads, as part of herding activity.

Prehistoric Cattle Symbolism

In addition to forming an important part of the prehistoric economy in many communities, there is clear evidence that cattle had a deeper symbolic meaning to many human groups. In recent years these kinds of relationships have been increasingly studied, in part due to the growth of a newer strand of zooarchaeology dealing with social aspects of human societies, sometimes referred to as social zooarchaeology (see, e.g., Overton and Hamilakis 2013; Russell 2011). Ethnoarchaeology (or ethnozooarchaeology) has also been used to explore the potential symbolic meanings of animals in the past—and this is the approach taken by Plan Shenjere-Nyabezi in chapter 13.

In chapter 11, Nerissa Russell discusses the evidence for the relationship between humans and aurochs at Neolithic Çatalhöyük in central Anatolia. She argues that parallels in the way that the dead of both humans and aurochs were treated suggest that aurochs were considered ancestral to humans. Two chapters also discuss human-cattle symbolic relationships in Neolithic, Chalcolithic, and Bronze Age Iberia. In chapter 12, Corina Liesau et al. present a case study from the Spanish Chalcolithic site of Camiño de las Yeseras, where two particular bovine deposits seem to have been subject to special treatment, highlighting the symbolic importance of cattle for the local community and wider Chalcolithic Iberia. In chapter 10, António Carlos Valera concentrates on southern Portugal, and uses pictographic, material, and zooarchaeological evidence to argue that the symbolic role of cattle was transformed at the transition between the Chalcolithic and Bronze Age in this region.

In chapter 13 Shenjere-Nyabezi presents her ethnographic work with a number of groups in Manicaland, eastern Zimbabwe, highlighting a number of ritual uses of cattle related to many aspects of life, including marriage, death, appeasement, and chief installation. She discusses how these kinds of ritual activities must be taken into account in the interpretation of animal bone assemblages, and their relevance in particular to Iron Age Zimbabwe.

Improvement and Intensification

Over time people began to select for specific traits in their cattle and started using them for different purposes—the process that eventually led to the establishment of our modern-day breeds. Some of the classic evidence often cited for the beginning of this process in Europe is the introduction of larger cattle across the Roman Empire (Albarella et al. 2008; Breuer et al. 1999; Fremondeau et al. 2017; Groot 2017; Groot and Deschler-Erb 2015; Lauwerier 1988; Lepetz 1996; Pigiere 2017; Teichert 1984; Valenzuela-Lamas and Albarella 2017), although some recent work has suggested that some kind of selection or improvement may already have been happening during prehistory (Trentacoste et al. 2018; Wright 2021). The European Roman cattle were larger, and able to work longer and harder in the fields, but also provided more meat than earlier smaller cattle. Two papers in this book focus on this aspect. In chapter 5, Cleia Detry et al. lay out the current evidence for the appearance of larger cattle in newly founded cities and urban areas of Roman Lusitania (the area now occupied by modern day Portugal and western Spain). Colin Duval and Umberto Albarella (chapter 6) present a large body of Iron Age and Roman data from Britain, where this pattern has been long established, providing an in-depth study on the nature and pace of this change in different regions. This is a pattern that has only recently been established in that region, in contrast to the situation in other areas of the Empire, such as Britain.

The process of improvement continued to evolve, with increasing focus on more specific traits through time. This was not a linear process and varied according to geography, climate, and political context. Particular moments have seen surges in this activity, with one such moment being the transition between the late medieval and early modern eras in Britain which saw a transformation in farming practices often referred to as the British agricultural revolution (Davis 1997). This transition is the focus of chapter 7, in which Tamsyn Fraser and Idoia Grau-Sologestoa draw on a large dataset to trace the variations in change between urban, rural, and manorial sites.

Archaeogenetics studies have been of utmost importance to assert the independent domestication of taurine and indicine cattle (Pitt et al. 2019; Verdugo et al. 2019), but genomic analyses can also be incredibly useful to understand the modes of improvement and to describe some phenotypic traits of past animals (McHugo et al. 2019; Frantz et al. 2020). In chapter 8, Irene Ureña et al. present the results of a genomic study of well-documented cattle remains from the seventeenth century retrieved from silos in Carnide, Lisbon (Portugal), and provide clues on whether these cattle were improved locally (and for what purpose) or if, alternatively, new stock was introduced from elsewhere. In addition, consistency between the biological sex determination using osteometric and genomic methods further validated previous findings on the measurements that provide a good distinction between the sexes (Davis et al. 2012, 2018).

The social and political context of cattle selection and breeding in China is also laid out very well in chapter 14 by Katherine Brunson et al. Here the authors highlight how documentary evidence is integral to our understanding of cattle husbandry over the last 2,000 years, for example, through agricultural and medical manuals that advised on livestock management, processes for making different dairy products, and the medicinal uses of cattle products. This chapter also takes us up to the modern day, highlighting the impacts of the introduction of Western dairy cattle breeds after the end of the Second Opium War in 1860, leading to the establishment of companies that managed the production of dairy products and finally to a full-blown dairy and meat industry with intensive commercial breeding.

Today, after poultry and pork, beef is the third most widely consumed meat in the world. In 2018 it accounted for about 20% of meat production worldwide—amounting to 72 million tonnes of beef in total).[1] Milk production is also a massive industry, and production continues to increase faster than that of meat, due in part to rising demand in countries such as China (Bai et al. 2018). Between 2005 and 2015, for example, milk production grew by approximately 30%, and the global dairy herd increased by 11% (FAO 2019). Now more than 80% of the world's population (about 6 billion people), regularly consumes milk or other dairy products (FAO 2019).

Unsurprisingly this level of production has a very large environmental impact, with beef production being responsible for approximately 41% of the global emission of greenhouse gases from livestock animals (Opio et al. 2013), as well as a driver of deforestation-caused land degradation (Cederberg et al. 2011). Humans have responded to this issue in a variety of ways. The increasing popularity of vegetarianism and veganism in many areas of the world (particularly the Global North) is a good reflection of the way in which people are starting to think more about their personal relationships with the meat and dairy products they consume, as well as their impact on the climate and on animal welfare. International bodies such as the United Nations as well as the meat and dairy industries themselves are also now attempting to tackle these problems through encouraging more sustainable farming practices aimed at increasing efficiency and reducing emissions (see, e.g., FAO 2019).

Despite the need to reduce the impacts of industrial cattle production, many people rely on cattle for their livelihoods, and for their status in society. More than 150 million farmers across the world today are thought to keep at least one milk animal, with local cattle being by far the most common, and in about 25% of cattle-keeping households dairy cows are directly owned or managed by women (FAO 2016).[2] In addition, it is widely recognized that local farm animal genetic resources hold greater levels of genomic diversity when compared to commercial breeds. These animals are more sustainably raised and contribute to fighting fires in temperate to dry climate regions, as well as increasing soil fertility. These aspects are key to our ability to respond to the chal-

1 Data taken from FAOSTAT–2018 dataset, and OurWorldInData.org, includes both cattle and buffalo.

2 For more on this topic see, e.g., Njuki and Sanginja 2013 for perspectives from Kenya, Tanzania, and Mozambique.

lenges imposed by imminent climate changes, and have therefore highlighted the importance of retaining local, smaller-scale cattle husbandry going into the future (Bruford et al. 2015; FAO 2011, 2015).

Conclusion

The chapters in this volume provide an important snapshot of the work being undertaken on cattle-human relationships in the past. In particular we present the work of zooarchaeologists and their collaborators, but it is clear that this work is highly relevant to many other fields. Zooarchaeology, and archaeology more broadly, is often at the forefront of multidisciplinary research that is both accessible and has the ability to reach large audiences. We are able to use this platform to provide key explanations about our past and how we became what we are, and through this to help plan for the future. The papers in this volume are a fantastic demonstration of this. These case studies provide examples of our relationships with cattle across approximately 650,000 years, from scavenging and hunting, to domestication, to the building and growing of cattle herds for increased production, to deliberate selection for different traits and products. They deliver insights into the contexts in which different husbandry strategies were adopted and the way that different environmental and climatic conditions in the past affected herding. But most of all they highlight how unbelievably important these animals have been for humans at different times, in different places, and in many different realms of life—including both the economic and the spiritual. Only through a better understanding of the ways in which cattle-human relationships were formed and evolved in the past can we truly understand the opportunities possible for sustainable and ethical relationships in the future.

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