

**RESSOURCENKULTUREN 26**

# BEYOND SUBSISTENCE

HUMAN-NATURE INTERACTIONS



**Editors**

Keiko Kitagawa,  
Valentina Tumolo &  
Marta Díaz-Zorita Bonilla

TÜBINGEN  
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# **RessourcenKulturen**

## Band 26

### **Series Editors:**

Martin Bartelheim and Thomas Scholten



Keiko Kitagawa,  
Valentina Tumolo &  
Marta Díaz-Zorita Bonilla (Eds.)

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## Preface

The volume ‘Beyond Subsistence – Human-Nature Interactions’ is explicitly dedicated to a central element of the theoretical concept of ResourceCultures: the question of cultural evaluations in the context of resource handling. In this case, those resources are of existential significance for the users. In fact, this does not contradict the concept of resources as being culturally constructed, which forms a key element in the theoretical concept of ResourceCultures, as has been repeatedly emphasised in the context of several publications of SFB 1070 (see, e.g. Hardenberg et al. 2017).<sup>1</sup>

With the workshop that forms the basis for this volume, the editors have dedicated themselves to exploring the fine line of distinction between subsistence as a livelihood for physical survival on the one hand, and as the basis of a way of life considered adequate on the other. The latter understanding includes elements of a cultural sphere that also contributes to ideal and social well-being, which in turn is considered fundamental to human existence in many societies. In this context, the examples presented in the various contributions highlight the multiple facets of subsistence that have emerged as a result of cultural conditioning, as well as the need to analyse each case in its own natural and socio-cultural context. The considerations made here about things that are considered fundamental for the functioning of societies in different cultural contexts and the handling of them ultimately lead to a reflection

on interactions between humans and nature. This opens up perspectives on the relationship between both, which is different in various cultural contexts from the modern Western world and also conceives nature as an actor in a variety of ways. The elaboration of human subsistence thus often takes on the character of an interaction with nature that goes beyond the mere use of organic substances or exploitation of raw materials. In the different ways of dealing with the things that are conceived as resources for subsistence, the cultural character of resources and their forms of use is revealed particularly clearly.

This volume illustrates very well the applicability of the concept of ResourceCultures. Especially the activities of securing basic human survival, which are primarily categorised in modern Western thinking as purely material-oriented and nature-exploiting, can be identified through the consideration of their respective socio-cultural embedding as much more complex activities, which are subject to strong cultural conditioning. The editors and contributors to this volume are therefore to be greatly thanked for the prudent and careful way in which they ensure this important broadening of our perspective on a fundamental aspect of our human existence.

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<sup>1</sup> Hardenberg et al. 2017: R. Hardenberg/M. Bartelheim/J. Staecker, The ‘Resource Turn’. A Sociocultural Perspective on Resources. In: A. K. Scholz/M. Barthelheim/R. Hardenberg/J. Staecker (eds.), ResourceCultures. Sociocultural Dynamics and the Use of Resources – Theories, Methods, Perspectives. RessourcenKulturen 5 (Tübingen 2017) 13–24.



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# Beyond Subsistence: Human-Nature Interactions

## An Introduction

Keywords: resources, social networks, agency, post-anthropocentrism, human-nature relationship

### Acknowledgements

We would like to thank SFB1070 RESOURCECULTURES for providing funding to organise our workshop. We would also like to acknowledge and thank all the members of the Working Group ‘Animals, Plants and Substances’ for the work and time they committed to the preparation and running of the workshop. Thanks to all participants in this workshop for engaging in lively discussions as well as the authors for their inspiring contributions.

### Introduction

This volume is the conference proceeding of the international workshop ‘Beyond Subsistence: Human-Nature Interactions’ which took place at the University of Tübingen in October 2019 and was conceived by the Working Group ‘Animals, Plants and Substances’ within the collaborative

research centre SFB 1070 RESOURCECULTURES. The centre has been committed to interdisciplinary research that covers large geographical areas and chronological ranges from the prehistoric Ice Age to the present, combining archaeological and ethnographic perspectives. While the spatial and chronological contexts remain broad and all-encompassing, all projects at SFB 1070 are centred around the topic of resources and the socio-cultural dynamics surrounding their use (Hardenberg et al. 2017; Teuber/Schweizer 2020). These subjects have crucially provided the theoretical basis for the workshop, drawing on some of the pre-existing methodological and conceptual differences to encourage interdisciplinary debates. This introduction will explore some of the theoretical concepts and discuss the objectives and motivations for organising the workshop. The contributions included in this volume reflect the fruitful exchanges that occurred during stimulating and thoughtful discussions.

### 1 The Theoretical Framework of SFB 1070 RESOURCECULTURES

The aims for bringing the concept ‘Resources’ to the forefront are multi-fold and have been extensively explored in several publications (see contributions in the SFB’s book series ‘RessourcenKulturen’, for a summary see Hardenberg et al. 2017). One main objective of SFB 1070 is to redefine this concept in a way that can be applied to cross-cultural studies at large. Yet, the notion of resources has been largely investigated through

<sup>1</sup> This article is the result of a joint effort, the three authors contributed to all the sections of the text. The question of the theoretical framework of SFB 1070 was mostly addressed by M. Díaz Zorita-Bonilla and K. Kitagawa. The topic ‘Human-Nature Interaction’ and ‘Beyond Subsistence’ was mostly developed by K. Kitagawa and V. Tumolo, while the introduction to the contributions of ‘Beyond Subsistence’ was mostly addressed by V. Tumolo and M. Díaz Zorita-Bonilla.



its economic aspects, and the researchers in this field have a historically significant role in shaping the discourse around such a topic (see Teuber/Schweizer 2020 for review).

Some disciplines face a greater challenge in giving equal weight to economic and social significance of resources, a challenge that is particularly relevant to archaeology (Allentuck 2014). Therefore, reframing the concept of resources beyond the traditional economic perspective is an intellectual endeavour that potentially enables the social sciences to explore the broader social and cultural contexts (see contributions in Scholz et al. 2017; Teuber et al. 2020). Resources are defined as tangible and intangible entities that actors interact with, and that shape social relations, communities and identities. They can contribute to the heuristic models that could be used ‘for the reconstruction of socio-cultural dynamics and practices of different cultures in space and time’ (Teuber/Schweizer 2020, 11).

With this analytical perspective on resources, both the economic and social values are considered of equal importance for the current discourse, enabling us to explore relationships of resources – including objects, living beings and immaterial entities – from a holistic viewpoint. This view is not uncommon in anthropology, as economic and cultural aspects are interwoven in the realities of the present world. Consequently, the anthropological gaze and theories within and beyond SFB 1070 are employed to complement studies that, at times, treated economic, social and cultural aspects as separate entities or heavily emphasised economic principles to be the determining factor that influences human decisions, actions and behaviour.

Moreover, multiple resources can co-exist and interact with one another but they also need to be maintained (Bird/O’Connell 2006). This interconnectedness of resources or ‘interdependencies of resource uses’ (Teuber/Schweizer 2020) is considered a ResourceComplex. Summarising Hardenberg et al. (2017), Sieler rightly argues that the analytical perspective considers resources not as ‘isolated objects but as always part of larger assemblages which are combinations of things, persons, knowledge and practices’ (Sieler, this volume).

## 2 Human-Nature Interaction and ‘Beyond Subsistence’

The workshop focused on human-nature interactions, in the relationships between humans, plants, animals and substances. This theme is relevant for both anthropological and archaeological pursuits and, within the latter, for bioarchaeology – that is the study of human, animal and plant remains from archaeological contexts (e.g. Buikstra/Beck 2006).

The human-nature interaction cannot be simply reduced to the use of natural resources by human actors to support their biological existence, but it is a ‘highly condensed social fact’ (Appadurai 1981, 494). In line with this, the title of the workshop and this volume has been chosen to revisit the concept of human-nature interaction, moving from the sole purpose of subsistence. As a process in which humans meet their basic needs and the environment provides resources to humans, subsistence connotes a specific kind of relationship between the environment and humans, tied to the notion of ‘survival’.

The concept ‘subsistence’ associated with Polanyi’s substantivist approach regards non-capitalistic economic realities as systems rooted in provisioning, reciprocity and redistribution (Polanyi 1944). In this approach, cultural norms and social relations play a crucial role in humans’ subsistence practices in addition to purely economic decisions. Furthermore, activities tied to people’s way of subsisting are embedded in multiple relational spheres besides economy. Polanyi attributed these lines of thinking to non-Western, pre-capitalistic societies, allowing anthropologists to explore economy in different cultural and societal contexts.

The notion of subsistence economy is also explored in Marxists’ works, which discuss the diachronic developments of the capitalist expansion and the predecessors of the Western economic system that came to the forefront through the Enlightenment and the Industrial Evolution. Other works follow the notion of subsistence in different ‘spheres of exchanges’ such as conversions and conveyance (i.e. Bohannan 1959), interrogating how Western industrial systems influence, alter or merge with local economies. According to these

contributions, the subsistence practices can be interlinked with other economic spheres of exchange such as prestige and, more importantly, they are often juxtaposed against developed Western capitalistic systems, imbuing the term with a specific notion of subsistence or subsistence economy.

In archaeology, subsistence could be understood as a key economic factor (Kelly 1992) associated with human needs (Menger 2007) and influencing diverse aspects of past human lifeways. The term in archaeological literature is at times used synonymously with the notion of survival (Binford 1978) and has been void of any theoretical consideration, in contrast to anthropological work. Furthermore, the concept of subsistence is closely linked to that of resources, which can be considered as ‘natural products, means of production, signs of wealth or forms of subsistence’ (Hardenberg et al. 2017). Lastly, while subsistence is at the core of most societies, in the archaeological discourse it is often not considered as a cultural practice.

Analysed with different theoretical approaches, subsistence as a concept becomes a broader theoretical lens in itself. Following Gibson’s seminal work, the term affordance ‘implies the complementarity of the animal and the environment’ (Gibson 1979, 128), which can be extrapolated to include humans, and importantly, the term also cuts across ‘the dichotomy of subjective-objective’, allowing us to broaden our analytical approach to the notion of subsistence. As Hardenberg et al. note: ‘There is no contradiction between the subsistence-related functions of resources and their cultural construction, since frequently the resources relevant for subsistence and the practices related to them, are the ones to which cultural meaning is particularly assigned’ (Hardenberg et al. 2017, 18). In addition, subsistence does not lie diametrically opposite of the cultural and social realms and can be understood to encompass and fulfil the multiple needs and interests of the actors involved in the subsistence practices. Thus, the interaction of culture and nature could also be defined by the phrase: ‘culture is the human nature’ (Sahlins 2008, 104). With that, it is possible to critically assess: what can truly be outside of subsistence? What do non-subsistence activities consist of?

Human-nature interactions have been investigated through various approaches influenced by diverse theoretical schools. Environmental determinism has heavily influenced interpretations of the relationship between nature and humans especially in the archaeological discourse, which seeks to reconstruct specific dimensions of the past (Livingstone 2011). Approaches embedded in this theory assume that there is a one-way relationship in which nature ‘affords’ resources to humans and impacts human lifeways. In recognising how humans are reactive to natural conditions, environmental determinism fails to consider the influences humans have on nature, and cultures are deemed as an evolutionary solution for dealing with their adversarial surroundings (White 1943). In investigating the extinction of different human populations (Black et al. 2015; Prüfer et al. 2021; see Timmermann 2020 for counterarguments) or the demise of civilisations in the Old and the New World (Yoffee/Cowgill 1991), multiple models have been proposed. Nature is often considered the major cause that accounts for the large-scale changes that humans underwent in prehistoric and historic periods. Such theoretical approaches, which give all explanatory power to nature and allow little or no agency to humans, are not just ubiquitous in the scientific domain, but have been widespread in the public view, as exemplified by the success of popular science books (e.g. Diamond 1997).

On the other hand, anthropocentric approaches emphasise human agency and centre around human practices as well as human ontologies. The massive environmental impact of humans’ activities on the earth is represented by the naming of the current geological epoch as the Anthropocene (Crutzen/Stoermer 2000; Haraway et al. 2016; Steffen et al. 2011). With its root in Western discourse (Catton/Dunlap 1978), this narrative, which permeates in recent anthropological and archaeological literature (Boyd 2017), puts humans to the forefront and attempts to explain worldly phenomena exclusively in relation to humans. In recognising the theoretical baggage of anthropocentric dogmas, here it is intended to reframe the understanding of human-nature interactions and allow for a nuanced understanding and complexity,

instead of painting them with a simple brush of dualism or dichotomy (for a similar discussion couched in nature and society, see Descola/Pálsson 1996). During the last few decades, new approaches – such as the ontological and posthuman turns, Interspecies Ethnography and entanglement of humans and things (e.g. Hill 2013) – have attempted to re-examine traditional anthropocentric interpretations to the human-nature relationship, aiming to recognise its complexity by investigating how humans and non-humans influence one another. The ‘multispecies/interspecies ethnography’ contributes to recognise that the boundaries between organisms and species are much more blurred and fluid than previously considered (‘species turn’: see Haraway 2008; Tsing 2015). Not only have humans never been humans on their own, but animals, plants, fungi and microbes are effective agents and not passive objects, as also stressed by more recent approaches in archaeology (deFrance 2009; Feinberg et al. 2013). The same applies to things, as suggested by the ‘social lives of commodities’ (Appadurai 1986, 3) and the Actor-Network Theory of Latour (1999; 2011), which strongly challenge the traditional anthropocentric approaches (see Knapett/Malafouris 2008). Every actor – also the unconscious ones (Hodder 1982) – has agency in shaping networks of social relationships. Such an ‘ontological turn’, following the ‘flat’ ontology by Latour, has contributed to deeply transform the way materiality and agency are conceptualised in archaeological research (Latour 1993; see Alberti/Bray 2009, 337 with relevant bibliography). An ontological distinction between people and things cannot be truly made in light of the constitution of societies and the production of agency.

Post-humanism also rejects the classic humanist divisions of self and other, mind and body, society and nature, human and animal, organic and technological (Wolfe 2009). Therefore, post-humanism can be understood as a call to move away from the anthropocentric approach that recognises the limits in interpreting worldly phenomena from the point of view of humans and acknowledges humans as one of many agents that help to shape the world. These efforts made in archaeology and socio-cultural anthropology are followed here to move beyond ontologically

anthropocentric perspectives, to investigate different forms of human-nature interactions (‘non-anthropocentric attitude’, see Boyd 2017, 39 with references therein and Hussain, this volume). While we are aware of the theoretical challenges that arise by excluding human privileges in writing nonhuman narratives due to the innate nature of human beings (Boyd 2017, 301; Russel 2012, 5), some attempts in this volume are presented to critically re-consider traditional narratives, with acknowledgment of the recent non-anthropocentric ontologies inspired by non-Western epistemologies (e.g. Viveiros de Castro 2012).

### 3 Introducing the Contributions to ‘Beyond Subsistence’

Starting from the most recent theoretical inputs regarding the concept of resources, this edited volume aims to investigate the complexity of the human-nature interactions with the contributions of several authors who deal with these topics in various fields of study and use different theoretical approaches.

The volume opens with chapters that address efforts to reconceptualise the interactions among humans, animals, plants and substances. The need to embrace a ‘non-human turn’ in reconstructing the prehistoric past, going beyond relationist/interactionist viewpoints, is stressed by **Hussain’s** contribution. This is aimed at understanding the independent roles of animals as agents that actively contribute to the complex networks of interactions in which they are embedded. The analysis of the components and processes of those networks is a way to capture the deep sense of non-human agencies and the dynamics of their engagements. The inter-species perspective recognises that animals are not just passive objects of humans’ economic or symbolic interests – as traditionally embedded in Western narratives – but agents that actively interact with their human counterparts. There is a need to acknowledge animal agency and human-animal mutualism (Boyd 2017, 308; see also Armstrong Oma 2010): ‘Just as humans have a history of their relations with animals, so also animals have a history of their relations with humans’ (Ingold 1994, 1). In this

sense, hunting is not just a resource acquisition strategy but an ‘interspecies entanglement’ (Boyd 2017, 308 and bibliography within). Following SFB 1070’s ‘resource turn’, **Sieler** stresses the necessity of fully including substances in the non-human turn, embracing the ‘posthuman relationality’ that wants to overcome the ontological anthropocentrism because: ‘relational understandings of the social explicitly include the non-human in the forms of plants, animals, and things. Substances have largely remained overlooked so far’ (Sieler, this volume). Substances are included within the entanglement of human-nature interactions representing the ResourceComplex, which is a set of multiple resources that exist in specific cultural and social dynamics and interact with one another.

The contributions in this volume stress how every type of entity assumes specific characteristics and social values in relation to the network of social interactions they are part of. Resources need to be considered within their own contexts, as suggested by **Wolf’s** work, focusing on personal ornaments made from mammoth ivory from the Swabian Jura, Germany, where this material was largely available and used for diverse artefacts. In other regions such as southwestern France, where this material was scarce, it was used exclusively for personal ornaments, which reflected and contributed to shaping social relations within and between groups. In the absence of separation between tangible reality and social relations (e.g. Ingold 2000; 2007; Renfrew 2001), the pivotal role played by the dialectic between (material) ‘dependence’ and (social) ‘dependency’ connecting humans and things, understood as entanglement (Hodder 2011; 2012), becomes apparent. Pigs are luxury products within the specific networks of actions and actors that surround the *jamón serrano* (**Melles**); rice is conceptualised in relation to the central values of ‘auspiciousness’ (*maṅgalam* or *cubam*) and distinction (*mariyādai*; **Beckmann**); grass pea can be charged with specific cultic value within parts of religious processes (**Orendi**).

The enactive relation of cognition and materiality in shaping the value of resources (Hutchins 2005; Malafouris/Renfrew 2010) can be recognised in **Karakaya’s** contribution. The value of food beyond subsistence is emphasised, as the object

of practices that create and contribute to maintaining social tissues, building up and stressing both connections and boundaries. Although food has special semiotic values because of certain universal properties, it bears messages (e.g. solidarity and community, identity or exclusion etc.) intimately embedded into each specific socio-economic context, conveying the ‘everyday social discourse’: ‘When human beings convert some part of their environment into food, they create a peculiar powerful semiotic device [...]. It is therefore a highly condensed social fact. It is also [...] a marvellous plastic kind of collective representation’ (Appadurai 1981, 494). The three main areas in which ‘gastro-politics’ express themselves are the household (**Beckmann**), marriage feasts and temple rituals (see **Orendi** and **Karakaya**). The cultivation of rice is not only embodied in different important rituals but also creates strong family and household networks involving many actors and entities (**Beckmann**). Moreover, the evidence of what has been discarded is also indicative of distinctive social and cultural behaviours, as stressed by **Karakaya’s** contribution. With his study about the cultivation of rice in the Kaveri Delta, India, **Beckmann** demonstrates how basic activities ‘can be understood as both embedded in and generative of complex cultural symbolisms and social relationships that emerge from and extend beyond the realms of subsistence and immediate family relations’ (Beckmann, this volume). A similar approach is comparable to that carried out by **Sieler** regarding the use of mercury as a therapeutic resource. The value of substances goes beyond the biochemical qualities: ‘basic need is a variable concept’ and mercury can be perceived and utilised in dissimilar ways: ‘Mercury does not always equal mercury’ (Sieler, this volume). The multifaceted nature of resources, between materiality and immateriality, praxis and cognition, seems to be clearly reflected in the dualism of the definition and the concept of ‘substance’. ‘Matter is more than merely representational, it is material and representational in its relationality’ (Sieler, this volume). Like culture, materiality is a social product, created and changed by the network of relationships among the entities themselves (see **Sieler**, quoting Barad 2007 and Ingold 2007). Substance is the matter of which things are made, but

it does not correspond to just ‘things’. Substances are, in fact, complex material structures to which many different properties can be attributed. Such properties are socially embedded because the perception and valuation of substances changes in different social realities over time. Conversely, the cultural appropriation of substances is based on the perception of substances. ‘[...] Substances are complex material structures to which many properties can be attributed. Their characteristics are associated with specific values that give substances social definitions. It is precisely through the often implicit embedding of a substance into social and cultural contexts that it differs from any general physical description of the same substance’ (Hahn/Soentgen 2011, 24).

Fine arts and luxury goods, which are the outputs of the transformation of resources into materialised objects that reflect social asymmetries, are also parts of networks of social interactions. Production-and-consumption patterns involve a wide range of resources that can be either directly connected to subsistence (**Beckmann**) or not, such as clay, metal, stones, wood and ivory (**Wolf**). These resources can be acquired by direct exploitation (**Melles**) or through exchanges, and they can be converted into objects and activities, expressing new asymmetrical relationships. They can be considered economic, social, cultural and symbolic capitals (Bourdieu/Wacquant 1992) which embody different forms of accumulated labour. **Wolf**’s contribution on personal ornaments emphasises the cultural value of technological traditions as well. In fact, ‘the cultural role of commodities [...] cannot ultimately be divorced from questions of technology, production, and trade’ (Appadurai 1986, 35), and is also through the reconstruction of technical changes that we can grasp transformations of social values. With **Melles**’ investigation of the definition of ‘good tastes’ and the perception of the consumers by the example of *jamón*, it becomes apparent that demand does not simply depend on the availability of goods, and that consumption is a social act (Appadurai 1986, 29–31).

Care is linked with the maintenance activities that go beyond subsistence, which are tasks that all human groups need to undertake to survive, regardless of their historical period and

geographical location (**Sánchez Romero**). Such maintenance activities create forms of communication that are fundamental for the development of cohesion, empathy or solidarity strategies. This same provision of care is embedded in the role of the givers of care, such as the mothers of children or cultivators of rice (**Beckmann**).

All in all, this volume aims to provide a spectrum of different perspectives on the interactions of humans and nature in the past and present. They all tackle different aspects of animals, plants and substances that have cultural meanings and social implications which go beyond economic values. All the different resources are embedded in ResourceComplexes (rice, ivory, serrano ham, care in the past, rituals as a few examples) reflecting socio-cultural processes, and not necessarily associated with subsistence. The materiality of those resources is interconnected, and humans and nature are entangled with one other, reflecting co-dependencies (Miller 1998). The chapters also are a reflection of interdisciplinary discussions across different historical and cultural studies. This can take the form of integrating more deeply anthropological and sociological studies with archaeology or taking a historical view into the investigation of cultures in the present. Interests in reframing resources as well as documenting cultural and social activities, which are as important as ‘basic needs’, may hopefully broaden our understanding of humans and nature, and their multifaceted relationship.

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## Deep Animal Prehistory

### Gathering Feral Voices from Vanished Pleistocene Worlds

Keywords: anthropocentrism, non-human turn, animal studies, animal agency, multispecies archaeology, deep history, Zoocene

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#### Summary

The deep past harbours exceptionally rich and diverse communities of non-human animals, and iconic species such as mammoth and reindeer are in the focus of popular and academic narratives on early human evolution. Yet paradoxically, the large majority of research on this critical timeframe continues to reinforce human-centred

understandings of deep history and tends to overlook or even dismiss the role of animals as active agents and potent history-makers. This paper identifies three influential intellectual orientations which have contributed to this marginalisation of past animal agencies and legacies: anthropocentrism, environmental determinism and radical relationism. It then motivates and frames the project of ‘Deep Animal Prehistory’ (DAP) in an attempt to overcome some of the limitations tied to these orientations and to make space for the self-sufficient analysis of animals’ varied yet significant contributions to the remote past. This proposal offers a suite of new arguments for the importance and necessity of studying animal agency in the deep past, illustrating some of the advantages of adopting, developing and pursuing a zoocentric research perspective. Key ideas and insights from human-animal studies and animal history are integrated with theories, taxonomies and perspectives from ecology, evolution, animal ethology and comparative behaviour studies providing a preliminary inventory of valuable concepts to trace, discuss and compare how non-human animals have influenced and shaped shared planetary pasts. In conclusion, this paper situates DAP within a broader, life-oriented approach to historical processes. It primarily formulates a critique on persistent anthropocentric tropes and categorisations in current palaeoarchaeological research, and catalogues emerging opportunities of empirical investigation and theory-building with the promise to counter-balance human-centred readings of the past, re-instating other animals to the heart of deep-historical accounts, narratives and debates.

‘[...] [W]e must seek out and factor in other animals’ realities as we consider our own views, practices and possibilities’ (Waldau 2013, xi).

## 1 The Animal Paradox of the Human Deep Past

Animals such as mammoths, cave lions, reindeer and wolves are intimately bound with our imagination of the human deep past, and they prominently feature both in popular media accounts and seminal academic papers and monographs (e.g. Barkai 2019; Mithen 1999; Shipman 2010; 2017). At the same time, however, non-human animals are rarely recognised for their historical autonomy and they are frequently portrayed as mere casualties or bystanders of much bigger history-making processes and developments. Pre-historic animals are primarily treated as resources of human subsistence, technology and symbolism or reduced to the function of cognitive fulcra (e.g. Amkreutz/Corbey 2008; Barkai 2019; Brusgaard 2019; Corbino/Albarella 2019; Porr 2015; Sykes 2014; Testart 2012). Moreover, the agential qualities of non-human beings, especially animals, remain shackled to ongoing negotiations of the human-environment nexus: animal agency is recast either (a) as a consequence of situated human-animal interactions – initiated and fashioned by humans (Albarella/Trentacoste 2011; Mithen 1999; Russell 2012; Shipman 2017), or (b) as a result of its broader environmental and climatic framing (Blasco/Peresani 2016; Carleton/Collard 2020; Potts et al. 2018). This leaves only limited space for animal behaviour to make a difference on its own and to impact the formation and unfolding of the past, independent of the stipulated main driving forces, processes and protagonists of history and evolution writ large. This tendency of overlooking and discrediting non-human animals’ role in and contribution to the remote past – notwithstanding or perhaps precisely because of their quintessential inclusion in standard narratives of the Pleistocene – is what the author identifies as the ‘animal paradox’ of making sense of deep history.

This paper outlines the project of Deep Animal Prehistory (DAP) to address this lingering animal paradox and to counterbalance the limitations of traditional, human-centred archaeological

approaches by re-directing the attention to the genuine role and agency of animals in co-fashioning long-term pasts. DAP is, however, not generally incompatible with traditional human-oriented approaches to the deep past and can complement them in interesting ways (see below). The core argument for a more animal-focused investigation of deep prehistory is developed and presented in four steps. First, it is shown how much scholarly thinking about non-human animals is filtered, and sometimes obstructed, by three influential (and chiefly Western) intellectual orientations: anthropocentrism, environmental determinism and relationism. These persuasive ‘foils of inquiry’ – easily reified as assumptions, quasi-certainties or even secure knowledge in ongoing archaeological discourse – have their roots in long-standing nature-culture binaries and related reactive attempts within Western scholarship to overcome or circumvent these. Second, DAP is motivated and outlined, in part as an attempt to break free from foregoing agenda-setting orientations of inquiry and theory-building in palaeoarchaeology. Subsequently, a preliminary inventory of key concepts, theoretical backgrounds and research perspectives is offered that can be instrumental for analysing and comparing past animal behaviours and histories, and which therefore should be further developed and re-synthesised under the DAP umbrella. Lastly, the role of DAP within broader concerns of de-centring the human for understanding the past (and possibly our near and long-term futures) is discussed, providing a general rationale for grounding the larger project in life-theoretical approaches to deep history.

## 2 Beyond Anthropocentrism, Environmental Determinism and Excesses of Relationism

Archaeology tables a long-standing tradition of interrogating the human-environment nexus (e.g. Butzer 1971; Dincauze 2000; McCorrison/Field 2020), and animals are certainly not absent from this conversation. However, our understanding of the status and role of non-human animals in the archaeological past remains entwined in the politics of debating the human-environment interface, obfuscating the historical self-determinacy and

agency of these beings. The first obstacle is presented by the doctrine of anthropocentrism (Boddice 2011; Domańska 2011; 2015): anthropocentrism refers to the tendency of foregrounding or prioritising human – and by extension hominin – behaviour, culture and cognition in the study and reconstruction of the deep past (Boyd 2017). Anthropocentrism is often connected to ideas of human exceptionality, ingenuity and superiority, often removing, or at least detaching, the human from the natural world and elevating it above all other living beings (Anderson/Perrin 2018; Crist 2018; Midgley 1994). A latent syndrome of archaeological anthropocentrism can, for example, be recognised in the trend among bio- and zooarchaeologists to consider, select, analyse and present only zoogenic data which promises to reveal something of relevance about past humans, either directly or indirectly (O'Connor 2004; Russell 2012). Animals, then, are treated merely as one of the many possible windows into past human behaviours, adaptations and lifeways, and animal remains or products, as a consequence, are primarily analysed as **artefacts** of human action (Davis 1995; Starkovich 2018). When the artefactual, human-made or influenced characteristics of the respective materials are questioned or even rejected – e.g. when the objects are identified as ‘geofacts’ or ‘theriofacts’ (Emery 2008; Fiedler 2012, 156) – the information is quickly considered superficial or even irrelevant, and thus easily re-cast as yet another line of evidence for the environmental ‘background noise’ of human behaviour and evolution (but see e.g. Pasda 2012). The value and status of animal evidence depend on our understanding of what this evidence is ‘good for’, and ultimately on how we frame the larger research enterprise of prehistory and deep history.

The problem may sound tautological at first: since archaeology is above all a human science, the goal must naturally be to learn about and understand human behaviour, and the investigation of animal remains can support this goal. While the intention is not to question the fruits and benefits of this approach, some of its underlying assumptions can be challenged: as soon as one refrains from the hegemonic and hubris-infused idea of a past that is owned and shaped by humans and their actions alone, this past opens up for plurality and can

be studied in analogy to a musical piece in which multiple, heterogeneous and often counteracting, tension-ridden voices resonate with one another to create rhythm, directionality and content. In this view, the archaeological past is more like a complex orchestration of unequal agential qualities, comprising humans and non-humans, variously co-fabricating the threads of historical and evolutionary processes (Kost 2019; Pilaar Birch 2018; Watts 2013). Theriofacts and other animal-related lines of evidence emerge as fundamental data for such a multi-faceted, pluralistic approach to deep history. The signature of non-human beings, independent of their intersection with contemporary human others, becomes imperative for examining and deciphering the continuous weaving of human and non-human factors in the making and unmaking of early human history.

The second obstacle is posed by the doctrine of environmental determinism. Environmental determinism is based on the claim that the natural environment, broadly conceived, supplies the main pool of causalities to determine the course, tempo and pattern of deep history (Arponen et al. 2019; Hussain/Riede 2020; Livingstone 2011). Numerous variants of environmental determinism have been offered, pursued and defended in the disciplinary histories of archaeology and palaeo-anthropology, some more sophisticated, controversial and exclusionary than others (Coombes/Barber 2005; Erickson 1999; Livingstone 2012; Hussain 2019a). Strict environmental determinists disagree with environmental possibilists and environmental eliminists (Ellen 1982, 1–51; Stanton 2004; Moran 2017). Environmental determinism contends that the natural environment is the fundamental difference-making force in the world (the ultimate cause for everything else), and that processes, patterns and effects observed in other domains of reality, such as animal behaviour or human culture and technology, are powered and made possible by environmental parameters and/or conditions. Environmental possibilism merely holds that natural environments set particular constraints or limitations that other agencies cannot escape from (Fekandu 2014, 136 f.). Environmental eliminism, finally, can take various forms and argues that either external environmental factors have minimal relevance for explaining the

progression of history and behavioural evolutionary trajectories – which are then typically viewed to be determined by internal regime dynamics, path dependencies and contingencies – or that the environment cannot be meaningfully separated from other dimensions of reality, particularly regarding human society because climate, physiography and landscape are always engaged from situated perspectives and perceived through a specific sociocultural lens (e.g. Hulme 2011; 2017). The decisive point is that the ‘animate’ environment – including animals, plants, microbes and fungi – has largely been absorbed within this broader recognition of nature as a prime motor of change and an anchoring pillar of reality (e.g. Guthrie 1990; Sánchez-Marco et al. 2016) – a direct consequence of the ongoing larger controversy on the status of the ‘environment’ in human history (Arponen et al. 2019; Hussain 2019a).

In human origins research, environmental determinism is traditionally widespread (Livingstone 2012) and sometimes even identified as a ‘null hypothesis’ for explaining hominin evolution (Levin 2015; Potts 1996). Animals in these studies are regarded as reliable proxies for past environmental configurations and *vice versa* (e.g. Breithaupt 1992; Britton 2020). This has resulted in the substantial narrowing of the agential space delegated to non-human animals, who are readily recast simply as a part or extension of the physical and climatic environments early hominins had to cope with (e.g. Potts et al. 2018), and has clouded the view for natural environments as *de facto* **compound** entities, with internal heterogeneity comprising many different actors and agencies. Environmental determinism clearly promotes the inclination to uncritically merge animal and environmental agencies, and presumes that non-human animals and environments are simply extensions of one another. Animals, in this view, are regarded only as signals of past climate, geography and vegetation – their evolution, as a result, can be directly linked to the various histories of the ecosystems and habitats they populate.

Even from the perspective of Earth-system science (Hamilton/Grinevald 2015), the zoosphere – as a part of the larger biosphere, and in contrast to the atmosphere, hydrosphere and lithosphere –

must be acknowledged as a distinct functional component of the planetary system, and as such a potential Earth-system force and causal factor in its own right. While emerging evidence from palaeontology, biogeography and palaeoecology highlights that animal behaviour can fundamentally shape ecological structure and climate (Lister 2013a; Mahli et al. 2016; Moléon et al. 2020) rather than merely being shaped by external ecological conditions, deep-time archaeologies have been slow to come to terms with this realisation and continue to study non-human animals as evidence for **something else**, illustrated by the continuous occupation with animals as proxies. All of this speaks of a correlational legacy to collapse mutually explicative relationships into one. This legacy, itself a latent reflex of environmental determinism, clouds the view for non-correlated, self-contained animal behaviours and the myriad of deep-historical agencies of animal others. The bioarchaeology of animal isotopes is another line of evidence: more often than not, shifts in the isotopic space of different animal species are explained as climatically-induced changes to the ecosystems in question (e.g. Gaboardi et al. 2005). Such isotopic shifts may also be accounted for by the internal dynamics of nested multispecies assemblages and the well-documented behavioural plasticity of animals (Baumann et al. 2020a; Sultan 2015). Ironically, the intimate association of animals with environmental agency, in part a response to the influence of anthropocentrism and cultural determinism in archaeology, has undermined the analysis of the historicity and world-making of animals in deep prehistory. Archaeologists render animals as immutable mirrors of ecology rather than questioning the universality of ethological stereotypes and embracing the genuine animal capacity for proactive, flexible and goal-directed behaviour.

The third obstacle is posed by some (radical) variants of relationism, (e.g. Vandenberghe 1999) or what is occasionally referred to as interactionism (e.g. Athens 2013; Denzin 2001). This research orientation arose in close interaction and often in competition with anthropocentrism and environmental determinism. Interactionism conveys, in many cases at least, a sophisticated attempt to overcome the basic polarities on which both

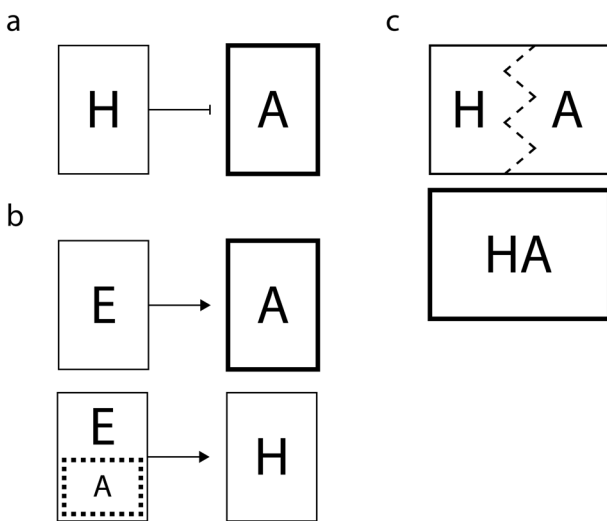
anthropocentrism and interactionism are founded: the nature-culture duality, the gulf between mind and body and more recently the human-animal boundary (Harris/Cipolla 2017, 193–195; Herva/Lahelma 2019; Watts 2013). Relationism rejects both the primacy of the human and the environment and instead proclaims that meaning and significance are generated where they meet (Hussain 2019a, 51–55). At the extreme, both the independent realities of culture and nature – their ontological status as bounded compartments of the world – are repudiated, and instead, relationships, co-dependencies and interactions are embraced as the touchstones of reality. In many cases, the result is an emphatic proclamation of ‘hybrid’ or ‘mixed’ realities (Haraway 1991), in which humans, animals, materials and environments are variously intermeshed and continuously spawn qualitatively new, irreducible configurations or assemblages said to be ‘more than the sum of their parts’ (Arluke/Sanders 2008). This entails a fundamental shift in perspective away from self-contained parts towards the description and study of emergent wholes. Importantly, since relationism seeks to get to the roots of intersections, relations and co-dependencies, in contrast to most part-centric approaches, it seriously considers the multipolarity of these constellations (Denzin 1989). Barad’s (2007) call for the examination of ‘intra-actions’ showcases this concern. The prism of determinism tends to reduce such multipolar phenomena to a mere question of ultimate causes or constraints, and anthropocentrism simply marginalises non-human poles of interaction. To counter these limitations and overcome their shortcomings, relational approaches commonly deploy methodological symmetry and seek to deconstruct supposed ontological hierarchies (Harris/Cipolla 2017, Chapter 8). Relationships are not simply pre-cast into sets of presumed power relations anymore, they are instead investigated as a locus of constructing, perpetuating and re-negotiating these relationships.

The nascent multidisciplinary enterprise of Human-Animal Studies is largely grounded in these root tenets and concerns of relational analysis (DeMello 2012; Haraway 2008; Kompatscher et al. 2017; Taylor 2013). Its signature accentuation

of tangled, multispecies realities is, for example, reflected in the mobilisation of concepts such as ‘humanimal’ (Haraway 1991; Taylor/Signal 2011), ‘humavian’ (Kost/Hussain 2019) or ‘anthropozoo-technical’ (Doré/Michalon 2017), opening up the analysis of the complex and ongoing intersection, cross-pollination and fusion of human, animal and technical worlds. The boundaries and categorical distinctions between these worlds, realms and/or domains of reality have at best heuristic value in this context, and overemphasising them is criticised as fundamentally impeding insight and understanding of historical processes. What is often lost in relationist renderings, however, is the specificity of both human and animal existences and contributions, equalising and often violently glossing over tension, conflict and asymmetric or ‘dejected’ power relations (Digard 2012; Piette 2017). Yet it can be argued that it is precisely this capacity of different organisms and eco-cultural beings to initiate, propel and sustain divergent and (at times) antagonistic trajectories of development and to cultivate friction at the emerging rifts and interfaces that makes a ‘multispecies’ past possible and productive in the first place.

It is certainly ironic that the dynamics of the nature-culture discourse in Western academia – largely oscillating between anthropocentrism, environmental determinism and radical relational inquiry – seem to have thwarted our grasp on the animal condition of the past. Even the recent re-discovery of the pervasive, time-transgressive significance of non-human animals across human societies past and present (Waldau 2013, Chapter 9) has rarely challenged the conviction that human affairs should be at the centre of analysis and knowledge production. Exposing and negotiating the challenges of anthropocentrism and environmental determinism and the promise of relational approaches to surmount them (*fig. 1*) has crippled our ability to recognise, analyse and theorise animals as independent deep-historical actors of their own with the capacity to alter evolutionary dynamics and to contribute to the long-term material and bio-cultural patterns and trajectories so routinely attributed to our species and its relatives (Hussain 2019b; Hussain/Floss 2015). To account for this history-making capacity of non-human





**Fig. 1.** Three intellectual orientations underpinning traditional approaches to past animals: (a) anthropocentric, resource-theoretical apprehension of animals – animals are recast as resources for human subsistence, technology and symbolism, thus primarily coming into view as ‘good to eat’ or ‘good to think with’; (b) ecocentric understanding of animals – animal behaviour is either determined by its associated environmental factors or seen as a part of the inert environmental backdrop of hominin evolution; (c) relational rendering of human-animal constellations, eroding the boundaries between the human and the animal and often resulting in hybrid, mixed or interwoven ecocultural realities where animal-specificities and contributions are lost. [H = human(s); A = animal(s); E = environment(s)].

animals and to study their potential in modulating and forging a multispecies past that recognises the situated positionality and unique ways-of-being of different animal others, we need to re-imagine the science of animal behaviour, pooling multidisciplinary resources, ideas and methods of analysis in a new way.

In the same spirit as Piette (2016) has argued for the restoration of a science of (separate) human existence, the time seems ripe to investigate the deep animal past on its own terms and to picture human-animal relationships as derived historical constellations of situated but mutualistic, resonant engagement – foregrounding tension, conflict and coordination rather than synthesis, amalgamation and coalescence. Such an approach to the past and deep past requires to interrogate and combine archaeological, palaeontological and ecological information concerning the actions,

consequences and legacies of past animal others and to promote conceptual frameworks taking stock of the **historicity** and **contingency** of animal behaviour and Earth-system agency on evolutionary timescales. The desideratum is to re-imagine the study of past animals for themselves, for what they are, were and became, and how the specificity of their being-in-the-world has affected the entangled stories of their landscape co-inhabitants, including humans. Scholars are therefore asked to more courageously and more radically probe into the perspectives of non-human animals and explore their proactive yet varying and always situated roles in deep history.

### 3 Deep Animal Prehistory: A Manifesto

What do animals strive for as deep historical actors? How do they make history? What are their historical and evolutionary vantage points? How does animal behaviour conflict with human ecological and cultural efforts, under which circumstances do they conflict, and what are the short and long-term consequences? What are the deep-historical deeds of non-human animals and how can we qualify and study them? These are only some of the questions that must be addressed and followed up on if we wish to circumvent the counterproductive ‘animal blindness’<sup>1</sup> described in the foregoing section, and to work towards a renewed, more focused and animal-oriented approach for better understanding the multi-vocal character and becoming of the deep past.

This past represents a shared and segregated reality at the same time. It is a shared past because we cannot hope to decipher its patterns, events and processes without incorporating the perspectives, agential qualities and evolutionary trajectories of all contributing agents. It is impossible to deny that various aspects, resources and components of landscapes and larger ecosystems are

<sup>1</sup> The author owes this reference to Norbert Peeters, who made him aware that animals often face analogous difficulties as plants when people think of history, even though ‘plant blindness’ (Allen 2003) probably runs much deeper, and plants are even more severely marginalised in evolutionary narratives than animals are, as they seem to be truly ‘alien’ to us and belong to another biological kingdom.

shared among organisms. All organisms, including animals and humans, **live with** other organisms (Haraway 2008; Kirksey/Helmreich 2010). Yet the ‘more-than-human’ past is equally segregated because, theoretically and epistemologically, it is composed of varying, heterogeneous perspectives, affordances, materialities and *Umwelten* (*sensu* Uexküll 1921) – i.e. organism-specific ways of being-in, acting-in and thinking-with the world (Tsing 1995; Maran et al. 2016) – and how they co-produce and calibrate each other, resonate or mangle (Kost/Hussain 2019). These divergent modes of living and interacting with others arguably make a difference for how human and animal agents should be studied, which theories and concepts may usefully be deployed and what methods should be preferred, notably making room for an uncanny space of alterity and difference.

The point here is not to re-introduce problematic human-animal dichotomies but to recognise that differences in body plan, motor skill, locomotion, perception, cognition, diet and ecology have important implications for how organisms navigate and impact the world they inhabit (Gibson 1966; 1979; Nöth 2001; see below). Humans are animals too, of course, and my ambition here is merely to call attention to the vast variety and diversity of needs, predispositions, capacities and behavioural potentialities within the animal kingdom (which includes humans), rather than reifying the ‘human’ and/or the ‘animal’ as mutually exclusive categories (van Dooren et al. 2016; see esp. the discussion in the final part of this paper). To trace, study and map the animal component of this diversity in the deep past is at the core of what may be called the project of ‘Deep Animal Prehistory’ (DAP), stressing the emancipatory ambition of the project but also its particularities.

DAP aims to extend animal history (e.g. Domańska 2017; Fudge 2000; Krüger et al. 2014; Nance 2015; Pearson 2013) further back in time, to include the vast majority of human prehistory for which no written records are available – in total > 99% of all human history – and brings into play a range of unique evidential and methodological perspectives, which, together with the distinctive temporalities of the deep past (Shryock et al. 2011), enable productive contextual and comparative investigations of animal past-making. DAP embraces

the theoretical, conceptual and methodological achievements of both the ‘animal’ (Marvin/McHugh 2014; Ritvo 2007; Waldau 2013; Weil 2010; Wilike 2013) and ‘non-human’ turns (Bennett 2010; Kohn 2013; Latour 1991; Tsing 2015), while not blocking or undermining the domain-specific interrogation of animals, and emphasising animal faculties to make their own history as well as to shape the historical trajectories of their many landscape co-dwellers (Betts et al. 2015; Hussain/Breyer 2017; Roy 2020; Swart 2010). DAP thereby acknowledges the self-contained causal efficacy of animals within long-term evolutionary processes (see below), yet simultaneously opposes the doctrines of anthropocentrism and environmental determinism as well as extreme forms of relationism to make room for animal-specific contributions to deep prehistory.

DAP also questions long-perpetuated notions of history – for instance in the wake of European historicism – and invites us to rethink the scope and nature of deep-historical processes.<sup>2</sup> Importantly, deep animal history rests on a pluralistic understanding of the historical, according to which history is always manifold, multivocal and dispensed. There is accordingly no single, exclusive or universal history but only varied **histories of and for**. In this view, it is problematic, and even misleading, to conceive of the deep past simply as a product of human history or evolution. History is no longer the domain of human exceptionality, re-casting humanity through the lens of a supposedly unique ‘historical animal’ (Premack/Premack 1994;

<sup>2</sup> A basic definition of history which, in principle, can also include animals comprises at least three components: history occurs when a group or population of organisms influences its environment, changes itself in the course of the sustained interaction with this environment and when the observed change is not entirely arbitrary in so far as it broadly depends on (but is not fully determined by) earlier actions, conditions and behaviours. We might generally want to discriminate between organisms making or having history. Although this debate is not within the scope of the present paper, it is useful to note that the transmission of social information or any other mechanism of historical change (and stability), as well as the faculty to remember/relate to one’s own history, are components of history-having, not history-making. History-making may not require historical consciousness and is often diagnosed only in retrospect, e.g. through the identification of powerful long-time legacies or so-called ‘chronofences’ (Landwehr 2020).

Furedi 2013),<sup>3</sup> but emerges as a multifarious and often discordant orchestration of a wide array of history-making agents with their own short and long-term contingencies and histories. This shift in perspective not only provokes a reconsideration of terminology in prehistoric and human origins research, it also encourages the investigation of the deep-time histories of animals for themselves, without the necessity to relate animal behaviour to human concerns, needs or achievements (even though it is suggested below that the ‘human environment’ and spatiotemporally specific ‘anthroecologies’ (Ellis 2015) are often key for situating and deciphering animal behaviour in varying deep-historical contexts).

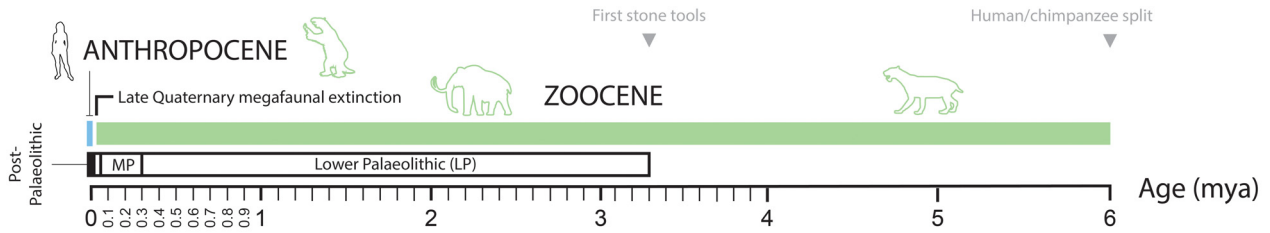
A methodological signature of DAP is the deliberate, provisional adoption of **zoocentrism**, along with the hypothetical inversion of key concepts and narrative tropes of traditional anthropocentric renderings of the deep and long-term pasts.<sup>4</sup> This manoeuvre is not only motivated by a critique of the currently dominating ‘animal-blind’ approaches to prehistoric periods, epochs and ages comprising hominin actors – e.g. the Plio-Pleistocene, the Middle or the Upper Palaeolithic – but also by the conviction that something new and substantial can be learned about these timeframes

<sup>3</sup> The flipside of history as a *differentia specifica* is the diagnosis – albeit difficult to uphold in the light of the currently available ethological and evolutionary evidence – that animals supposedly lack ‘historical consciousness’ and display comparatively low rates of evolution (‘slow’ evolution; e.g. Premack/Premack 1994).

<sup>4</sup> Some scholars in and outside of archaeology (Hayward 1997; Russell 2012, 5; Tague 2015; Boyd 2017, 201) have argued that an authentic zoocentric perspective is ultimately impossible to attain because *qua* being humans, we remain inescapably bound to our human-specific vantage points. While the latter part of this assertion is difficult to deny (Crist 2018), it does not necessarily follow that ‘zoocentrism’ is unachievable. Part of the confusion here is the assumption that in order to adopt a zoo-centric point of view, we need to project ourselves into the animals in question, try to perceive and contemplate the world as they do, and thus ultimately simulate their being-in-the-world. This understanding echoes the problematic Diltheyian, empathetic mode of understanding once considered to be a precondition for historical knowledge in general (von Wright 1971). In contrast to this, zoocentrism is here primarily deployed as a methodological strategy, to develop more inclusive and multivocal histories and prehistories, and to examine the significance of past phenomena, including human realities, for other beings (see below). This project is less-assuming and does not depend on bio-cognitively, that is literally, becoming a non-human animal.

if we develop different modes of animal-centred inquiry. A basic consideration here is that the deep past of our species – defined here as all pre-Holocene periods involving hominins – was essentially a world dominated and to some extent ruled by non-human animals, especially large mammals such as the iconic megaherbivores and megacarnivores of the Eurasian Pleistocene (Guthrie 1990; Stewart 2005). In this setting, the agency of the mentioned non-human beings must be expected to have overshadowed the Earth-system agency of their hominin contemporaries.

Part of the methodological inversion of anthropocentrism is therefore to conceive of the deep past – at least heuristically – as a structural antithesis to the so-called ‘Anthropocene’, the dawning ‘human-epoch’ of the present and near-future (Ellis 2015; Lewis/Maslin 2018; McCorriston/Field 2020). In contrast to the Anthropocene, where humans are hypothesised to emerge as Earth-system agents of truly geological scale, shaping and fashioning climate regimes and ecosystem compositions on a planetary level, the deep past was characterised by reduced human population densities and fragmented, or at least much more dispersed, human populations with a significantly decreased ecological fingerprint and Earth-system impact. Unlike in the Anthropocene, where humans are projected to become a major driving force of larger Earth-system dynamics and logics (Crutzen/Stoermer 2000; Hamilton 2016), landscapes and climates of the deep past appear to be fundamentally animal-fabricated and non-human animals, especially large keystone species, play essential and irreplaceable roles in the assembly and maintenance of these environments. They provide key ecosystem services, and regulate the structure of the phytosphere, the growing cycle of plants, and facilitate other organisms’ ecological relationships (Bocherens 2018; Mahli et al. 2016; Galetti et al. 2018). This condition may be provocatively referred to as the **Zoocene** – an antithesis to the Anthropocene (*fig. 2*). In the Zoocene, there are hardly any ‘anthromes’ or culturally framed, human-shaped climate regimes (*sensu* Ellis 2015) and hominins therefore essentially inhabit ‘thieromes’ – environments engineered and sustained by other animals. This perspective makes room for animals as important deep-historical agents



**Fig. 2.** Timescales of ‘Deep Animal Prehistory’ (DAP). DAP pushes the project of animal history (covering merely a small subsection of the Post-Palaeolithic period) more than 3 million years back in time, integrating historical, evolutionary and geological timescales. DAP unfolds in what may be referred to as the ‘Zoocene’ – the antithesis to the ‘Anthropocene’ – in which animal communities enact, shape and direct agencies of geological scale (see main text for explanation and discussion). The Zoocene is characterised by distinct animal-dominated, generated and maintained landscapes and only partly overlaps with early human prehistory, which formally begins between 3 and 4 million years ago with the emergence of the first stone artefact technologies. The Zoocene may further be subdivided according to conventional mammalian biostratigraphic units. [MP = Middle Palaeolithic; human and animal silhouettes are taken from phylopic.org with a Public Domain or Creative Commons license].

and incentivises the exploration of animal agency and history-making in the wider context of hominisation and human evolution. It also raises the important question of how ecological power-relations were mediated by animal behaviour and its intersection with hominin agency.

Although the Zoocene stretches back far beyond the critical timeframe of hominisation (*fig. 2*) and perhaps up to the rise of large mammals at the onset of the Phanerozoic almost 600 million years ago, the Pleistocene period (ca. 2.6 mya to 11.8 kya) may nonetheless be taken as a paradigm case for examining the significance of multispecies life when humans were frequently marginal or even liminal historical actors. One important reason for why one might wish to include hominins into the DAP research framework is because the provisional adoption of zoocentrism calls for the analysis of animal ecology and *Umwelt* much in the same spirit as deep human prehistory would investigate ecology and human-environment relations and because a part of Pleistocene animal *Umwelten* is certainly human-influenced (see below). The key point, however, is not merely to invert the traditional research rationale, but to avoid analogous pitfalls of anthropocentric perspectives, namely the complete absorption or reduction of the respective ‘Other’ (either humans or animals). Taking animals seriously as full-blown historical agents cannot mean assuming or pretending that humans were not present or largely irrelevant to animal behaviour and evolution, just as the reverse position is also obsolete and undefendable.

The basic issue here is of course empirical and not merely theoretical, but the advantage of focusing on the prehistories of animals without blanking out hominin others also lies in the resulting disciplinary configuration of the proposed research enterprise. DAP is not just palaeontology in disguise, and the archaeological context of past animal agency emerges as a formative dimension of the here-concerned animal perspective. Even though DAP challenges some long-standing assumptions and narratives in human origins research, palaeo-anthropology and Palaeolithic archaeology, it still operates within the broader discursive and intellectual space of these disciplines and draws on their data, methods and expertise. Although DAP **inverts** the human-centred perspective of the mainstay of traditional deep-historical research, it aims to complement and enrich our understanding of the concerned timeframe in which hominins and non-human animals co-inhabited the planet in various constellations. The fact that DAP in this way indirectly contributes to our apprehension of the human story is not self-defeating or incoherent but rather illustrates that the evolution of our species cannot be divorced from the evolution of the larger Earth-system, including the histories of other animals. To understand this ‘more-than-human’ condition of deep prehistory, we need to ask not only what animals can do for humans, but also what humans can do for animals, and what the ramifications are.

Importantly, animals in the Zoocene not only come into view as ‘good to eat’ (Harris 1985) or

‘good to think with’ (Lévi-Strauss 1963, 89), but as sentient beings ‘[good] to live with’ (Kirksey/Helmreich 2010; Culler 2013), and the power relations between hominins and animals appear to be generally precarious with much leeway (and often the need) for coordination and negotiation. Under Zoocene conditions, animals are arguably quasi-political actors, greatly influencing the eco-cultural politics of the multispecies deep past. The likely underestimation of the ecological impacts and roles of hominins in the Zoocene, including anthropic ‘landscaping’ (Foley/Lahr 2015) and low-level ecosystem manipulation (Boivin et al. 2016; Kindler et al. 2020; Maring/Riede 2019), should not detract our attention from the basic circumstance that these influences seem to be fairly local, with little or no Earth-system effects of cascading potential (Foley et al. 2013; Hamilton 2016). This being said, the Zoocene hypothesis not only entails an argument about the anchoring and distribution of Earth-system agency beyond the confines of the human, it also reinforces the necessary attention to climatic, ecological and zoological deep-time difference and alterity. Much of the attraction of DAP, it could be argued, derives precisely from the realisation that many ecosystems and animal communities of the Zoocene have probably differed substantially from today’s operative ecosystems and zoological communities – we are frequently dealing with **non-analogue** environments and animal community structures (Faith et al. 2019; Stewart 2005).

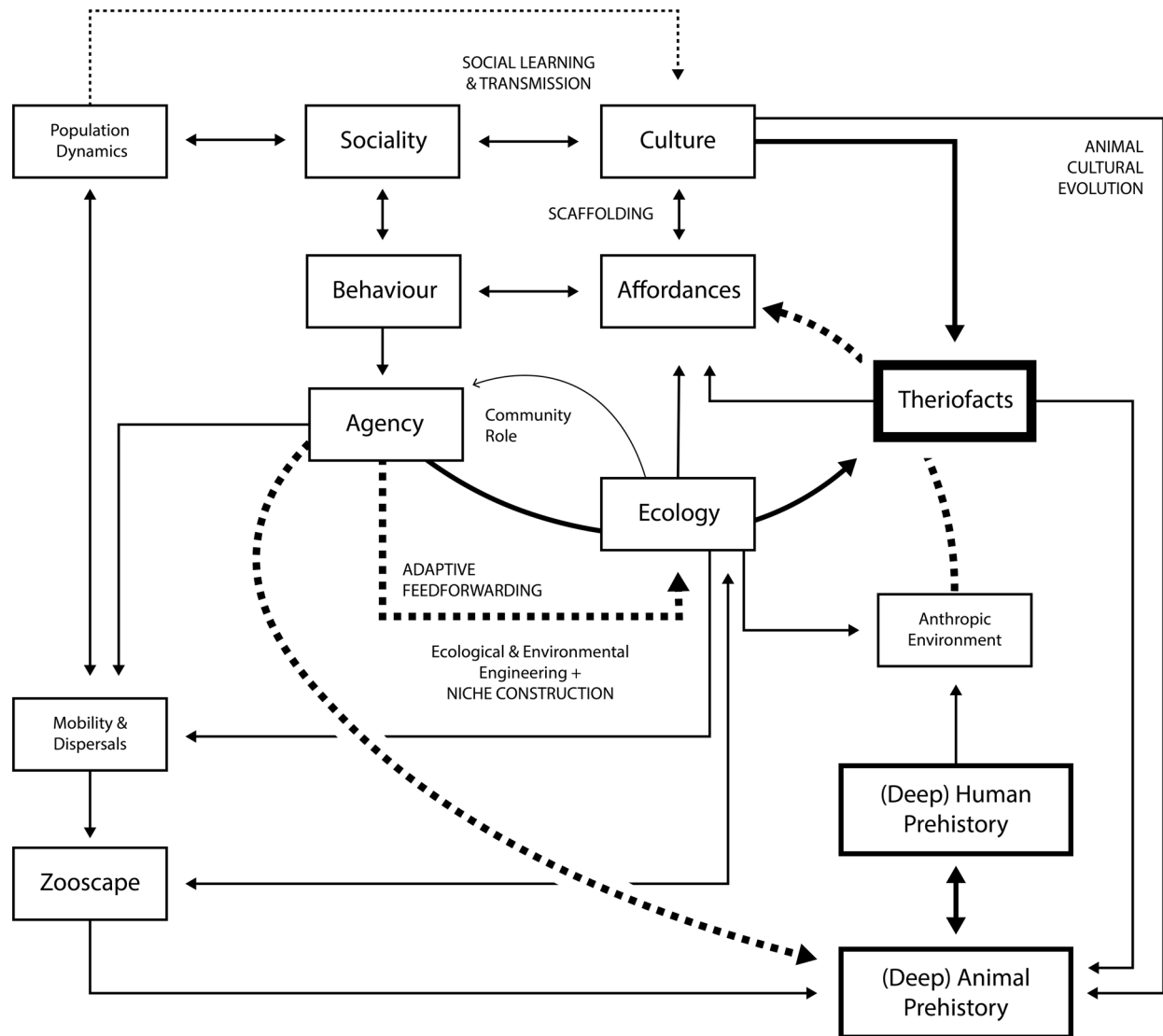
While this condition furnishes some epistemological and methodological challenges for the study of animal agentivity and ecosystem evolution, it also exposes a largely unexploited opportunity: to understand historically unique and now ‘fossil’ articulations of animal life and animal-ecosystem feedback loops. DAP thus frames a peerless laboratory for the examination and comparison of alternative modes of animal behaviour, affect and ecosystem relationships (Graham 2005), and the long-term consequences of these various agencies, for landscapes and ecosystems at large, as well as for hominin neighbourhoods. Notably, the gained insights and learned lessons of such investigations can inform contemporary quandaries in ecosystem restoration and wildlife conservation (Dietl 2019; Kost/Hussain 2019).

#### 4 Key Concepts and Perspectives of DAP: a Preliminary Exploration and a First Inventory

Deep Animal Prehistory (DAP) is predicated upon transdisciplinary research at the interface of archaeology, archaeozoology,<sup>5</sup> palaeontology, palaeoecology, palaeoclimatology, palaeogeology, the variety of archaeological sciences, ethology, zoology, wildlife conservation, ecosystem management, historical ecology and the science of animal behaviour, psychology and cognition, to name only the most important disciplines. But DAP is also an attempt to re-ignite the dialogue between the ‘scientific’ investigation of the deep past and conceptually ‘thick’, interpretive and critical perspectives derived from the humanities, gathered under multidisciplinary strands of research such as human-animal studies (DeMello 2012; Kalof/Fitzgerald 2007), multispecies anthropology (Kirksey/Helmreich 2010; Ogden et al. 2013), more-than-human geography (Hodgetts/Lorimer 2015; Philo/Wilbert 2000), animal history (Fudge 2000; Nance 2015) and zoosemiotics (Maran et al. 2016).<sup>6</sup> DAP seeks to extend these latter perspectives into deep time, to marry them with concepts and methods from the palaeosciences, and to ultimately re-calibrate the study of the past in terms of its animal horizons. DAP generally promotes an integrated approach to the diversity of animal agency in the deep past and its various long-term consequences. DAP also seeks to collate, synthesise and cultivate promising research concepts and interpretive perspectives from the partaking disciplines. This will help to qualify, elucidate and compare the dynamics and ramifications of non-analogue past animal behaviours.

<sup>5</sup> Archaeozoologists and bioarchaeologists have long been preoccupied with similar concerns as DAP, and have developed some important conceptual and empirical resources to investigate the deep history of animals. Some of these resources have recently been drawn together under rubrics such as ‘social zooarchaeology’ (Marciniak 2005; Overton/Hamilakis 2013; Russell 2012) or ‘ethnozooarchaeology’ (Albarella/Trentacoste 2011). Notable is also the recent coinage of ‘multispecies archaeology’ (Harris/Cipolla 2017, 152–170; Pilaar Birch 2018).

<sup>6</sup> This transdisciplinary vision resonates with the work of Sykes et al. (2020), although DAP puts deliberately more emphasis on humanistic and interpretive research angles.



**Fig. 3.** Conceptual roadmap of investigating animal agency and legacy in the deep past (see main text for in-depth exploration of the included categories).

Fig. 3 provides a provisional roadmap of core research domains and their possible interrelationships to be addressed and explored by an integrated DAP approach. The roadmap is broadly modelled on its human counterpart and outlines possible trajectories of animal-centred inquiry and showcases the complexity and multidimensionality of understanding animal agency, landscape ecology and history-making in the deep past. The remainder of this section offers a preliminary inventory of key concepts and research perspectives drawn together from some of the key disciplines to inform and anchor a consolidated and truly transdisciplinary DAP.

#### 4.1 Agency, Ethology and Taphonomy of Animals

Mitigating ‘animal blindness’ (York/Mancus 2013) in the study of the deep past requires the recognition and theorisation of animal subjectivity, sentience and intentionality (Brittain/Overton 2013; DiNovelli-Lang 2013; Hill 2011; 2013; Hussain 2019b; Pearson 2013; Poole 2015). Following the critique and the many insights of the ‘animal turn’ in the humanities and social sciences (Andersson Cederholm et al. 2014; Kalof/Fitzgerald 2007; Marvin/McHugh 2014; Ritvo 2007), but also long-standing observations by biologists, ethologists and ecologists

(see especially Naiman 1988), animals are poorly understood as responsive agents shackled to their natural environments, climate milieus and ecosystems (i.e. they are not merely ‘re-actants’). To the contrary, animals often play proactive and foundational roles in shaping, supporting and nurturing these environments (Leino et al. 2017; Overton/Hamilakis 2013) – they thus regularly assume a status as ‘actants’ or even ‘pro-actants’ (following the terminology developed by Latour 1991 in his symmetrical anthropology) and as such supply critical ecosystem services. Animals generally bring their own agendas and motivations into play, and although these can in part be illuminated by invoking energy trade-offs and basic cost-benefit calculations, there is a sense of agency to be found in animal life that cannot adequately be captured or understood by ecological, economic or functional reductionisms (Kost/Hussain 2019; Locke 2013; McFarland/Hediger 2009; Roscher 2016).

Rather than re-casting animal behaviour as the **outcome** of more foundational causes, mechanisms, processes and agencies, we must begin to develop and cultivate a model of animal agency in which the latter is reciprocally linked to its natural environment, the biophysical constitution, the wider horizon of aspirations and needs of the animal under consideration. Animal agency must be recognised as an integral part of complex ecological and social networks, directly contributing to the shape, structure and internal dynamics of the larger ecosystems in which animals operate (e.g. Sultan 2015; Walsh 2015). Overcoming the ingrained tendency of simply equalising animal behaviour with the ‘inert’ environmental backdrop of early human evolution requires a more critical, emancipatory and system-level analysis of animal-environment relationships, including, but not limited to, the meticulous re-assessment of animal-environment mapping functions and the careful exploration of behavioural predictions derived from environmental and climatic parameters (see also e.g. Robinson et al. 2021). A key task here – often overlooked due to prevailing correlationist preoccupations – is the active (and attentive) search for **mismatches** and **violations** of theoretical and predictive expectations, for example, in terms of surprising and unsettling animal-landscape associations. Asynchronised trajectories

of behavioural and physiological animal evolution (Lister 2013b) can thus yield significant insights on the role and long-term legacies of animal agency in the deep past. The remote past is an ideal playing field for this type of comparative, diachronic and confrontational animal-centred research because of its unique temporalities and its many non-analogue animal communities and environments (Faith et al. 2019; Graham 2005; see above). DAP foregrounds the causal role and efficacy of animals in the formation of these deep-historical patterns and constellations and calls attention to the possibility that animals make and pre-structure their own history rather than being enslaved by the histories of others, for example of environments, climates, or human societies.

What is needed, therefore, is a proper palaeoethology of animals which examines rather than pre-casts past animal-environment articulations and maps out both ultimate and proximate causes of variation in animal behaviour and evolution (*sensu* Tinbergen 1963; Alcock 2001). The millennial-scale observations and patterns of the deep past offer an unparalleled opportunity to arrive at a more nuanced understanding of the modulating role of animal agency in long-term zoological and environmental change. The concept of ‘agency’ as being developed, criticised and refined in ‘more-than-human’, multispecies or interspecies studies, and animal history, in particular, is a useful point of departure (Carter/Charles 2013; Howell 2019; Nance 2013; Pearson 2013; Steward 2009; Wirth et al. 2015). Agency goes far beyond the traditional rendering of ‘behaviour’, but is broadly compatible with accruing developments in extended evolutionary theorising, where organismic **agency** has recently been re-discovered as a fruitful locus of inquiry (e.g. Brizio/Tirassa 2016; Okasha 2018; Soto/Sonnenschein 2020; Walsh 2015).<sup>7</sup> Agency adds a further dimension to Tinbergen’s four ethological questions and explanations

7 Walsh’s ‘Situated Darwinism’ is a paramount example of the resurgence of ‘agency’ as a key concept in modern evolutionary thinking, as well as in the philosophy of biology. Walsh introduces the concept of agency to overcome what he perceives as the inherent fractionation of the Modern Synthesis in evolutionary biology, rendering living organisms mostly passive and sometimes even epiphenomenal entities (Walsh 2015).



(ontogeny, phylogeny, mechanism and function, Tinbergen 1963) and can be smoothly integrated into the list of focal topics (developmental bias, developmental plasticity, inclusive inheritance, niche construction) addressed by the nascent Extended Evolutionary Synthesis (Laland et al. 2015).

A central challenge of theorising and studying agency in non-human animals is that one cannot simply appeal to the traditional and (in Western thought) deeply embedded human benchmark categories such as free will, rationality, reflexivity, deliberation, moral responsibility or even higher-level intentionality (Howell 2019). Doing so would betray the central ambition of DAP: to circumvent and, if possible, overcome an anthropocentric frame of reference. Ongoing debates and controversies in human-animal studies and in history on the question of whether or not non-human animals can be reasonably said to possess agency of a relevant kind – especially the various arguments tabled to show that they supposedly cannot – only demonstrate how difficult it is to arrive at a satisfactory and inclusive definition of agency when appealing to overdetermined human categories.<sup>8</sup> These categories have long been regarded to index a space of human exclusivity, though they are now increasingly relativised or even entirely called into question by the observational animal sciences and their allies (Anderson/Perrin 2018; Whiten 2019). Most, if not all, attempts to make a case for agency-poor animals cannot avoid falling back into some trait-based human exclusivity presumption, which is either conceptually or empirically problematic, or both. The problem is not so much whether animals have agency – they most certainly do – but how their agency can be characterised and studied and how it

relates to human agency (see especially Howell 2019 for a thoughtful exposition of the issue).

Animal agency can, in principle, be discussed along two lines: as a ‘negative’ and emancipatory capacity or as a ‘positive’ and proactive faculty. In the first case, activities and behaviours that contribute to the animal’s capability to resist, withstand, oppose or counteract other actors and agencies are emphasised (e.g. Hribal 2010; McNeur 2014; Warkentin 2009). Two variants of this negative agency of animals have been deployed in the literature. Both are closely related but have been developed in different disciplinary contexts. The first, devised in human-animal studies and animal history, is centred on the idea that animal agency introduces tension and resistance to the world – especially to human actions, intentions and ambitions – so that possibilities and potentialities of actions and situated horizons of behaviour and thought are reconfigured (see especially contributions in Hribal 2010). This concept comes close to Bennett’s invocation of ‘resistant force’ and her notion of ‘recalcitrance’ and may generally be linked to the ability of animals to initiate relations of dependency which limit and constrain other actors and forces, drawing the latter into particular agential pathways or re-calibrating their behavioural options (Bennett 2010).

The second variant of negative agency is based on an animal-oriented re-appraisal of the classic structure-agency debate in social theory. Agency here refers to ‘the ‘negative capacity’ of individuals to empower themselves beyond the constraints of their social and institutional worlds and to ‘co-constitute’ this social world rather than simply be determined by superindividual ‘social structures’ (Howell 2019, 199). In a more-than-human world, structure not only refers to the structural framework of human society, but also to the environment, the organisation of larger ecosystems and species-transgressive ecocultural relationships. Animal agency, in this view, may also be found in the capacity to express behaviours or develop social habits despite counteracting agencies, selective pressures and adaptive needs. But agency similarly rests on the propensity to co-construct (for example, through reciprocal causal involvement) those relationships and dynamics which are formative for the landscapes and ecosystems

<sup>8</sup> The ambition of inclusivity does not undermine the argument here. The appeal to inclusivity is purely theoretical and does not imply that animals have to be included. Inclusivity merely demands that the foundational criteria and categories underpinning our conception of agency cannot be human exclusive by definition, and must in principle leave room for more-than-human applications, although in reality, it might still turn out that this is not the case. It is the theoretical possibility for including other organisms into the realm of agency that is important. Needless to say, the appeal to inclusivity also counters normative views of the natural order, according to which agency is a higher-order expression of a supposed (universal) hierarchy of life.

in which animals live and act. While the second variant of negative animal agency may be partially captured by the idea of ‘niche construction’ (see below), the first calls for a concerted investigation and re-appraisal of **decorrelated** patterns of human-environment association writ large (see above).

The second, positive and proactive dimension of animal agency is perhaps the most informative for DAP since it speaks to an animals’ ability to directly – and not only indirectly – induce change in other compartments of reality (Howell 2019, 207–209). Positive animal agency elevates non-human animals to possible *agents provocateurs* of deep-historical change. This type of agency supports the ambition of moving beyond the human benchmark in the theory and study of past animal agency. Animal agency, in this view, is then broadly understood as the capacity to make a difference in the world and to actively contribute to the make-up and dynamic ‘becoming’ of the world (Carter/Charles 2013; Pearson 2013; Steward 2009). This positive agency can be spelled out in different ways but the emphasis is always placed on the ability of animals to **make something happen**, including the promotion and catalysation of change and stability.

Whether the relevant agential qualities can be located within the animal *sensu stricto*, or rather appear to be distributed across different actors and entities does not matter as much as long as the difference-making effects and the agential contribution of the animals are discernible. As long as the specificity of the animal contribution is not fully absorbed in interrelationships, actor-network-agency (Latour 1991), ‘conactive’ agency (Bennett 2010), assemblage agency (Deleuze/Guattari 1983; Jarvis 2018) and other forms of relational agency, the conjured articulations and agential constellations can be of great interest to DAP. Animal agency may, for example, simply consist in the supply of semiotic relationships underpinning the cultural lives of both humans and other animals in the same environment (Kohn 2013).<sup>9</sup>

<sup>9</sup> Note that what Howell (2019, 202–204) refers to as ‘ascribed animal agencies’ can in principle be subsumed under the effects of animal behaviour, albeit as a particular effect on human societies of course.

Likewise, positive animal agency may subsist in the fabrication and provisioning of specific ‘affordances’ – actionable options and invitations (see below) – which are exploited by other agents and may consequently re-furbish larger ecosystem dynamics. It is, therefore, often useful to distinguish between the capacity of animals to directly shape events and situations through their behaviours and actions and their capacity to more subtly influence the course of history through their ability to manipulate, re-arrange and possibly subvert the broader conditions of history-making itself.<sup>10</sup>

The important point for DAP is that there is probably no universal manifestation of animal agency insofar as the latter is always bound to the bio-cognitive specificities and potentials of the animals in question, to their specific ways of being and becoming and to the situated relationships they uphold with other lifeforms. Animal agency depends on the make-up of the animals in question and is thus most likely much more historically variable than commonly granted. This exposition alone may be enough to suggest that the study of animal agency requires multidisciplinary collaboration in a vocal transdisciplinary and ‘transepochal’ spirit, and also needs to be ready for radically **historicising** animal agency in deep time. DAP, in other words, must refrain from the presumption that past animals are equipped with particular, quasi-eternal agential qualities and instead insist that the agential qualities of past animals were probably diverse and fundamentally amenable to historical change. It remains a key empirical task of DAP, and also a central goal, to trace and map this agential diversity. The deep past is not only a formidable arena of investigating this diversity because of its unrivalled temporalities, but also because it harbours many now-extinct species. Fossil animal communities as well as fossil animal-environment constellations, enable a systematic exploration of the varying capacities of animals to make a difference under dramatically disparate conditions based on their specific bio-physical constitution,

<sup>10</sup> Although not precisely congruent and partly still rooted in anthropocentric terminology, Roscher’s distinction between *Handlungsmacht* (power to change through acts/behaviours) and *Wirkmacht* (power to change through effects) is also relevant here (Roscher 2016).

their status and their place in the landscape as well as their shifting relationships with other beings.

Taphonomy also provides surprising opportunities and resources to inform the study of animal agency in the deep past. From a more-than-human perspective, understanding taphonomic processes inserts corrections to oversaturated human-centred interpretations. Taphonomic analysis enables the diachronic examination of concrete material consequences of animal landscape interference (Pasda 2012), for example, by investigating animal-framed formation histories of archaeological and palaeontological sites and deposits (Brain 1981; Kuhn 2011; Lyman 1994). Unsurprisingly, animals are important formative agents of the material record of the deep past, and taphonomic analysis, coupled with traditional archaeozoological research and palaeoenvironmental reconstructions, can thus reveal unique behavioural signatures of past animals (Kourampas 2012). Taphonomic studies often have the potential to violate actualistic expectations (Smith et al. 2013), thus disclosing promising avenues for future animal-oriented inquiry.

Another notable window into the mutability and diversity of past animal agencies opens through interdisciplinary research integrating archaeological, zooarchaeological, isotopic and other biomolecular lines of evidence (e.g. aDNA and ZooMS) about the ecosystem or landscape-scale behaviours and effects of Pleistocene animals (e.g. Bocherens 2015), including the focused exploration of possible patterns of long-term human-animal co-adaptation and affordance building (Baumann et al. 2020b; Hussain/Floss 2015).

#### 4.2 Affordances of the Animal-Environment Nexus

Another way of theorising and studying past animal agencies is by exploring so-called ‘affordances’ at the animal-environment interface. The notion of affordance, initially proposed and developed by ecological psychologist Gibson (1966; 1979), offers a means to re-think animal-environment relationships in ecological terms, that is how animals – given their specific physiological, behavioural and cognitive resources – intersect with and attend

to their natural (and possibly constructed) ecologies (Ingold 1988; 1992; Reed 1988; Sanders 1997). Broadly conceived, affordances are **actionable options** that emerge at the interstices of organisms and their natural and social environments. Affordances ‘invite’ behaviour, but they can also be created, re-modelled or erased by different behaviours, and some affordances are a structural precondition for particular types of observable behaviour in living organisms. Affordances help explain why animal behaviour is normally contingent on particular ecological clues but never fully determined by these external environmental stimuli – the ‘distance’ between environmental imperatives and observed behavioural performance and variability thus creates room for an affordance-theoretical perspective on animal agency.

In the context of animal agency, the concept of affordance has a threefold purpose: (i) it draws attention to the importance of the specific nature of exposition between animals and their environments; (ii) it undermines overly-mechanistic theories of animal behaviour, highlighting the self-referential and co-constitutive dimension of this behaviour; and (iii) it shifts the attention away from narrow talk about causality and constraints to a broader concern with behavioural incentives, possibilities and potentialities and their structural conditions.<sup>11</sup> Affordance underscores, and powerfully re-theorises, the often-underestimated leeway of animal action in a given environmental setting, and further illustrates the promise of understanding animal agency in relation to opening and closing windows of actionable opportunity.

At the heart of the affordance concept lies the recognition that all realised behaviour of organisms is conditioned both by the intrinsic characteristics and qualities of the active organisms themselves – that is, their biological make-up, dispositions, capacities and social needs – and by the configuration of the physical environment in which their behaviour is executed (Reed 1996). Furthermore, appealing to affordance acknowledges that not every feature in the environment

<sup>11</sup> This emphasis on ecological ‘structure’ enables us to link affordance theory with general debates on structure-agency dialectics in sociocultural theory alluded to in the previous section.

is equally relevant or meaningful to any organism in any given situation. In other words, animal agency is typically underpinned by some form of coordination between the intrinsic properties of the target animal and the intrinsic properties of its external environment; it is also highly situational. Affordance theory enables to acknowledge and make sense of this configuration.

This perspective dispels strong claims of animal heteronomy and makes room for the behavioural autonomy of animal others, without necessarily alleging perfect self-determinacy. For example, an ant and an eagle have dissimilar access to the same environment. Ants are much smaller than eagles and may thus only interact with different objects and aspects of the same environment, but they are eusocial animals and navigate the landscape in a fundamentally different way than eagles do, not only because of their specific locomotor capabilities, but also because ant movement in the landscape is mediated by distinct social relationships, clues, needs and imperatives. The behavioural options and the eco-social structures in which the two animal behaviours are embedded are therefore very different, as are the motivations and the associated trade-offs of their environmental interactions. Studying the realised behavioural options of particular animals under changing historical and ecological conditions is an important avenue of understanding animal agency both in its situationality and historicity. Affordance theory promises to help in identifying, describing and qualifying the available space and topology of these actionable options.

Affordance theory also highlights that environments are never strictly given, they always present themselves in particular ways to their inhabitants and can thus be navigated, manipulated, managed and exploited in a myriad of different ways. The utility or function of a feature or object of the environment can not be separated from the specific **being** of the animal under investigation. This means that the behaviours of other animals and other members of the same species or group contribute to the total space of actionable options in a given setting which is relevant to configuring an animal's behaviour – it is the relationality and exposition of the animal and its socio-ecological environment which propels and motivates particular

actions. Animal behaviour is therefore both driven by affordances and it is possibly affording in itself by continuously creating novel affordances or manipulating pre-existing affordance structures and/or conditions. Needless to say, this presents yet another way of theorising and exploring agency in non-human animals. How animals harness as well as dynamically make and unmake affordances on different spatial and temporal scales is of special relevance to DAP because such a perspective promotes the **animal-centred** analysis of behavioural options and possibilities. Affordances are always contingent on the 'lifeworlds' and the 'horizons' of the animals in question (Lijmbach 1999) as well as on the field of significances tied to distinct animal positionalities and ecological niches in the world. Affordances greatly contribute to the characterisation and qualification of different ways-of-being-in-the-world associated with differing animal taxa and help to explore the ramifications of animal-specific *Umwelten* (*sensu* Uexküll 1921). Following Uexküll's seminal work and recent developments in zoosemiotics (e.g. Maran et al. 2016; Martinelli 2010), it should be possible to develop a proper animal perspectivism here: a stance of research which both acknowledges and illuminates the unique placement and world-making capacity of animal others.

Exploring and comparing affordances at the animal-environment interface in the deep past is ultimately promising because it furnishes new theoretical and empirical resources to develop animal-oriented perspectives on how different animals co-construct their habitats and how they interact with them. Such a perspective is also useful because the deep past has seen both long-vanished landscapes and animals, the relationship of which can be re-examined and mapped by utilising the resources and comparative framings provided by affordance theory. Affordance theory further allows to effectively integrate available data on animal physiology, adaptation, diet, mobility and evolution with information on changing palaeolandscapes, climates and ecosystems and to interpret the resulting relationships in terms of interaction, coordination and agency, thereby shedding new light on the **variability** and **context-dependency** of animal behaviour in deep history and the changing logics of covariation

between past environments and the structure of animal agency and population-level behaviours.

### 4.3 Animal Construction of Environments and Ecosystems

Animals actively contribute to the production, maintenance and transformation of the ecospace in which they live and this ecological agency has long been recognised and analysed both in animal ecology and wildlife/ecosystem conservation studies (Caro 2010). Keystone species – a notion initially coined by zoologist Paine (1969) – denote animals who (relative to their overall abundance in the landscape) have disproportionately large effects on the shape, structure, dynamics and composition of their local environments (Mills et al. 1993). Many apex predators can be considered keystone species, but keystone species also include large herbivores and megaherbivores such as proboscideans who impact vegetation cycles and regulate carbon budgets within their ecosystems (Asner et al. 2016). Foundation species – following Dayton (1972) – denote organisms who play outstanding roles in structuring the ecological community in which they live from the bottom up and on a landscape scale (Crotty et al. 2019). Foundation species provide some of the most essential ecosystem services/functions and anchor key interactions in space and time. Most foundation species are plants, however, since these are often indispensable to the resilience, stability, biodiversity and viability of larger ecosystems (Angelini et al. 2011; Thomsen et al. 2018), especially marine environments (Altieri/Van De Koppel 2013). Umbrella species, finally, is a conservation-oriented term to identify and characterise organisms whose protection indirectly protects other organisms who occupy the same environments or habitats (Caro 2010, 99–125; Wilcox 1984).<sup>12</sup>

<sup>12</sup> Another frequently used conservation-oriented term in the literature is ‘flagship species’ (Heywood 1995). Flagship species comprise ‘charismatic’ or other culturally or psychologically appealing animals which may serve as incentives, rallying points, icons and/or powerful symbols for larger conservation and restoration projects. This category speaks of the perception and reception of animals in human societies and only indirectly appeals to the agency of the animals in question.

Umbrella species are often represented by extremely mobile, wide-ranging and relatively large-bodied animals whose requirements include, or substantially overlap with, those of many other species (Launer/Murphy 1994; Ozaki et al. 2006).

These concepts operate on varying levels of description and observation and highlight different aspects of an organism’s role and place in its ecosystem. They are thus not mutually exclusive and often help to describe different aspects of animal agency and ecosystem legacies. Many umbrella species are simultaneously keystone and/or foundation species and the relationships between the two and their ecosystem significance is an empirical question, depending on many different contextual factors including the nature and structure of plant and animal communities, the observed interactions and mutualisms and the type of shared environments in question. Keystone species are central touchstones of their respective ecologies because they often construct at least part of the landscapes and environments they inhabit (e.g. megaherbivores) or regulate the trophic pyramid and energy flow in their wider ecosystem (e.g. apex predators). Foundation species provide some of the principal ecosystem resources (e.g. primary consumable biomass) and root the trophic pyramid as well as facilitate and/or catalyse a wide range of organismic interactions. These are only tendencies at best, of course, since ecological ‘facilitation’ (McCoy et al. 2012) or ‘probiosis’ (Reshef et al. 2006) are often also a consequence of keystone species’ behaviour (e.g. Bruno et al. 2003). It is the kind of ecological facilitation and its wider systemic ramifications and dependencies that matters most for our understanding of animal-ecosystem interplays, both past and present. This emerging recognition is also illustrated by the notion of ‘ecosystem engineering’ which has gained substantial traction in the ecological sciences in recent years (Alper 1998; Jones et al. 1994).

Ecosystem engineers actively modify, maintain and/or create habitats (Jones et al. 1994; Hastings et al. 2007). In contrast to relatively widespread behaviours altering features of the environment to the benefit of the actor, ecosystem engineering characterises behaviours that change broader conditions of interaction and adaptation on local to global scales, affecting and possibly re-fashioning

the behaviours and ecological relationships of many other organisms within the same ecosystem (Jones et al. 1997; 2010). Ecosystem engineering emphasises but is not limited to resource modulation, community assembly and indirect interaction. Early approaches to ecosystem engineering have distinguished between ‘autogenic’ and ‘allogenic’ engineering. Autogenic engineering describes behaviours in which ‘the structure of the engineering species itself alters the environment, such as tree leaves that fall on the ground and change soil conditions’ (Altieri 2015). Allogenic engineering, by contrast, describes behaviours that create or contribute to the creation of novel habitats or key resources of which the engineering organism is itself not a part of, as illustrated by beavers who dam creeks or rivers and create ponds and marshland, which in turn become vibrant and attractive living spaces and foraging grounds for other plants and animals.

It is critical to differentiate the varying scales and effects of ecosystem engineering. Organisms may shape the structure and resource-distribution of entire ecosystems, or they may construct local environments and place-specific subsistence opportunities. Organisms may, in this way, create living spaces, hunting and foraging grounds, shelters, resources, movement possibilities, specific patterns and cycles of edible, camouflaging or protective vegetation and so forth. In addition, some organisms may be better categorised as ‘environmental engineers’, while others shape the function of larger transregional ecological networks. Both keystone species and foundational species can be ecosystem engineers. Corals, for example – paradigmatic foundational organisms of marine reef ecosystems (e.g. Wild et al. 2011) – construct the reef habitat, furnish its basic material resources and facilitate a large range of coral-other and other-other relationships in this ecosystem. The point is that animal agency is a foundational pillar of the natural world; there is a rich reservoir of concepts and ideas from which we can deepen the understanding of and differentiate various animal agencies and their consequences.

Niche construction theory (Laland et al. 1999; Odling-Smee et al. 2003) is another perspective that enables the examination of the evolutionary consequences of animal ecological engineering

and may help to further the quality and scope of animal agency in deep-time. Niche construction occurs when animals manipulate and transform their physical and social environments and thereby **pre-structure** their evolution and, by extension, the evolution of other living beings who intersect with them in the landscape. Classic niche construction theory invokes an independent pathway of inheritance – labelled ‘ecological inheritance’ – joining established biological and cultural inheritance systems (Riede 2019). Ecological inheritance can be described as the landscape and ecosystem legacy of animal histories, especially the transfer of altered and constructed ecologies to subsequent generations. Niche construction underscores the reciprocal interaction between organisms and their environments and the causal coupling of organism-ecosystem arrangements. Through niche construction, however, animals not merely impact the world around them; they modify and often re-model the selective pressures operating on them, thus influencing their long-term patterns and trajectories of behaviour (Odling-Smee et al. 2003).

Niche construction is about the active interference of animals with their natural environments and evolutionary developments and expresses both the negative, emancipatory and positive, proactive forms of animal agency outlined previously. Exemplary and well-established empirical cases of animal niche construction include earthworms, beavers and boars, as well as ants and termites who re-fashion entire landscapes and are also able to sustain them over extended time-scales, building on previously constructed physical structures and affordances (Barker/Odling-Smee 2014; de Schaetzen et al. 2018; Jouquet et al. 2011; Wright et al. 2002). Niche construction generally illustrates the co-evolutionary involvement of animals in the assembly of larger ecological communities, which in turn take advantage of the created opportunities and habitats, thereby dispelling the myth of the inert and merely reactive animal.

From a DAP perspective, niche construction can inform our understanding of cascading regime shifts in past landscapes and animal assemblages. In contrast to ongoing scholarly discussions on the dramatic extinction of large megafauna at the end of the last Ice Age, in which proponents of

a ‘climate hypothesis’ are pitted against defenders of the ‘human impact hypothesis’ (Sandom et al. 2014; Araujo et al. 2017; Louys/Roberts 2020), animal niche construction provides an alternative explanatory framework for understanding the demise of past ecosystems in terms of animal agency itself, or rather the **lack** of particular forms of animal agency and its irreversible ecological consequences (whether additionally mediated by climate change and human interference nor not). As soon as the now-vanished Pleistocene ecosystems in question are recognised as partially co-constructed by animals (Bocherens 2018; Doughty 2017; Doughty et al. 2013; Owen-Smith 1987; see above), the loss of these ecosystems may be conceived as a result of missing or fundamentally restructured animal-centred ecosystem functions and services provided by past keystone and/or foundational species, eventually leading to systemic destabilisation, collapse and reorganisation (Mahli et al. 2016).

The deep-historical specificity of ecosystems such as the iconic Eurasian mammoth steppes (Guthrie 1990; Hofreiter/Stewart 2009) may be explained by appealing to distinct configurations of animal agency and their emergent system- and community-level effects. It is long suspected that mammoths were important keystone species and potent ecosystem engineers in the glacial, open steppe environments of Pleistocene Northern Eurasia (Johnson 2009; Haynes 2012; Hussain/Floss 2015) – environments which effectively also disappeared completely together with the demise of these megaherbivores at the end of the last Ice Age. The current Holocene period may similarly be reconstructed as a long-term ecosystem-consequence of the gradual extinction of large-bodied animals around the globe and the related shift in biodiversity, ecological structures and climates. The idea of the previously discussed Zoocene also supports this perspective.

Analogies from the present day help to illustrate the relevant structural linkages of animals and ecosystem function and elucidate the potential role of specific animal agencies in past ecological transitions at varying scales. A paradigm case is the North American bison, whose mobility and grazing behaviour greatly influences the growing pattern and distribution of plants, thereby

modulating the spatial behaviour of other grazers and birds in the same ecosystem (Geremia et al. 2019; Knapp et al. 1999). The animals engineer the so-called ‘green wave’ of the North American short-grass steppe (Geremia et al. 2019) and thereby increase the nutrient content of plants between 50 and 90% by the end of the summer, shaping large-scale patterns of animal-ecosystem interaction. Another paradigm case is the wolf’s now renowned ‘ecology of fear’, illuminated by the media-effective re-introduction of wolves to the Greater Yellowstone ecosystem in the north-western United States (Ripple/Beschta 2004). The Yellowstone experiment has revealed the critical importance of trophic cascades in the maintenance of biodiversity and vegetation heterogeneity in larger ecosystems, especially the significance of (under normal conditions) indirect predator-herbivore relationships that are difficult to observe and quantify. Long-term observations from Yellowstone demonstrate that predation risk, even if normally non-lethal, can structure larger ecosystems and regulate the interaction patterns of co-existing plants, herbivores and carnivores. For instance, preventing herbivore species from overgrazing particular areas and controlling growing cycles balances out the effects of rumination (Beschta/Ripple 2016; Smith et al. 2003). This indirect, and at first glance often intangible, role of predators in administering ecosystem relations as well as the risks and opportunities of grazing or browsing is also evident in other ecosystems (Ritchie et al. 2012; Srinivasan 2019). It is for example illustrated in the marine realm by the role of sharks in regulating broader ecosystem relations (Hammerschlag et al. 2015). These examples point to the central importance of animal agency in the assembly, function and evolution of ecosystems. Studying this agency in the deep past is essential to understanding environmental change, especially punctuated ecological transitions, in deep history.

Through the prism of DAP, animal ecological engineering and niche construction must also be evaluated in terms of their population histories and underlying social and cultural mechanisms and dynamics. The issue here is whether these consequential forms of animal agency have **historicity** – that is, whether they are learned,

transmitted, adjusted, perhaps varied between animal groups or populations and, more generally, whether past instances of these behaviours condition subsequent instances. Given the mounting evidence for widespread animal culture (Whiten 2019; 2021; see below) and our growing dataset on social learning and knowledge transmission underpinning animal behavioural domains such as mobility habits and land-use strategies (Jesmer et al. 2018), it seems reasonable to suspect that socio-historical factors are similarly mediating the expression of animal world-making agencies discussed in this section. Phylogenetic analysis has, for instance, produced some initial indications that lower termite nest-building activities evolved through time and that their capacity for collective construction is inherited (Mizumoto/Bourguignon 2020). With regards to the animal fossil record, it has further been argued that patterns of asynchrony between different domains of animal development point to the significance of ‘behavioural leads’ in directing the long-term evolution of animal behaviour and physiology (Lister 2013a). Taken together, these lines of evidence underscore the agential status of non-human animals and incentivise the creative, and sometimes radical, reconsideration of animal agency in the deep past.

#### 4.4 Theriofacts and Animal Materialities

Animal agencies, or at least some of their effects, are also documented in tangible signatures, patterns and material traces framed by the archaeological record. This materiality of animal behaviour represents a comparatively rich and long-term archive of information on how animals have shaped and impacted the various worlds they inhabited. Despite its evident and arguably unparalleled potential, students of the deep past have been slow in activating these datasets, and the vast majority of animal history continues to be written in ‘shallow time’, mainly based on human-fabricated documents such as historical reports, letters, photographs and drawings (Benson 2011; Kean 2012) and, more recently, also oral sources (e.g. Zehnle 2015). However, animal historians have repeatedly and persuasively pointed to the unique potential and promises of

material evidence for the exploration and comparison of multispecies and more-than-human pasts (e.g. Rothfels 2010; Swart 2015). Different material traces and source materials shed light on different kinds of animal activity and behaviours. These traces can also be investigated across varying observational scales – from micro to macro, from local to planetary – hence contributing in different, but often complementary ways to our growing knowledge on the history-making capacities of past animals. Material evidence may, in this way, elucidate animal site-specific behaviour of local scope, or instead illuminate landscape-scale behaviours affecting entire ecosystems and their long-term evolution.

Examples for material traces of the latter type – theriofacts of landscape-scale animal agency – are perceptually captivating. Widely visible polished rock surfaces attest to the deliberate and recurrent rubbing of larger groups of past herbivores, especially proboscideans, in the open landscapes of North America and elsewhere (Erickson/Parkman 2010; Haynes 2006). Another example of landscape-engulfing animal materialities is the impressive underground burrows of past giant sloth and armadillo populations of South America, which probably date to the pre-Holocene (Pereira Lopes et al. 2017; Vizcaíno et al. 2001). These palaeoburrows provide hitherto neglected opportunities to examine the geomorphology and formation history of past animal building projects and niche construction behaviours that work towards a proper ‘animal archaeogeomorphology’ (in analogy to the eponymous human-centred project described in Delannoy et al. 2013). These examples hold great promise to inform us about the local-to-regional effects of such animal structures in terms of past vegetation patterns, mobility strategies, processes of ecosystem assembly and interaction. The characteristic scratch marks of Eurasian cave bears, including the in-cave-systems of often widely distributed *Bärenschliffe* (Rosendahl/Döppes 2006), by contrast, illustrate material traces resulting from situated, often episodic interactions between animals and particular localities or physical mesoscale environments. Lastly, animal tracks and footprints from the Pleistocene period form yet another category of theriofacts with the capacity to elucidate the agency of animals in the deep



past. While some footprints capture single events and provide snapshots into past animal lives and interactions (e.g. Poschmann/von Berg 2020), other such traces enable the assessment of animal spatial behaviour and site-use rationalities, animal group size and even animal population structure (McNeil et al. 2005; Roach et al. 2016; see below). It should be noted that such animal-centred environmental legacies, materialities and productions have great history-making potential even if they do not immediately influence the action of other history-makers or directly impact contemporary multispecies assemblages. Landwehr (2020, 244–248) has recently framed the notion of ‘chronofences’ to flag and examine this historical potential beyond spatiotemporal immediacy. Chronofences are history-making effects that are temporally disconnected from the origin of the phenomena on which they centre, and they are often connected to the co-optation, re-imagination and re-signification of objects, locales and landscapes in later times, which can develop historical impacts even thousands of years after their creation.

Although their detailed state-of-the-art analysis can also lead to important insights about the ecological position and landscape-scale behaviour of their animal producers, theriofacts such as *in-situ* owl pellets or fossilised faeces (see e.g. Qvarnström et al. 2016 for a general review) provide hands-on material evidence for the presence of the respective animals at particular places in the landscape and throw light on the role of these places in past animal land-use systems. Pellets often designate localities as hideouts, sleeping or nesting places (e.g. Stoetzel et al. 2012); the presence and distribution of animal faeces, for example, dense concentrations of Pleistocene hyena coprolites, may help to qualify the nature of the animal occupations including the duration and timing of animal visits. This enables the investigation of domesticity and mobility in past animal populations and paves the way towards the comparative study of animal spatial organisation and settlement behaviour. DAP can build on previous works from palaeontologists, taphonomists and archaeozoologists here, e.g. to investigate spatial patterns and bone assemblage compositions in hyena dens (e.g. Discamps 2011; Mangano 2011; Marra et al. 2004). The goal is to broadly apply the

same techniques, approaches and methods that are routinely deployed in studying human spatial behaviour and to ask some of the same questions.

From the perspective of DAP, animals come into view as potent faunal accumulators with the capacity to create unique material patterns and object assemblages, and they also figure as significant agents of interference – manipulating, re-configuring and at times, overprinting the distinct materialities and activity traces of other landscape actors such as hominins (e.g. Camarós et al. 2017). This agentive interference of past animals is not only documented in alterations of a site’s spatial, structural or stratigraphic profile, but may also be reflected in trampling patterns or bite and gnawing marks preserved on the recovered faunal remains of other animals or even on hominin fossils themselves (Camarós et al. 2016). Examining these dimensions of the archaeological and palaeontological records provides robust, direct evidence for animal presence and agentivity, and for the role and enrolment of these animals in past webs of life. DAP asks whether the agential profiles and capacity for interference of the target animals have substantially changed through space and time; whether and under which conditions we can observe regime shifts in animal agency, interference and interaction; and how animals variously used and shaped specific places, locales or larger palaeolandscapes.

In addition, this research trajectory offers novel opportunities for contextualising bioarchaeological insights on significant evolutionary shifts in animal ecology and diet considering the material signatures of the target animal behaviours to understand the system-level dynamics and trade-offs underpinning these shifts. A paradigm example may be provided by the Eurasian Pleistocene cave bear, who experienced several notable shifts within more-or-less herbivorous dietary strategies across time and space (Krajcarz et al. 2016). Although the question of whether cave bears were strict herbivores or at least occasionally adopted more flexible omnivorous diets remains contested (Robu et al. 2013; Bocherens 2019), it seems clear that different cave bear groups and populations have produced distinct isotopic signals, indicating their behavioural plasticity and showing that dietary variation might be a group

and population-level phenomenon rather than a species-specific, phenotype-fixed trait (Krajcarz et al. 2013). Another flagship example is provided by pandas, whose ancestral representatives are thought to have been carnivorous or at least omnivorous (Qiu/Qi 1989), while contemporary giant pandas are prototypical herbivores, exclusively specialising in bamboo consumption (but this might also be partly due to the circumstance that most present-day panda populations have been pushed to the margins of their former range). Furthermore, giant pandas witnessed substantial niche contractions throughout their evolutionary history, probably as a consequence of their increasing dietary specialisation and habit-formation (Han et al. 2019), modulated both by increasing anthropic pressure and broader ecosystem changes. These examples generally underscore the ethological flexibility of non-human animals and the need for a more holistic and agent-centred approach to understanding past animal behaviours, identifying behavioural variability as a locus of insight.

#### 4.5 Attractions of Anthropogenic Milieux

The inversion of anthropocentrism – a key subversive manoeuvre of DAP – results in the important recognition of hominins as a potential key component of animals' outer ecologies and not in denial and glossing of human behaviours and influences. Just as non-human animals have traditionally been conceived as an inextricable part of the human environment, hominins and their behaviours must be approached as an inseparable part of the biotic environment of animals and contribute to animals' lives and ecological relationships. The animal horizon of behavioural possibilities and constraints, in other words, has to be explored also against the backdrop of human actions – local and regional. From the perspective of DAP, humans may provide other ecosystem services as other ecological agents, some of which may be of special relevance for analysing and understanding animal agency and landscape-scale behaviour, and human behaviours and socio-material productions should therefore be studied as a potentially

formative part of past animal-specific *Umwelten* (*sensu* Uexküll 1921; see above). As hyper-niche constructors (Smith 2007), humans modify and shape animals' outer ecologies on various scales and in various ways, probably even under Zooecene conditions. The relevant human factors can be subtle, however, ranging from the provisioning of alternative food resources over the spatio-temporal re-ordering of present resources to the anchoring of genuine 'ecologies of fear', and these ecosystem framings greatly depend on the ecosystem status of hominins – for instance, whether they were habitual, high-ranked carnivores or not – as well as on the socio-cultural imperatives which have dictated how hominins used, exploited and re-arranged the landscapes they inhabited. What has elsewhere been referred to as the 'anthropogenisation' of space (Kost/Hussain 2019) is a particularly promising locus of investigation since human spatial agency in the deep past – e.g. in the form of varying modes of settlement and place-making, low-level food production and other modes of low-threshold landscape management such as the burning of land or the modification of stream flows for catching fish – can create potent affordances and implies all sorts of behavioural attractors for other animals who co-inhabit the same landscapes with humans. The point here is not to fall back on the problematic claim that animal agency is determined by external human factors, but rather to draw attention to the fact that external agents, including humans, may intersect with animals and how they operate in the environment in meaningful ways, thereby disclosing new possibilities of action and interaction or altering pre-existing preferences and action-goals. That the presence of humans, as well as the physical structures they build and the socio-technical infrastructures they establish and leave behind, can make a real difference for the life and culture of animals (Boyd 2018; Clucas/Marzluff 2011; Lucas 2018) is richly illustrated by the emerging field of urban ecology and human-animal studies which examine cities and other human-made spaces as **multispecies meeting places** and **melting pots** (e.g. Atkins 2012; Clucas/Marzluff 2011; Kheraj 2017). From an anthropological point of view, moreover, even highly mobile groups with shallow,

short-term settlements can eco-engineer new vegetational structures or landscape conditions with larger-scale ramifications for other organisms including animals. In a seminal but rarely-cited paper, Politis (1996) has pointed out that habitually gathering and consuming selected plants and fruits by human foragers at particular locales, combined with regular residential shifts, can trigger the subsequent growth and overabundance of these plants at these localities, generating exploitable 'natural gardens' in the landscape which (in the long-run) attract other organisms but also 'pull back' the human groups in question and reinforce the respective emergent multispecies dynamics. Such places promote spatial overlap and notable ecological intersections between varying and perhaps even inconsistent human and animal 'taskscape' (*sensu* Ingold 1993; see below). They are ecocultural nexuses that transform the ways non-humans and humans attend to each other and how they operate in a shared environment.

Yet how animals benefit from their hominin neighbourhoods greatly depends on the animals in question, their needs and preferences, but also on their adaptability, behavioural flexibility and other agential qualities. Drawing on ecological concepts and terminology, two broad categories of how animals attend to human-created landscape opportunities can be distinguished. First, synanthropes denote wild animals who thrive in human-modified settings and often live close to human habitation or human-shaped habitats (Klegarth 2017; O'Connor 2013, 126 f.). Synanthropic animals may either be 'commensal', primarily profiting from human-elicited food sources and novel foraging or hunting opportunities, or they may be classified as 'edificarian', mainly taking advantage of physical anthropogenic structures and their respective living, sheltering and nesting affordances. Alternatively, there are 'environmental' synanthropes who prosper as a result of more indirect effects of human landscape utilisation, such as the manipulation of growing patterns and vegetation cycles discussed above. Many classic synanthropes are insects or birds and many combine commensalism with edificarianism, such as various rodent species. Non-human animals may also be negatively affected by hominin proximity,

however, and these animals form the behavioural category of antanthropes (O'Connor 2013, fig. 57). They avoid or even eschew human-touched areas and/or larger landscapes and their ecological success is often substantially hampered by human proximity, neighbourhoods and nearby environmental transformation. The kingfisher is a good example of an antanthropic animal. Most kingfishers require clean, high-quality water to forage; they are easily disturbed by human activities and they commonly depend on unregulated, non-canalised river-bank soils and vegetation to hunt, nest and reproduce (Kost 2019). In general, some animals exhibit strong synanthropic or antanthropic tendencies, while others have developed combinations of both, and appear to be synanthropic in certain regards while acting antanthropically in other respects, sometimes even deliberately shifting between both modes, depending on the context. These categories should not be regarded as essential qualities of the animals in question, but rather as behavioural tendencies amendable to change and subjected to evolution.

DAP always aims to also chart the long-term behavioural trajectories of animal-human interstices and intersections, and endeavours to ask whether and under which conditions animals have shifted their human-directed behaviours and strategies and why. The central ambition is to examine larger animal-environment systems and their co-evolutionary dynamics, potential path dependencies as well as self-reinforcing tendencies. Some animals may, for instance, develop particular biological adaptations to particular human-influenced environments with important but easily overlooked long-term changes in phenotype, ecology and behaviour, while other animals might gradually transition from environmental synanthropes to full-blown commensal species. Such processes are likely to foster larger ecosystem re-configurations, for example, when turned-commensal species open up new prey opportunities for other species which might, in turn, develop commensal tendencies themselves as a reaction. Studying the potential variability and historicity of non-human animals in the deep past generally requires one to recognise and examine how the behaviours of other effective agents in the landscape mediate,

and thus co-calibrate, the motivations, needs, adaptations and behaviours of the animals in question.

Paying attention to the human input to animal *Umwelten* should, therefore, open up novel research opportunities at the animal-human interface and help to supersede the reductionist impulse of radical DAP readings – animals always operate in a wider, shared world and their agency is to some extent contingent on this world and its internal dynamics. Early hominins and perhaps especially radical expressions of available ecological roles in the hominin lineage (for example, hypercarnivorous hominin forms such as Neanderthals or generalist-to-hyperherbivorous members of the *Paranthropus* genus) may then provide interesting opportunities to examine the agential space of other animals in the same landscapes. Neanderthals may, for instance, have acted as important carrion accumulators in the environment, providing critical feeding opportunities for opportunistic animal predators and various flexible scavengers, and archaeologists can assess this condition empirically from different perspectives. Late Pleistocene human settlement behaviour can similarly be analysed as supplying key ecosystem services and functions for animal others, especially for so-called ‘early adopters’ (O’Connor 2013), for example omnivorous scavengers such as corvids (Hussain 2019b; Tchernov 1984; 1993) and opportunistic carnivores such as foxes (Baumann et al. 2020a). DAP not only throws these relationships into new relief, but it also helps to recognise, theorise and ultimately assess them from an animal-oriented perspective.

#### 4.6 Animal Social Histories, Population Dynamics and Cultural Evolution

The capacity of past animals to influence and shape history is closely interwoven with their social, cultural and population histories. DAP can draw on established perspectives from archaeology, zooarchaeology and palaeontology to examine this relationship, but it may also tap into new possibilities of enquiry that emerge from comparative animal behaviour research in the present. The important part is to recognise and examine non-human animals from the past not

only as ecological actors but also as social and cultural agents in their own right (Byrne et al. 2004; Whitehead 2008).<sup>13</sup> This realisation, albeit perhaps not revolutionary for ethologists and students of comparative behaviour, could be a real game-changer for animal studies in the deep past. The emphasis on the social and cultural conditions of animal life is thereby motivated by a whole suite of currently emerging observations and experimental insights (see especially the recent summary by Whiten 2021), demonstrating that many non-human animals have developed distinct strategies for social learning (Heyes/Galef 1996; Hoppitt/Laland 2008), evolved specific group-level habits and behavioural preferences (Laland 2008) and perhaps even cultural geographies (Whitehead 2009; Whiten 2017; 2019; Schuppli/van Schaik 2019). That animals exhibit sociality and frequently engage in behaviours that many would designate as ‘cultural’ (see already Munding 1980) automatically, and arguably consequentially, shifts the attention to the internal dynamics of animal societies and provokes new questions on how intra-group, intra-population or intra-species principles of demographic and sociocultural organisation modulate the behaviour, long-term evolution, ecosystem roles and the various other-directed relationships of different animals in the past. The possibility of animal cultures in deep prehistory shifts the burden of evidence and reconfigures the commonly tabled assumptions so that violations of ecological expectations and heightened levels of behavioural variability may reasonably be interpreted as evidence for sociocultural diversity in past animal behaviour.

DAP consequently promotes the development of social archaeologies of animals – subverting exclusionary *animal sociale* tropes (Gerhardt 2019, chapter 3) – by drawing both on established and emerging research methods and re-assessing the

<sup>13</sup> As noted by Galef (1992), the point here is not so much to conceive of animal culture as homologous to human culture but to recognise the analogous status of animal traditions and cultural expressions and to make space for the investigation of animal multiculturalism, including, but not limited to, the human species. This view secures the value of cultural studies concerning non-human animals, while simultaneously safeguarding the specificities of animal behaviour and world-making.

available data on animal adaptation and evolution from a distinctly social and, if possible, sociological or socio-cultural point of view. Possible avenues to uncovering the social agency of past animals are opened by approved bioarchaeological methods for the analysis of diet, mobility and lifestyle, such as isotope analysis and the study of biomarkers. Traditional zooarchaeological analysis targeting pathologies, age and mortality profiles as well as gender balance within animal groups and populations, may similarly be co-opted to inform questions of past animal sociality and demography. The example of zooarchaeology also shows, however, that the social archaeological investigation of past animal behaviour must clearly entail more than a mere rhetoric manoeuvre, and thus calls for a substantial shift in perspective and the scrutinising of long-held views and assumptions about animal agency. Although often difficult to ensure, zooarchaeological signals such as supposed seasonality indicators should be systematically confronted with independent lines of evidence on the timing and duration of occupations to avoid universalist extrapolations. The same is true for assumptions about the social organisation and home range of past animals, for example of cave lions, which can markedly diverge from behavioural patterns observed in their present-day cousins (Bocherens 2015). Likewise, the current-day habitat preferences of animal species should not be taken as a given in the past, and the target species may have markedly modulated their subsistence behaviour, including their group organisation and mobility strategies in response to new, acute ecological challenges. The general lesson for DAP here is that universalist presumptions about animal behaviour must at least be transformed into explicit hypotheses to be tested against context-sensitive, independent data and interpretations must in principle allow for the historicisation of animal agency and sociality. We can no longer presume that variation in past animal behaviour unequivocally reflects variation in past natural environments and/or climate regimes.

In addition to reimagining the interpretive value of established methods and approaches, DAP also seeks out alternative and unorthodox creative means to chart animal sociality and demography in the deep past. Geomorphological approaches

may, for instance, help to isolate places of animal aggregation that have affected processes of soil formation and sedimentation. Researchers may also take advantage of the stratigraphic nature of archaeological and palaeontological deposits and search for evidence on animal legacies in long-term vegetation and pollen records – that is, whether earlier patterns of animal behaviour have affected the composition of subsequent plant communities (in close analogy to the study of human landscape legacies; Scharf 2014). Similarly, animal behaviours and social dynamics of animal groups may be reflected in distinct food residue accumulations as well as the import of particular seeds, pollen and microorganisms at specific locales. More generally speaking, DAP hopes to identify and analyse archaeological ‘sites’ produced by animals and to study them diachronically by using some of the same methods routinely employed in order to extract and qualify human habitational fingerprints.

It has been suggested elsewhere that waterbird colonies may be a potential target of such animal-oriented archaeological fieldwork (Kost/Hussain 2019). Hyena dens, interlaced with hominin occupations and visits or not, present yet another example of genuine animal places (Enloe 2012; Kuhn 2011; Stiner 2004) that can be examined archaeologically in terms of their social organisation of space and their long-term animal habitation dynamics including their animal-invested site **biographies** (Diedrich 2011). The immense potential of such focused excavations has already been demonstrated by primate archaeologists (e.g. Haslam et al. 2017; Whiten 2017). Archaeology undoubtedly yields the great promise here to trace the long-term development of social groups of animals through time and to document the varied place-making practices of past animals as well as coupled trajectories of animal-site co-evolution.

The fossil record further enables the investigation of millennial-scale animal life history changes and the latter’s social and behavioural consequences. Demographic parameters of past animal populations and societies can, for example, be explored and compared through communities of death at particular sites and localities (*thanatocenose*) or based on continental-scale population and dispersal dynamics inferred from

animal presence/absence data and aDNA estimates and simulations (Hofreiter/Stewart 2009; Widga et al. 2017). These data could then be compared against simulated or otherwise calculated carrying capacities of animal populations to assess deviations from expectations or to detect deep-historical population bottlenecks. Importantly, however, DAP echoes the premonition of Discamps (2011) here, according to whom palaeontological and archaeological data should in principle be given precedence over simulation or theory-derived demographic estimates to allow for historically sensitive conclusions and to credit animals' mutable individual and population-level agencies.<sup>14</sup> Independently derived demographic estimates nevertheless play an important role in pinpointing, calibrating and interpreting the agential leeway of animals in the deep past.

That being said, from a DAP perspective, faunal data on past animals should be approached similarly as data on human demography: species distribution models and the analysis of the distribution and density of radiocarbon dates (e.g. French/Collins 2015) taken from animal bones can, for instance, be employed alongside settlement area approaches facilitated by GIS analysis (Schmidt et al. 2020), then calibrated against observed present-day variations in the respective animals' home ranges (instead of ethnographically recorded catchment areas of mobile human groups), to derive effective animal population estimates and quantitatively reconstruct past zoospheres. The macroscale results of such analyses of past animal demographics can then be contrasted with localised snapshots of animals' group compositions, mobility and land-use preferences as portrayed in ichnological traces (animal tracks and footprints, see above; Roach et al. 2016).

<sup>14</sup> A key locus of animal behaviour-related social information maybe found again in the mismatch between different data categories (compare discussion above). A recent example is the reconstruction of genomic adaptations and the evolutionary history of the extinct scimitar-toothed cat *Homotherium latidens*, which indicates that these megapredators were more abundant than their fossil presence/absence data suggests (Barnett et al. 2020). Together with other ethological, physiological and genomic data, this may be explained by their unique social and sex-biased mobility behaviour and can be taken to further underscore the non-analogues nature of many past animal behaviours.

DAP ultimately seeks to collate these various animal-oriented data, methods and interpretive perspectives in hopes to detect and qualify shifts in animal population histories and link them to past animal social behaviour, population structure and size. The aim is to examine the resulting patterns in terms of community dynamics, population-level trade-offs, path dependencies and behavioural lock-ins as well as changes in social norms and preferences, rather than merely as a product of external factors or animal's outer ecologies.

#### 4.7 Zooscaping and Animal Mobilities

Animals' mobilities and modes of movement as well as their reasons to travel can vary widely and how animals navigate the landscape captures an important aspect of their agency and their capacity to mould the worlds they inhabit. Following a recent push in animal studies and more-than-human geographies (Kirksey/Helmreich 2010; Ogden 2011; Philo/Wilbert 2000; Urbanik 2012; Whatmore 2002), non-human animals have to be recognised as key geographic agents, actively contributing to and structuring the various spatial relationships which make up past landscapes and environments (Overton/Taylor 2018). Embracing animals as potent geographic actors calls for a number of terminological clarifications and entails a range of conceptual re-orientations.

First, movement may be taken to refer to a shift in Euclidian space, a translocation in terms of spatial coordinates, whereas mobility encompasses more than mere geographic displacement (Cresswell 2010). Mobility involves social mediation, embodiment, affect and links up with animal horizons, hence foregrounding animal-specific motivations, incentives and lived experiences (see especially Hodgetts/Lorimer 2020). Second, one might wish to distinguish between animal spaces and beastly places (Philo/Wilbert 2000). The former emphasises human impacts on animal spatial existences, for example how animals are **spaced** by human behaviour and anthropogenic milieux (see above), while the latter underscores the self-governed construction of place and the 'emplacement' of landscapes by animals through

meaningful spatial experiences and interactions. Third, the totality of observed animal-centred spatial relationships, patterns and mobilities can be referred to as ‘animal geographies’ (Bennett 1960; Ogden et al. 2013; Wolch/Emel 1998). The plural is important here, since it places emphasis on the various entanglements of animal spatiality with diets, ecosystem relations, movement capacities, social needs and preferences as well as cognitive devices of animals and thus brings to the fore scale-dependent specificities of animal geographic agency.

Animal geographies are both constituted and constitutive. Animals react, resist and adapt to other geographical and ecosystem agencies including humans and climate regimes, but their spatial behaviour also engenders signature ‘tasksapes’ (Ingold 1993), ‘soundscapes’ (Schafer 1977), ‘smellscapes’ (Henshaw 2013) and distinct animal-framed atmospheres (Lorimer et al. 2019), all of which shape the world and other life processes around the animals in question. Importantly, together with more tangible physical effects of animal behaviour, these spatial arrangements and their various intersections and emergent outcomes contribute to the **making of a place** – place-making is therefore not necessarily a uniquely human achievement and often at least a multispecies edifice (Duhn 2017). The aggregate of these animal-propelled ordering practices and the geographic consequences of animal behaviour as well as their relationships compose larger zoosapes – spatially configured multispecies assemblages (e.g. Dransart 2013; Kirksey 2014) with distinct and varying historical dispositions, affordances, affective qualities, requirements, potentials and long-term dynamics. Animal geographies are thereby always **transformative** and to a certain extent ‘in-the-making’; they are often tension-ridden (interspecies conflict, competition and antagonism are key evolutionary drivers), precarious and characterised by metastability. In this view, the individual and group-level actions and preferences of non-human animals can quickly develop disproportionate effects on the organisation and functioning of larger multispecies assemblages or sub-assemblages, exposing animal agency as a key locus of ecological and geographic re-structuration and change.

Another important research theme for DAP is the partitioning of geographic space through animal behaviour and sociality. A prime example is territorialisation practices through which animals create and enforce a more-or-less bounded section of space. Such practices include signposting, scent-marking, territorial calls, border enforcement and even open threats, assaults or other acts of displayed or effective violence (Potts/Lewis 2014; Hodgetts/Lorimer 2020, 10). In contrast to animal place-making, such territorialisation practices pertain to the wider landscape and can have large-scale, nonlinear consequences for the assembly, organisation and spatial dynamics of multispecies assemblages in it. Animal territoriality varies greatly across species and families and is likely contingent on a host of contextual factors, including the composition and structure of animal communities themselves. Pleistocene ecosystems with large carnivore guilds, including all sorts of meso- and apex predators and their various habitual scavengers, are thus likely to have fostered unique and possibly non-analogous territorialisation practices (see e.g. Hagen/Hammerstein 2009); not to mention the various co-dwelling hominin groups which may have engaged in comparable practices (or not). Spatial partitioning can also be achieved with day-to-night gradients and specific adaptive strategies related to them. Albeit admittedly difficult to study in deep-time, nocturnality and diurnality are behavioural tendencies that, in principle, can be adjusted or amended if required or favourable. It has, for example, been shown that some predators and scavengers have actively become nocturnal as a response to the overabundance of urban street lightning in human-dominated environments (Gaston et al. 2013). DAP is cognisant about such trade-off dynamics and stresses the importance of constantly contemplating the possibilities and ramifications of possibly alien eco-spatial arrangements in deep history.

The re-appraisal of animals’ mobilities and geographies also encourages the application of classic archaeological methods to systematically assess spatial patterns, mobility and dispersal among different past animals. Given the mounting evidence on the social significance of many animal movement patterns in the present-day, for example, among cetaceans (e.g. Tyack/Whitehead

1983; Whitehead/Rendell 2014), researchers may begin to deploy various GIS-aided techniques to examine geographical dynamics in past animal groups and populations across multiple spatial and temporal scales. These techniques can be complemented by formal distribution modelling and various agent-based simulation approaches to assess mobility constraints and possibilities under changing social and environmental conditions. There is also a notable opportunity here to explore the utility of quantitative methods tailored specifically for the retrieval of data on social dynamics, for example social network analysis (Farine/Whitehead 2015), precisely because these methods in archaeological contexts have been applied almost exclusively to the human realm of behaviour.

Such DAP approaches can further build on isotopic evidence to compare the pattern and timing of animal home ranges and to identify group-level differences within different animal taxa (Britton 2010; 2018). The analysis of isotopic oxygen in animal tooth enamel – resulting in regional ‘isocapes’ – is a relevant complementary technique. Alternatively, DAP scholars may map and analyse palaeoenvironmental features and landforms concerning their animal affordances (see above) and come up with species-specific maps and relational topologies of utility, model their movement possibilities and compare the results with the available presence/absence data. These data can then be confronted and integrated with continental-scale information on animal population and dispersal dynamics (Graham 2005; Hofreiter/Stewart 2009; Somveille et al. 2020). This being said, DAP ultimately urges us to pay more attention to local situations and regional constellations of animal agency and mobility. The reconstruction of total animal biomass, species richness and diversity as well as community structure based on high-resolution faunal assemblages paired with careful vegetational and natural resource analysis can reveal the anchoring role of certain places; for example, lakeland environments (Kindler et al. 2020) and the capacity of animals to modulate their mobility strategies regarding such local ecological opportunities. The textbook example of Eemian Neumark-Nord (Kindler et al. 2020) also reminds us that local

observations should always be calibrated against habitat-scale animal data and that a landscape-archaeological approach to multispecies assemblages in the deep past is not only possible but also desirable and productive.

The principal aim of all of this is to strengthen our grasp on the animal-perspective on mobility and to equip researchers with alternative concepts and perspectives to study the spatial behaviour of animals in the deep past. The here-enlisted entryways enable us to ask for the lived patterns and experiences of past animals themselves (*sensu* Beaudoin 2016), and whether and how hominin activity in the wider landscape might have modulated animal mobility (for example, through provisioning emergent, secondary food sources: McGrady et al. 2018), and if so, to what effects and on which spatial scales. Although DAP does not necessarily break with established and emerging research methods, it compels critical reconsideration of interpretive standards and challenges the presumption that patterns of animal behaviour are primarily ecologically framed, rather than being social phenomena worth being studied and interpreted as such.

#### **4.8 Questioning Anthropocentric Categorisations and Developing Alternative Animal-Oriented Frames of Reference**

Given that insight from cognitive ethology, comparative behaviour and other animal-related fields continue to challenge long-standing pillars of human exceptionalism such as emotionality, empathy and compassion, creativity, mental time-travel and even morality (e.g. Bekoff et al. 2002; Bekoff 2017; Rosenthal 2019), it becomes increasingly clear that human-centric terminologies, categorisations and conceptualisations must be overcome if true understanding of the richness and diversity of animal agencies, perspectives and agendas through time and space is aspired. A classic example of the persistent and hard-to-overcome human benchmark is the framing of past animal behaviour through the polarity of ‘wild’ and ‘domestic’ (Swanson et al. 2018), which remains particularly influential in archaeology and its master narratives on the evolution



of human-animal connections (e.g. Mithen 1999; Shipman 2010; 2017). Yet, distinguishing between ‘wild’ and ‘domestic’ animals makes little sense outside of dominant anthropocentric frames of reference and merely perpetuates the idea that some animals have become largely dependent on human behaviour and ecosystem services, whereas others have managed to retain their autonomy and behavioural independence and their agency is thus only indirectly influenced by humans. Wild animals, from this point of view, primarily operate **outside** or **peripherally** to human worlds or **disrupt** and **interfere** with human livelihoods in significant and often adverse ways; they are liminal figures at best and inhabit subgrade ‘parallel societies’ – a view that only fosters the undesired consequences of divisionary thinking and might even be taken to suggest that domestic animals are agency-poor or deprived, overlooking the fact that domestication processes re-configure the agential possibilities of the animals in question. Rendering non-human animals as ‘poor of agency’ reintroduces the classic Heideggerian (1983) notion of animal ‘world deprivation’ (*Weltarmut*), while humans, by contrast, are understood as ‘world builders’. Needless to say, this bifurcation of human and animal being-in-the-world is precisely what DAP wants to overcome and ultimately tear apart. Animals need to come under deep-historical scrutiny both as beings rich in world and as potent world-makers of their own.

Developing such an animal-oriented purview of the deep past requires devising concepts and categories that can capture the specificity of animal agency and ecosystem involvement. Possible avenues here are the development of novel typologies of animal agency which recognise and elaborate on the non-identifying of animal agency and human agency while simultaneously building on already established process-oriented and outcome-centred categorisations from conservation ecology (e.g. keystone species, foundational species; see discussion above), symbiotic ecology and organism co-adaptation studies (e.g. commensalism, mutualism, parasitism; see discussion above) or human-animal studies (e.g. ‘negative’ vs. ‘positive’ animal agency; see discussion above). Another possibility is to consider how animals contribute to the contours and properties

of shared, multispecies lifeworlds, engage in ecosystem or environmental engineering and bring various sets of biologically and socially mediated affordances into play. Further resources are provided by cognitive ethology and animal psychology, allowing us to address animals in terms of their cognitive and behavioural predispositions, preferences and vulnerabilities (e.g. ‘neophilia’ vs. ‘neophobia’ and so forth). The role of animals in anchoring geographies of affect, sound and smell (Rutherford/Wilcox 2018), species, population and group-specific mobilities and their attendant multispecies assemblages as well as different types of animal societies (e.g. eusocial, fission-fusion, clan-based, layered/hierarchical, etc.) might similarly motivate a substantial reconsideration of conceptualisations of past animal life, agency and legacy and its relation to history-making.

Even though the construction of animal-oriented frames of reference is certainly an intricate, somewhat daunting and extremely challenging task, it is a key requirement for the success and future development of DAP. DAP not only seeks to promote ways of addressing animals that appeal directly to their behaviours, effects and affects, agendas and deeds, it similarly insists on the historical plasticity and context-sensitivity of the assembled and mustered interpretive categories, leaving as much room as possible for non-analogue behaviours and historically specific expressions of animal agency. The latter implies the necessary transdisciplinary nature of DAP at the junction between the sciences studying the biology, ecology and ethology of non-human animals and the disciplines interested in the history and historicity of animal agency, including the latter’s variable yet potent intersections with human realities.

As convincingly argued previously by Hill (2019), DAP compels us to embrace the attitude of a naturalist and incorporate perspectives and insights from diverse fields as classic zoology, ecosystem management and animal conservation studies (Kost/Hussain 2019). Simultaneously, however, DAP obliges us to adopt the attitude of a contextualist, situationalist and possibilist with regard to the historical framing, specificity, relationality and alterity which need to be taken into account to understand the changing configurations of animal behaviour in deep prehistory. DAP proponents

may consequently wish to engage with foundational zoological literature and fieldwork, but also with core observations and considerations from human-animal histories (e.g. Barsh/Malor 2003) and carefully consult ethnographies with ‘more-than-human’ contents and references (Descola 2005; Mullin 1999). Traditional detailed and book-length ethnographies might hold surprising and rich information on the various human-directed agencies of animals, including difficult-to-classify human-animal encounters (e.g. Simonova 2018) and their socio-historical ramifications. These sources can provide a baseline for developing a new echelon of mid-level theories on the agential qualities of non-human animals helping to link patterns with agencies and assisting in the interpretation and synthesis of the various lines of evidence and insight brought together under the umbrella of DAP. Harnessing this information about animals requires a concerted research effort, however. In many ways, DAP is thus generally concerned with the careful triangulation of information on past and present animals from various types of sources to propose new animal-oriented, ‘thick’ narratives of deep history and cultivate novel scholarly sensibilities for the many feral voices of these pasts.

Another, and no-less important, dimension of the animal and multispecies critique which DAP takes as its conceptual point of departure concerns how temporal units of analysis, as well as deep-time chronologies, are forged. Here, DAP promotes a critical reconsideration of current human-centred modes, frameworks and logics of periodisation and greatly incentivises the exploration of the possibility, scope and sequence of ‘animal ages’ and other chronounits as well as their utility for organising and understanding the dynamics of the past in non-anthropocentric ways.<sup>15</sup> Similar to animal historians who have

recently started to chart animal-specific temporalities and relate them to traditional chronological human-centred historical schemes to stress and examine the multidimensionality of temporal order and change (Fudge 2002; Koselleck 2004), DAP seeks to devise animal-centred periods, eras, epochs, ages or stages which refer to animal agencies and legacies to offer alternative perspectives on deep history and to map emergent relationships with human-defined timeframes, paying special attention to offsets between animal ages and their geological, climatic or human counterparts. In this context, it is for instance tempting to re-think and expand Sewell’s (1996) seminal ‘Three Temporalities’ from a zoocentric perspective or to experiment with the categories of structural history (e.g. Braudel 1949) to chart animal history-making on varying spatiotemporal scales. DAP is arguably in a privileged position to counterbalance overly human-oriented categorisations of temporal order and it can readily draw on available biostratigraphic evidence and categories to do so, for example by building the millennial-scale mammal biozonations employed in palaeontology, palaeoecology and palaeoclimatology such as the Villafranchian-Galerian-Aurelian sequence. Exploring the Zoocene proposed above and investigating its temporal structure in terms of animal behaviours, consequences and legacies, and more generally regarding the structural coupling of specific animal communities and past Earth-system functioning, is only one of the many possible steps towards a critical animal-oriented re-appraisal of the temporal dynamics of the past and deep past. Importantly, DAP may not only follow the footsteps of historical investigation and reflection here, due to its unique vantage point and empirical resources, it may also arguably elevate the discussion to a whole new level and can thus fundamentally transform how scholars think and talk about time and temporality beyond the human.

<sup>15</sup> Animal-oriented chronological stages have, for instance, famously been proposed by Lartet (1861) in the early days of Palaeolithic archaeology and Quaternary research. Based on key cave sequences in France, Lartet distinguished, in chronological order, between a ‘Cave Bear period’, an ‘Elephant period’, a ‘Rhinoceros period’ and a ‘Reindeer period’. It is noteworthy that especially Lartet’s Reindeer Age was later equated with the Upper Palaeolithic and a particular way of life in which reindeer played ‘a great part in the life of man, for whom it provided food, clothing, and the raw mate-

rials for a large proportion of his industry’ (Boule 1923, 246). These animal-oriented chronological stages, in other words, assumed a palethnographical and economic status characterising the interstices between humans and key animal others (Chazan 1995). The logic of periodisation, however, remained largely human-centred.

## 5 Deep Animal Prehistory and Human-Animal Interstices: Some Clarifications, Conclusions and Perspectives

Archaeology is often characterised as the study of human behaviour broadly conceived through the lens of material remains and biosignatures in a global, comparative and long-term perspective.<sup>16</sup> If archaeology is defined in such human-centred terms, there is no space, no need and hardly any incentive for the development of animal-oriented research perspectives on past affairs. But why is archaeology commonly framed in such a restricted way? A pragmatic answer is that through archaeology humanity strives to learn about itself, what it means to be human and what the past of our species was like in order to establish where we are coming from and possibly going to. In this view, archaeology is identified, implicitly or explicitly, fundamentally as a human science with its primary aim being the generation of knowledge about the human, especially its changing practices and productions. There are, however, at least two major problems with this view. First, even if archaeology would be judged merely by its capacity to produce knowledge of relevance to understanding and learning from the human past, it is unclear that evidence derived exclusively from the human realm or associated with this realm, even including information about its associated natural environments, would be sufficient to achieve or live up to this goal. The agencies, deeds and legacies of non-human animals (and other entities) as well as the various human-animal interstices framed by past animals, in other words, may turn out to hold indispensable information for understanding

the course of human deep history, evolution and ultimately, what it means to be human. Indeed, it has persuasively been argued that what ultimately defines the human species and its evolutionary trajectory is not so much what sets humans apart from nature, but instead what can be found in the rich, value-pregnant and variable relationships that humans uphold with the natural world and the many sentient living beings which are a part of this world (e.g. Haraway 2016).

The emphasis on the human in making sense of our past also carries a problematic normative burden: it easily perpetuates the assumption that the deep history of the human species is simply the result of human agency, intentionality and accomplishment, elevating hominins above all other history-makers and world-makers in nature. It should suffice to say that the now-available evidence on the intimate interweaving of human evolution and climate history demonstrates that humans have no exclusive claim on the histories in which they participate (Chakrabarty 2009) and that it is, moreover, certainly ironic that we still speak of ‘human history’ even though climates and landscapes are now widely accepted, and regularly cited, as potent history-shaping forces.

The second challenge is linked to the societal promise of archaeology and its role in diagnosing the present as well as informing planetary near and long-term futures (Hussain/Riede 2020). Notwithstanding all of its conceptual difficulties and contradictions, the image of the Anthropocene vigorously draws attention to the interdependency of life on Earth and highlights the need for a true and general ecological understanding of long-term histories, transcending traditional, deep-seated polarities (i.e. nature-culture, human-animal, intentional-instinctive). A central contribution that archaeology can make here is to open up a deep-time perspective on the mingled co-evolution of human and non-human affairs and to certify the need to take stock of the inherent multivocality of historical processes. Apart from pluralising and partitioning historical processes (human history, geological history, climate history, ecosystem history, animal history etc.) and to underscore and map their heterogeneity, the emphasis is then automatically redirected to a general history of life on

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<sup>16</sup> Walda (2013, 238) correctly observes that archaeology is currently experiencing a broadening of its disciplinary scope and that this transformation is linked to a lingering realisation that other-than-human players are an important source and influx of remote human pasts. He symptomatically cites Aftandilian’s contribution (2007, 81) in the *Encyclopedia of Human-Animal Relationships: A Global Exploration of Our Connections with Animals*, however, and the larger framing of this volume is no coincidence. Traditional archaeologies before the multispecies turn remain, by and large, strongly premised upon humans as their primary study objects and matters of concern, sometimes even invoking, as Walda (2013, 238) perceptively reminds us, an ‘anthropology of extinct peoples’ (Deetz 1967).

Earth to which archaeology is invited to contribute with its empirical resources, theories and narratives, rather than exclusively working towards a better understanding of a human-foregrounding story of bio-cultural evolution.

DAP strongly echoes this plea for a long-term, generalised history of life on Earth, and hence ascribes to ongoing attempts to re-imagine archaeology not only as the study of human pasts but as a discipline of integrated life-processes and interspecies figurations in deep history with an important role to play in the emerging field of macro-history. The attention to life as well as to the diversity of lifeforms and life-processes as a new target of deep-historical analysis is, needless to say, extremely significant and consequential for how history both as a concept and a field of inquiry is conceived. History, then, is no longer considered a privileged human domain or discourse but instead rendered a 'more-than-human' achievement – pushing it far beyond the fringes of long-standing Western traditions of historicism. Put this way, an archaeology of non-humans including animals not only becomes credible but desirable. A new focus on life also helps to circumvent a classic and long-standing dilemma when attempting to re-negotiate and/or re-imagine the human-animal boundary: the necessity to embrace the animality of the human lineage, while recognising, or at the very least making room for, its bio-cultural specificity. The challenge, in other words, is to alleviate the traditional humanist gulf between humans and animals without absorbing or even assimilating the former entirely into the latter. Hominins are undeniably specific kinds of animals just as proboscideans and cetaceans are, and a serious re-orientation to matters of life and shared living in the past may help us to better navigate and address these long-standing issues and to adequately account for them.

Understanding life as an evolving, internally differentiated field can be useful in this context. Life processes can then come into view as producing, sustaining and transforming diversity and difference in the living and non-living world. This view of life is opposed to absolutist and all-encompassing apprehensions of the same, in which all organismic differences are assimilated or negated to create the misleading impression of a unity

of nature. Through this prism of life, the human emerges as a specific type of animal rather than a being removed from the animal kingdom. Analogously, DAP insists on the importance of theorising and studying interspecies, inter-population, inter-group and inter-individual differences among different animals in the past, including hominins, and to make these differences and varieties our primary target of investigation. In this view of life in the past, differences do not only express themselves on varying taxonomic or social levels, they also speak of the contingency and historical plasticity of past animal behaviour and fossil animal cultures. Although DAP aspires to become a self-sufficient field of inquiry, it is therefore not an isolated research enterprise, bequeathing key insights to a broader history of life on Earth.

Rather than deepening the human-animal divide, DAP re-calibrates our understanding of both the 'human' and the 'animal' from the perspective of life itself and in the wake of radical multispecies theory. It is from the specificity theorem, however, that DAP derives its mission statement, conceptual foundations and its distinct research interests. It presumes that the empirical and conceptual investigation of past animal agency must have precedence over the study of human-animal relationships and interstices, both logically and methodologically. Because the respective relationships and interstices are emergent and not foundational qualities of particular historical constellations and conditions, DAP considers it imperative to first describe and explore the contributions and effects of each partaking difference-making agent, including the involved animals themselves. DAP, from this point of view, has many potential uses and may of course also be mobilised to better understand the deep history and evolution of human-animal relationships, but it remains above all a basic science (*Grundlagenwissenschaft*) of deep-historical animal behaviour, agency and legacy, embracing and expanding upon Waldau's (2013, 238–241) insistence on archaeology's key role in the nascent enterprise of animal studies.

As such, DAP has a clear possibilist and future-oriented impetus: DAP investigates animal behaviour in the deep past not only to re-imagine a key period in the history of life on Earth but also to systematically map the **spaces of possibility** opened

up by specific animal agencies and to compare the effects of animal behaviours concerning changing historical circumstances. Through its unique observational perspective and focus of analysis, DAP endeavours to gather key information on alternative ways of multispecies life on Earth and the conditions of hitherto successful interspecies cohabitation. DAP thus considers animal-specific perspectives, ambitions and horizons, as well as knowledge about their changing expressions and consequences through time and space as an indispensable input for new models, theories and ideas on how to better coordinate human and non-human life on Earth as well as to promote mutualistic opportunities that support such multispecies living. Needless to say, DAP thereby cannot fully escape its human and scholarly nature – it remains an academic artefact – but it nonetheless hopes to actively contribute to building a world in which humans and animal others find new modes of encounter, respect and co-existence. The material archives of the deep past hold manifold clues and inspirations but also concrete lessons and warnings for how such a world could be built and we should thus make them count.

To conclude, Deep Animal Prehistory (DAP) is not inherently anti-human nor does it seek to marginalise or even purge the human factor from the deep past. On the contrary, DAP recognises hominin behaviour as a key pillar of past ecosystems and the unfolding of deep history. Yet DAP

simultaneously insists on the importance and need to pluralise agency and history-making in the remote past and to complement human-centred approaches and research methods to the Pleistocene archaeological record with animal-oriented research strategies, concepts and interests. The ultimate goal is to contribute to and foster a more inclusive, difference-embracing, sensible and balanced understanding of complicated multispecies histories, stressing divergent aspirations, capacities, efficacies and horizons and the emergent nature of long-term pasts. Recovering the animal from the interstices of anthropocentrism and environmental determinism, freeing it from the binds of an all-absorbing relativism and re-inserting it to the centre of ongoing palaeoarchaeological research and theoretical debates is the first step in this direction.

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Sibylle Wolf

## Mememes in the Early Upper Palaeolithic of the Swabian Jura?

### Personal Ornaments Made from Mammoth Ivory in Focus

Keywords: mammoth ivory, Aurignacian, personal ornaments, meme, social group

#### Summary

Within the UNESCO World Heritage cave sites of the Swabian Jura (southwestern Germany), abundant mammoth ivory remains were excavated that date back to the beginning of the early Upper Palaeolithic, the Aurignacian. The extensive research of these caves started in the 1930s. Among other artefacts, the excavators unearthed whole tusks, debris, splinters, figurative artworks, flutes and personal ornaments which were carved from mammoth ivory. Especially the personal ornaments are of interest here because these items were excavated at all sites and particularly the double perforated beads are present in the Ach and in the Lone Valley sites. Personal ornaments could have a functional use. In any case, these artefacts are regarded as cultural expressions used by the respective carrier of the beads. The double perforated bead occurs over a time span of at least seven millennia. This form was transmitted within generations of Palaeolithic people. Even if the meaning of these ornaments changed over time, the transfer of a very special form, restricted to the Swabian Jura, shows that this special bead can be denoted as a meme. These memes accrued to traditions that existed over multiple generations.

#### Introduction

Nowadays, prehistorians know of thousands of mammoth ivory remains from the Aurignacian cave sites of the Swabian Jura, southwestern Germany (Wolf 2015). Mammoths were abundant in the Swabian Jura during the Upper Palaeolithic (e.g. Riek 1934; Hahn 1988; Münzel 1997; 2001; Münzel/Conard 2004; Münzel et al. 2016; Krönneck 2012; Conard et al. 2019). Mammoth ivory was directly available within the Ice Age landscape. There was no need to hunt the mammoth frequently in order to get the tusks. The hunter-gatherers could collect tusks from deceased animals and bring these selected pieces to the respective sites. The durability of the material mammoth ivory surely played a major role in the decision making of the makers of personal ornaments, not to mention its aesthetic and tactile charm; its soft, smooth surface after polishing very likely appealed to the humans of the Early Upper Palaeolithic (e.g. White 2007; Conneller 2011), also in comparison with bone or antler.

The main cave sites with ivory remains are Geißenklösterle, Sirgenstein and Hohle Fels in the Ach Valley as well as Vogelherd, Hohlenstein-Stadel and Bockstein-Törle in the Lone Valley. Altogether 584 personal ornaments made from mammoth ivory are known so far. It is suggested that these objects were used as decorative elements. In the narrower sense, the term ‘personal ornament’ describes an object that is perceived as beautiful,



**Fig. 1.** Different bead types, Swabian Aurignacian: (1) double perforated bead; (2) double perforated bead with wedge-shaped appendix; (3) single perforated bead; (4) discoid bead; (5) ring-shaped bead; (6) basket-shaped bead; (7) eight-shaped bead; (8) not perforated, constricted bead; (9) cone-shaped bead; (10) bulgy bead; (11) single perforated bead with appendix; (12) triple perforated bead; (13) raw form of a bead; (14) bandeaux. Hohle Fels: 4, 5, 7, 8, 11–14. Vogelherd: 1–3, 6, 9, 10 (photos by S. Wolf [1–10] and H. Jensen, University of Tübingen [11–14]; Montage by G. Häussler).

which is attached to the body or clothing (Hahn 1992). Personal ornaments that are presented in this work are those artefacts that are smaller than 5cm. They show either one or several perforation(s) or another possibility such as a circumferential notch to thread a cord through in order to hang the item or to fix it on a substrate.

The ivory assemblages of Hohle Fels Cave in the Ach Valley and Vogelherd Cave in the Lone Valley are outstanding. The excavation teams uncovered whole tusks, segmented tusks and debris as well as hundreds of personal ornaments in all stages of their production dating to the Aurignacian about 42,000 to 35,000 years calibrated before present (calBP) (e.g. Hahn 1988; Conard 2009; Conard/

Bolus 2003; 2008; 2015; Wolf 2015; Bataille/Conard 2018). The forms are diverse and we define roughly twelve different shapes that reoccur throughout the Aurignacian as well as special forms that are rare until today (Wolf/Heckel 2018; *fig. 1*). The double perforated bead possesses a special character because this form occurs in most of the Swabian Aurignacian cave sites in the Ach and the Lone Valley and does not appear in other regions to our knowledge. The definition of the double perforated bead is as follows:

These small beads are elliptical in outline (Hahn 1988). In profile, they are flattened at each longitudinal end, with a thicker raised section in the middle. A perforation is positioned in the middle of



each flattened end. The range of dimensions and morphology is considerable (Wolf/Heckel 2018, 354).

Personal ornaments are often the subject of research. With the help of these artefacts, prehistorians argue for the existence of cultural units within the European Early Upper Palaeolithic (e.g. Vanhaeren/d’Errico 2006) and vast social networks that can be proven by the distribution and use of special beads that have been selected carefully (Stiner 2014). Body ornamentation is interpreted as a medium or technology for communication and the witness of social interaction (Kuhn/Stiner 2007). The form and function such as the standardisation of prehistoric beads have been studied (e.g. Heckel 2015) as well as their very different meanings (e.g. Rigaud et al. 2015; White 2007; Wolf/Conard 2015).

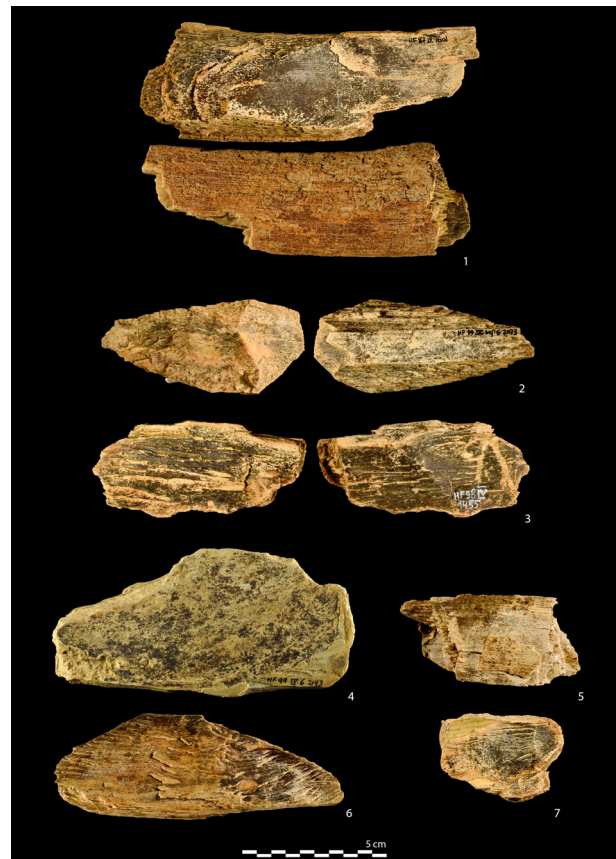
In this article, I pursue the idea that certain forms of personal ornaments became mememes during the Swabian Aurignacian. Like a gene in a biological context, a mememe is the smallest unit in a cultural context: an idea that can be imitated spreads with the help of communication; if this idea is successful, it gets a place in the daily life of humans and it is used repeatedly because of its benefit. It replicates itself (Dawkins 1998).

**Material**

**Hohle Fels Cave**

The first scientific excavations inside the Hohle Fels cave in Schelklingen were conducted in 1870 and 1871. Almost every year since 1977, the University of Tübingen, first under Hahn’s and later under Conard’s direction, conducted excavations at this site (Blumentritt/Hahn 1991; Conard et al. 2000; Hahn 1989). Here, the Aurignacian layers have provided calibrated radiocarbon dates between about 42,000 and 35,000 calBP (Conard/Bolus 2003; 2008; Conard 2009; Bataille/Conard 2018), including the transitional layers IID and IIE (Aurignacian and Gravettian artifacts; Teller/Conard 2016).

More than 10,000 ivory pieces have been excavated from layers IID to Vb so far. The ivory finds range from debris, pieces which were detached



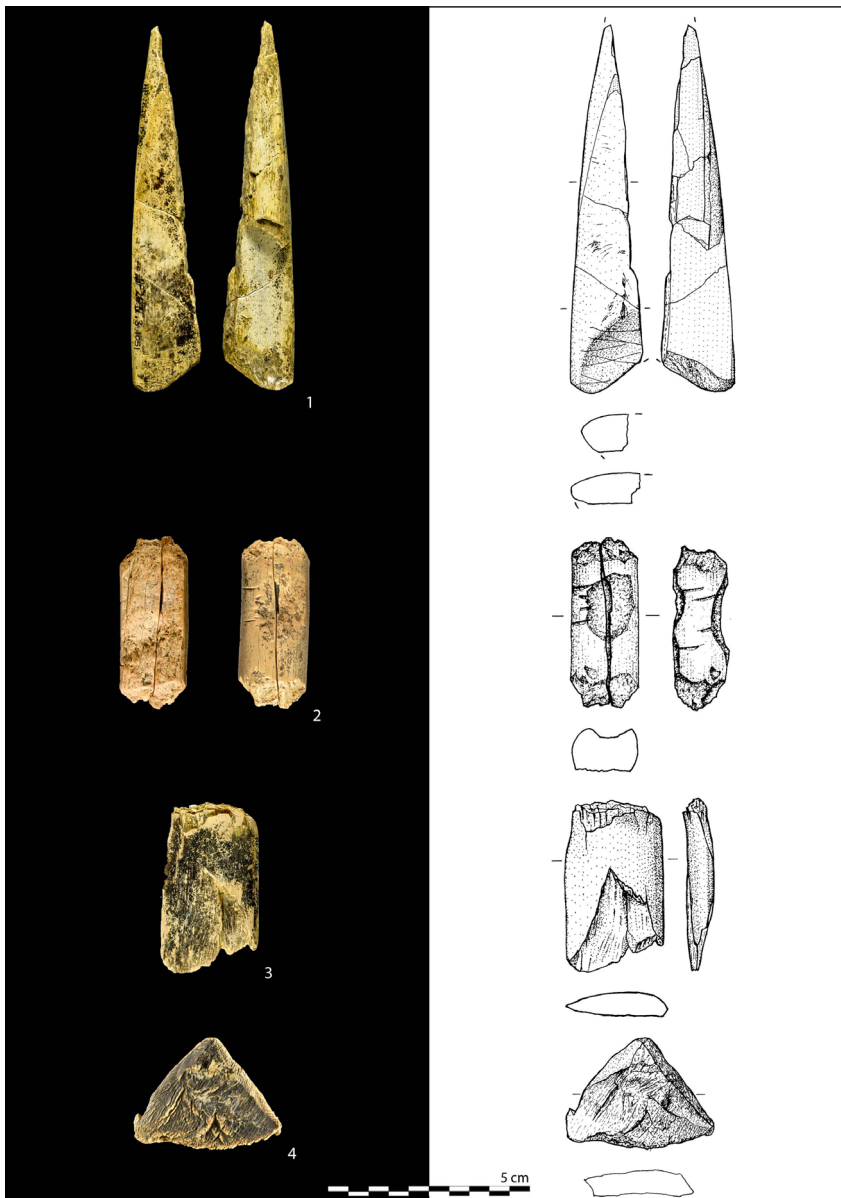
**Fig. 2.** Hohle Fels, archaeological horizon (AH) IV, debris, mammoth ivory (photos by H. Jensen, University of Tübingen).

from the tusk or a bigger tusk fragment by direct percussion (*fig. 2*) to hundreds of small splinters and shavings (*fig. 3*). The tusks or tusk fragments were probably collected from deceased animals instead of being procured by active mammoth hunting (Niven 2006; Wolf 2015). As far as it is known, no tusk was stored inside Hohle Fels. Ivory fragments (with a maximum length of 25cm) were brought into the cave and worked on site. A <sup>14</sup>C date on an ivory fragment as well as the fragmentation pattern of many pieces and hundreds of slivers are evidence that fresh mammoth ivory was used for the production of artefacts (fresh means without cracks; Wolf 2015). The flakes were primarily produced via direct percussion (Heckel/Wolf 2014).

Debris and blanks for the carving of different artefact types were excavated. The rods are blanks for many artefacts, such as points or flutes, and they document ivory working at the site. The



**Fig. 3.** Hohle Fels, fine splinters, mammoth ivory (photo by H. Jensen, University of Tübingen).



**Fig. 4.** Hohle Fels, archaeological horizon (AH) IV: (1) broken base of a Lautscher point; (2) recycled point that became a raw form of a bead; (3) flake from a point, used as chisel; (4) flake, mammoth ivory (photos by H. Jensen, University of Tübingen).



**Fig. 5.** Hohle Fels, production sequence of different beads made from mammoth ivory, proven by artefacts excavated at the site (photos by H. Jensen, University of Tübingen [row 1–3, 5] and S. Wolf [row 4, 6–8]; Montage by G. Häussler).

treatment of ivory and the resulting objects are especially impressive due to the large volume of material as well as the sophisticated production techniques and the diversity of artefacts (fig. 4). The regularly fashioned and implemented mammoth ivory tools from this period are exceptional: the *batôn percé* (Conard/Malina 2016), chisels, scrapers and points as well as numerous recycled pieces were excavated (e.g. Wolf 2015). Ivory points with a massive base have been prepared in different variations (Wolf et al. 2016). Ivory artefacts

from all stages of the production process (fig. 5) were found together and suggest that there were no special working areas for specific artefacts according to different locations within the excavation surface.

Personal ornaments were recovered from all archaeological horizons, from the Early Aurignacian until the transitional horizons. The double perforated bead dominates the assemblage (Wolf/Conard 2015; table 1). Beside this standardised form, some unique items exist (Wolf 2015).

Bead type/layer	II <sub>d</sub> /II <sub>e</sub>	III	IV	Va/Vab	Vb	Other
Double perforated	3	8	52	50	9	5
Single perforated			4	1		1
Double perf. with wedge-shaped appendix			1			
Pendant	3		5	2	1	
Ring-shaped	2					
Non-perforated constricted	1	4				
Basket-shaped	1	3				
Cone-shaped	1	1				
Eight-shaped		1		3		
Bead (no type detectable)		3	23	19	7	
Discoid			2			
Triple perforated					1	
Total	11	20	87	75	18	6

**Table 1.** Hohle Fels, type and numbers of the personal ornaments made from mammoth ivory of the different Aurignacian layers (n = 217).

The enormous variety of ornaments is evidence of the creativity of the carvers and the unique pendants show the desire for individuality of the Aurignacian people (see *fig. 1*). Of course, these pieces of personal ornaments also could have had other meanings and served other purposes than solely body decoration (such as buttons). Nevertheless, the items are expressions of creative minds and skilled hands.

### Geißenklösterle Cave

Geißenklösterle cave had been excavated between 1973 and 1991 (Hahn 1988; Conard et al. 2019). In 2001 and 2002, Conard continued the work at this cave until the bedrock was reached (Conard/Malina 2003). Like at Hohle Fels, the Aurignacian layers III and II have been dated to approx. 42,000 to 36,000 calBP. These dates are based on calibrated radiocarbon ages that have been confirmed by a range of other radiometric dating methods (Conard/Bolus 2003; 2008; Richter et al. 2000; Higham et al. 2012; Richard et al. 2019). Here, personal ornaments were also uncovered within the Aurignacian layers III and II (*table 2*).

Bead type/layer	II	III
Double perforated	7	3
Single perforated	1	1
Pendant	1	
Bead (no type detectable)	1	2
Total	10	6

**Table 2.** Geißenklösterle, type and numbers of the personal ornaments made from mammoth ivory of the different Aurignacian layers (n = 16).

### Vogelherd Cave

During his excavation in the Vogelherd cave in 1931, Riek completely emptied the cave of sediments, dumping the excavated sediments onto the slope adjacent to the cave (Riek 1934). The layers which were richest in finds are the Aurignacian layers V and IV, dating between 40,000 and 35,000 calBP. Riek worked quickly but carefully for the time, recovering ten figurative artworks made from mammoth ivory and one made from antler. These artworks mainly depict animals from the last Ice Age.



Between 2005 and 2012, a team from the Department of Prehistory and Quaternary Ecology at the University of Tübingen under Conard's direction excavated the backdirt sediments of Riek's excavation. The goal of this phase of fieldwork was to check whether Riek's team had overlooked finds in 1931. The new excavation succeeded in finding an abundance of new artefacts such as hundreds of personal ornaments, many dozen fragments of figurative artworks and multiple fragments of bone and ivory flutes (e.g. Conard et al. 2007; 2010; Conard/Kind 2017; Dutkiewicz 2021; Wolf 2015). These artefacts from Riek's backdirt, however, have very poor stratigraphic context and must be studied in tandem with finds from sites with well-documented stratigraphy. Nonetheless, it is very likely that the great majority of the finds date to the Aurignacian, due to numerous radiocarbon dates that fall within the Aurignacian, as well as the recovery of remarkable characteristic Aurignacian artefacts, such as double perforated beads, that had been uncovered in front of the cave (e.g. Wolf 2015; Wolf/Conard 2015).

At Vogelherd, whole mammoth tusks were selectively prepared and then stored. At the southern entrance, the team discovered a minimum of five segmented tusks (AH V). These pieces had a length of 50cm each (Riek 1934). In addition, the excavators found ten ivory plaques placed on top of each other there. Niven (2006) interpreted these accumulations as caches of ivory. Riek described a working area for ivory in the southwestern entrance; he recognised ivory dust on a stone and interpreted this as evidence for grinding. Flat tusk cementum and cementum-dentin fragments dominate the ivory assemblage which were used as blanks for further processing; they were extracted from the exterior of the tusks and this part is harder than the dentine that constitutes the inside of the tusk. The tusks and tusk fragments were stored in the two entrances of the cave. They were exposed to the weather and therefore these pieces altered and probably already fell apart during the Aurignacian.

Numerous massive pieces with scars and cut marks were probably used as pressure flakers or as a working surface. Such pieces were not found at Hohle Fels. Tools, such as burnishing tools, are

Bead type	Number
Double perforated	219
Bead (no type detectable)	43
Pendant	35
Single perforated	34
Double perforated with wedge-shaped appendix	4
Basket-shaped	4
Other	3
Cone-shaped	2
Eight-shaped	1
Non-perforated constricted	1
Total	346

**Table 3.** Vogelherd, type and numbers of the personal ornaments made from mammoth ivory of the backdirt excavations (n = 346).

rare at Vogelherd. In contrast, rods and rounded rod fragments of different sizes are typical artefacts of worked ivory at Vogelherd. On the one hand, these were used to produce ivory points and on the other hand, the rods are also the blanks for the serial production of personal ornaments (*table 3*).

Vogelherd seems to have been a site for the large-scale production of beads. The double and single perforated beads were especially frequent and it can be assumed that there was a specialisation for the production of these pieces at the site. Various techniques were used for the production of these beads, characteristic of the Swabian Jura. All ivory beads were recovered from the backdirt of the 1931 excavation and cannot be assigned to one specific stratigraphic horizon. Similar stratified pieces from neighbouring caves in the Ach Valley as well as the massive Aurignacian layers documented during the 1931 excavation of the Vogelherd lead to the conclusion that humans repeatedly visited the cave or lived there for a longer period of time and that the personal ornaments were not produced *en masse* during a short period of time.

## Social Groups and Identity

What do we do with the information we gain from the ornamentation in the archaeological record concerning the interpretation of these items? To approach this issue, it is important to think about the living actors who created the artefacts. While it is hard to determine different social roles and positions with regard to the distribution of power, competence, influence, authority or other significant social resources for the Palaeolithic, researchers can depend on the material remains and the artefacts to provide clues about group identities or common cultures. The concept of social groups helps us to understand communal life during the Early Upper Palaeolithic.

The smallest unit of communal life is a social group. This consists of a minimum of three individuals who are directly related to each other. An important criterion is the interaction between these people (Tajfel/Turner 1986). These people must have a feeling of togetherness, i.e. an inner cohesion that excludes others. This means that a so-called group identity which connects certain people must be present. A group can be the smallest unit of three people or could be built of numerous individuals. Group identity is a special social feature (Neidhardt 1983; Wimmer 2007). This group identity is constructed by individuals who share common opinions, common behaviour and often also make use of specific symbols. The group shares similar ideas but needs 'others' and other norms to recognise this behaviour and separate their own group with its characteristics from other groups. The feeling of togetherness is an essential factor for maintaining groups because the group feeling is based on sentiments of belonging and familiarity. The social existence within the group is characterised by social relationships and contacts, common interests, mutual perception of those involved and coordinated social roles (after Bourdieu 1976). The interaction of the individuals within a group results in group dynamics.

Another important factor is the relationship between the group and other groups. The group defines itself through different belongings such as shared rituals (see Brosius et al. 2013; Dapschaskas 2015). To recognise a group, another group is important to project their own cultural

practices and values onto. The other group is needed for a sharp delimitation. As soon as these connecting elements are not shared by or with an outsider, the group distinguishes itself from others. People who are not integrated within the community are hard to identify on the basis of material culture. People who share a group identity behave in a similar way, but the system is as flexible and dynamic as the individuals are – group identity is a communicative construction that changes over time. The ideas, ideals and characteristics could be transmitted over time but the group itself changes as the actors change. It is certain that culture is created by a community and in turn creates community. So, people living together create a common culture whose roots are located within the social groups; this means that people share the same values and that a common code of conduct exists. The social group requires living actors and is therefore determined by the individuals, but their culture can be passed on over long periods of time and thus carried on.

## Culture in an Evolutionary Aspect

At this point, approaches are provided to understand artefacts beyond the archaeological classification. The following explanations are not exhaustive, but only offer a starting point for interpreting the concept of culture. It is impossible to do justice to all disciplines and opinions on these topics. The definition of culture is always influenced by the spirit of the respective time, in German *Zeitgeist* (e.g. Kroeber/Kluckhohn 1952). The term 'culture' comes from the Latin *cultura* and means 'processing, maintenance'. First of all, culture points to everything that is created by humans. In a broad sense, the term encompasses all skills and abilities such as knowledge, products and institutions, which are not genetically innate but acquired by humans and passed on from generation to generation (Schurz 2011, 193). Animals also have certain abilities to create their culture, but in this context, the question arises what defines human culture as such (e.g. Mithen 1996; Tennie/Hedwig 2009; Pradhan et al. 2012; Tennie 2016).

Anatomically modern humans possess the intellectual abilities to create different cultures

than their predecessors. According to Haidle and Conard, the so-called ‘cultural capacity’ is made up of biological, historical and individual components, which in turn are dependent on the respective environmental conditions (Haidle/Conard 2011). With the help of archaeological remains, an attempt can be made to explore the evolution of human culture. Haidle and Conard develop a six-stage model that starts with socially transmitted information, which often only has a short-term influence on the behaviour. The next stages are tradition that is based on repeated social learning and ‘basic culture’, in which individual learning takes place. In the ‘delayed culture’, problem-solving strategies can be successfully tackled after a time gap in which the problem has not been rectified. In the next stage, the ‘cumulative culture’, cultural changes are accepted and problems are solved in different, individual (flexible and creative) forms. According to this model, the fully developed culture is ‘communal culture’, in which actors understand themselves as individuals, recognise the group and interact with it. The ability to ‘develop modular culture’ to ‘composite culture’ is seen as a milestone in the cognitive expansion of humans, which also importantly applies to modern humans (Haidle/Conard 2011). Personal ornaments are recognised as a cultural achievement that no doubt places people at the level of communal culture (Wadley 2001).

Mammoth ivory was the raw material for numerous artefacts in the Swabian Aurignacian (Wolf 2015). It was used to make tools and as a medium for symbolic and aesthetic expressions such as figurative art, engravings, musical instruments and personal ornaments. We know these artefacts in the caves of the Ach and Lone Valley. This leads to the assumption of a common culture in this region (Dutkiewicz et al. 2018) that we interpret as communal culture in this context.

## Meme

The generalised theory of evolution based on the work of Charles Darwin (1859) is described in detail by Gerhard Schurz (2011). This theory of biological evolution might be transferred to cultural evolution. It should help to understand patterns

of human behaviour. The following explanation is based on Schurz (2011). In the humanities, cultural evolution is not reduced to the biological-genetic level. In contrast, in sociobiology, some scientists postulated that humans are ultimately determined by their genes (e.g. Wilson 1975) and instinct-controlled behaviour is a part of humans’ behavioural repertoire. This statement is also supported by recent evolutionary psychology (Buss 2003, 169). In cultural systems, there are certain cycles of reproduction of material culture which cannot be explained with biological reproduction.

The decisive work on the cultural theory of evolution took place in the 1970s. Richard Dawkins first wrote about his theory on memes in 1976 (Dawkins 1998, 2<sup>nd</sup> German edition). He postulated that memes are the cultural counterparts of genes. Memes are understood as human abilities and ideas ‘which are reproduced by the mechanism of cultural tradition’ (Schurz 2011, 192). This includes cultural learning in the broadest sense. Originally coming from the word ‘mime’, a meme is a unit of imitation which can include, for example melodies, thoughts, catchphrases, clothing fashions, the way of building pots or bows (Dawkins 1998, 309). As soon as an idea or a skill is transferred to another person through imitation, cultural reproduction takes place.

The cultural theory of evolution also states that by combining cultural learning and traditions over many generations, ideas and skills are created that go far beyond determined skills – there is permanent innovation. The smallest unit that is responsible for reproducing and replicating is the meme. When the reproduction (replication) rate is high, the cultural attractiveness of a meme increases. There is a possibility that the traditional meme will be reinterpreted and varied. The transmission of the memes that one has appropriated takes place like the transmission of the genes to the offspring (Barbot 2007). This theory of memes can be applied to archaeology (Shennan 2002).

The transmission of the personal ornaments made from mammoth ivory in the Swabian Jura is retraceable over thousands of years. The tradition of personal ornaments production made from ivory can already be proven in the Early Aurignacian. Based on the theory of the meme (Dawkins 1998), the example of the double perforated bead

shows that this idea was transmitted over a long period of time. The double perforated bead was a cultural feature that was worth repeating. Thus, due to the high reproductive rates, one recognises a dominant and attractive meme during the Swabian Aurignacian, which was of great importance for social coexistence of the people who inhabited the cave sites throughout time.

## Discussion and Conclusion

The very good preservation of the beads of the Swabian Aurignacian is also due to the resistant material, ivory. This material allows the creation of different forms and it is pleasant at the same time. Certainly, ivory was valuable for the Aurignacian hunter-gatherers. For example, in southwestern France, where mammoths were rare (Heckel 2015), people used mammoth ivory nearly exclusively to carve personal ornaments during the Aurignacian in the Dordogne (White 2007; Heckel 2015). In this case, we see a special form, namely the basket-shaped bead, which people worked from the rare material ivory. During the Swabian Aurignacian, the woolly mammoth was native in the region and ivory was available and a basic raw material for many artefacts. Because of its volume, it was suitable to carve large figurines such as the Lion Man of Hohlenstein-Stadel (Wehrberger 2013) and therefore, it was chosen. It played a major role as an osseous raw material in the daily life of people and was used for many purposes. No matter in which region, ivory was the preferred raw material for carving ornaments and this is also true for the Swabian Jura. The waste of carvings as well as the different pieces of the whole production sequence of beads is apparent within the cave sites Hohle Fels, Geißenklösterle or Vogelherd. This proves that the Aurignacian people worked on site to carve their ornamentation. This happened throughout time and underlines that people of different generations produced special forms on site – which indicates a constant behaviour concerning personal ornaments.

The depth of time is difficult to grasp in the Palaeolithic: for example, the accumulation of artefacts in one place or within an archaeological layer of a site can indicate the work of an

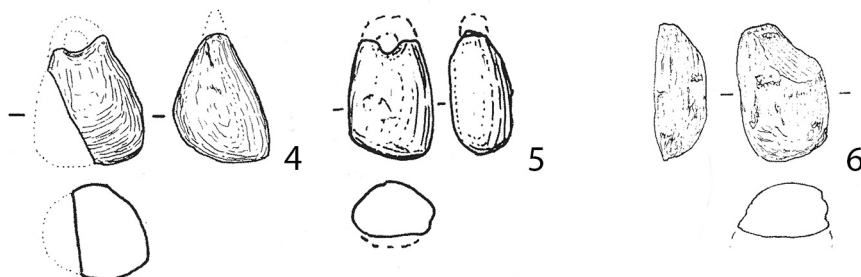
individual or of a social group, or it could be the result of the work of many different people in consecutive periods of time that we cannot differentiate today. But if the same artefact type occurs within different layers over a long-time span and in different locations, a common culture through time can be assumed. However, some forms, such as the double perforated beads, are unique to the Swabian Jura and were recovered from all Aurignacian layers of Hohle Fels and Geißenklösterle as well as from Vogelherd. Many people carved the same bead type over millennia. This form was not exclusively used by one social group as defined before, but shows a long living tradition among numerous inhabitants of the Swabian cave sites. This tradition could be interpreted as an expression of group identity within the region. I assume that social groups used these forms and passed on the knowledge. A meme was transported and was a stability factor within a culture with common values. This culture endured throughout millennia. This use of personal ornamentation is interpreted as a pillar of a communal culture that is based on the tradition to carve characteristic bead forms. It is clear that culture is also a dynamic entity, which is clear from an anthropological perspective (i.e. when we look at cultures in the present). Interestingly, this study serves as a counter-example of this, based on the archaeological record, but I acknowledge that 1) we do not know whether the meanings and values of the personal ornaments changed over time given that they remain intangible in the material record and 2) we are dealing with a different temporal scale. In this case, clear continuities and traditions can be observed that support the argument for memes.

The traditions were fostered and distinguished the inhabitants of the Swabian Jura caves from other groups. Some personal ornaments from the caves in the Ach and Lone Valleys are comparable with personal ornaments from western Germany (fig. 6), Belgium and southwestern France and are evidence for the exchange of ideas during this period (Wolf et al. 2013). This concerns, for example, beads made from clay shale from Bockstein-Törle that resemble pieces from Wildscheuer cave in Hessen in form, size and material. However, the double perforated bead as well as other forms such as the triple perforated bead are only known





**Fig. 6.** Wildscheuer (1–3) and Lommersum (4–6), personal ornaments. The objects from Wildscheuer are made from clay shale, the objects from Lommersum are carved from mammoth ivory (photos by S. Wolf; drawings after Hahn 1989; Montage by G. Häussler).



from southwestern Germany. The use of those special forms excludes other groups and can reinforce the identity of groups and be characteristic of a special culture or tradition. Even if beads of these forms appear through future excavations in other European regions, from today’s point of view, these memes are inextricably linked to the traditions of the Swabian Aurignacian.

The societal structure of the Aurignacian people is not known, but the presented ivory artefacts suggest that it was a highly complex system in which, for instance, the meme of the double perforated bead was passed on over a period of at least 7000 years. Very probably the groups were not big (e.g. Schmidt/Zimmermann 2019) and the people had to work in manifold ways to survive. That is why I assume that all group members were able to work with ivory. Certainly, some were more gifted than others. The manufacture and use of weapons and personal items such as personal ornaments can be assumed for all individuals in my opinion, meaning that all individuals were capable of manufacturing personal ornaments. That also underlines why the double perforated bead is identified as a meme, because different humans carved this

form repeatedly over such a long time. The production and use of special personal ornaments show that cultural practices continued over a long period, underlining the significance of traditions in the past. The ornaments are also indicative of cultural memes as the knowledge surrounding personal ornaments and the knowledge for this craft were passed on from generation to generation. With the remains that were excavated in the Swabian Jura, it becomes clear that the perforated bead is a cultural phenomenon that was transmitted within the Swabian Aurignacian as a successful meme.

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## Archaeobotanical and Archaeological Indications to Feasting at Late Bronze Age Tel Burna, Israel

Keywords: feasting, *Lathyrus sativus*, Late Bronze Age, southern Levant, grass pea, Tel Burna, Shephelah

contemporary sites, discussing the phenomenon of increased *Lathyrus* finds in the Late Bronze Age.

### Summary

The archaeobotanical record not only gives insight into agriculture and subsistence strategies of ancient societies, but also offers fundamental indications about social behaviours and practices such as those related to cultic activities. Historical and ethnological sources indicate that seeds and fruit as well as secondary products like wine, beer or cereal porridges were often part of ritual operations, yet it is a challenging task to directly connect ancient plant remains to any kind of ceremonial or feasting activity. The grass pea (*Lathyrus sativus*) finds from the Late Bronze Age at Tel Burna (southern Levant) may contribute to the discourse surrounding the role of the plants in ancient ritual activities. The grass pea finds were retrieved from a monumental building, where various archaeological features attest to ritual and feasting practices that took place at the site. This paper presents the grass pea finds of this Late Bronze Age cultic complex and discusses the role of grass pea in ritual and feasting activities. The grass pea seeds from Tel Burna do not stand by themselves. In the Late Bronze Age, other Canaanite sites of the Shephelah stand out due to a high number of vetchling finds. The main aim of this paper is to investigate the increased presence of grass pea in the Shephelah during this period and its relationship with cultic or ritual activities. For this purpose, we present the archaeobotanical evidence from Tel Burna and compare it to the evidence broadly found at

### 1 Introduction

Plants are an essential element of human life. Not only are they essential for our survival in producing oxygen and supplying us with food, plants and their secondary products also provide us with clothing and building materials as well as the ingredients for medicines and/or drugs. It is known from historical and ethnographic sources that plants and their secondary products such as wine, beer or cereal porridges were often part of ritual activities. Likewise, a considerable number of ethnographic and archaeological works focusing on feasting in modern and ancient times also combine these two fields of research (e.g. Bray 2003; Zuckerman 2007; Twiss 2008; Hayden/Dietler 2010; Dietler 2011; London 2011; Maeir 2015).<sup>1</sup> Since plants were part of the everyday life of the ancient people, the archaeobotanical record mainly gives insights into what was consumed but not always in which circumstances and for which purposes. It is challenging to establish a direct connection between ancient plant remains and ritual or feasting activities. The number of archaeobotanical papers dealing especially with plant remains related to feasting activities is relatively small (e.g. Harlow/Smith 2001; Goldstein/Hageman 2009; van der Veen 2014; Cagnato 2018). The same is true for the topic of **feasting**

<sup>1</sup> The references listed here are just a selection of the many publications which focus on the topic of feasting.

in the ancient southern Levant, which is mainly reflected by archaeological (and biblical) studies (e.g. Zuckerman 2007; London 2011; Koch 2014; Susnow 2019). This paper presents the archaeological finds of the Late Bronze Age cultic complex at Tel Burna and shows how grass pea seeds were used within the ritual and feasting activities that took place in the complex. Grass pea seeds were not only found at this site but were also found at other important (and nearly) contemporary sites. During the Late Bronze Age, several Canaanite sites in the Shephelah stand out as having a high number of vetchling finds, suggesting an increase of *Lathyrus* consumption during this period.

## 1.1 Theoretical Background: Feasting

### 1.1.1 Definition of Feasting

Van der Veen (2014) emphasises the strong relationship between plants, emotions and social relations which are reflected in various manifestations of bonds between plants and people. From her point of view, plants should be embedded into the concept of materiality, which is used in anthropology and archaeology to explore the relationship of people and objects/materials.<sup>2</sup>

Feasting is one aspect of materiality of plants which is mostly represented by food and drink. Therefore, the plants – as (basic) ingredients of food and drink – can be interpreted as material objects. The floral resources were directly consumed and/or were prepared to be consumed during the feasting activities, and the ingestion of food and drink during those activities gives vegetal resources a ritual and symbolic value. In this sense, food and drink take a prominent role in ritual and religious activities as ‘embodied material culture’ (Dietler 2011, 179).

The act of feasting involves the joint consumption of food and drink which creates community. Pollock (2003, 19) calls feasts a ‘**formal**

**commensality**’ as they are political and religious occasions which serve a wide variety of structural roles in the broader political economy of modern and ancient times. Dietler (2011, 181 f.) expresses the meaning of feasts as follows: ‘[the feasts] create and maintain social relations that bind people and societies together [...and...] they are extremely important in establishing sentiments of friendship, kinship, and group solidarity, as well as in cementing bonds between affine groups and political links between leaders of various kinds [...and...] they articulate exchange systems’. It is emphasised that feasts are not restricted to political and elite classes. All levels of society took part in feasting rituals in which the social relations ranged from local households to regional and interregional political communities (Dietler 2011, 181).

### 1.1.2 Identification of Feasting

The detection of feasting activities in ancient societies relies on different factors. Zuckerman (2007, 187 f.) and Twiss (2008, table 1) provide various indications of how feasting left its marks in the archaeological, iconographic and textual record. The following points, though, refer to eastern Mediterranean manifestations of feasting during the Late Bronze Age. In the textual record, details about feasts and their performance are mainly known from the Mycenaean Linear B archives. For the southern Levant, only indirect references from other territories such as the Egyptian Amarna tablets – a group of governmental texts from the Egyptian Empire that mention Canaanite city-states and their rulers – refer to feasting activities in Late Bronze Age Canaan. Iconographic sources are, for example, represented by two ivory plaques from Megiddo which date to the 14<sup>th</sup> and 13<sup>th</sup> cent. BCE (Late Bronze Age IIA; Yasur-Landau 2005, 172). On ivory plaque n° 2, the **ruler** is seated and holds a bowl in his hands (*fig. 1a*). He is accompanied by his wife, who is serving him a drink, as well as servants and dancers (Yasur-Landau 2005, 172). On ivory plaque n° 160 (Yasur-Landau 2005, 172), the **ruler** (or head of the scene) is the only person seated in front of two rows of (aristocratic) participants (*fig. 1b*). The two ivory

<sup>2</sup> For further discussions and references see Gosden 2005; Ingold 2007; Tilley 2007.





**Fig. 1.** Feasting scenes. (a) Ivory plaque (n° 2) from Megiddo (© Todd Bolen/BiblePlaces.com); (b) ivory plaque (n° 160) from Megiddo (© Todd Bolen/BiblePlaces.com).

plaques show a clear hierarchical composition of the feasting party by the proximity to the ruler – who is seated – and the size of the drinking vessels, with the largest bowl in the hands of the ruler. According to Yasur-Landau (2005, 179), the depicted drinking vessels are of Canaanite-style. Aegean/Mycenaean banquet scenes depicted on ceramics or described by the texts of the Mycenaean Linear B tablets show some differences in the vessels used. Also, in Yasur-Landau's opinion, the Canaanite feasting ceremonies were not adapted or related to the Aegean/Mycenaean ceremonies due to the scarcity of Mycenaean and Aegean pottery imports of drinking vessels found in southern Levantine settlements. The archaeobotanical and archaeozoological remains allow further insight into the food and drink which were part of the feasting rituals. Exotic species, labour-intensive preparation of specific foodstuffs, the archaeological context within elite or ceremonial contexts or the unusual abundance of specific food and drink remnants might link the organic remains to feasting practices (Twiss 2008, 420, table 1). With regards to the archaeological record, the pottery assemblage might refer to feasting, as is the case for food preparation and serving vessels such as

bowls and goblets. The spatial frame of feasting might have been at special locations such as in monumental buildings, cemeteries or shrines at landmarks. Prestige items such as ritual equipment are important components of public feasts. These items were publicly displayed and used to exhibit the wealth of the elite and the control of their resources.

Many of the above-mentioned items were detected in Building 29305 at Tel Burna (see e.g. Shai et al. 2015; Shai/McKinny 2020). The grass pea finds in particular are an extraordinary example of archaeobotanical remains which might be understood as traces of feasting activities and ritual practice.

## 1.2 The Grass Pea as an Indicator for Feasting

### 1.2.1 The Grass Pea and Its Symbolic Value

*Lathyrus sativus* is the domesticated species which probably originates from the wild *Lathyrus cicera*. The area of domestication in the Neolithic is still under debate. Early finds of *Lathyrus sativus/cicera* from Turkey, Iran and Iraq (Aceramic

Neolithic A/B, 10250–9300 BP) are in opposition to finds from Greece and Bulgaria which date to later periods of the Neolithic (7850–5000 BP: Zohary et al. 2012, 96; Mahler-Slasky/Kislev 2010, 2479 f.). According to Mahler-Slasky and Kislev (2010, 2482), in the Middle Bronze Age (ca. 2000–1550 BCE), the seeds of the vetchlings were either exported from the Aegean to the southern Levant or the cultivation of the *Lathyrus* species was adapted from the Aegean region.

In modern times, the grass pea and other *Lathyrus* species are primarily used as fodder, but may also be used for human consumption. The vetchlings provide many advantages in cultivation and nutrition. They are more resistant to drought than other crops e.g. free-threshing wheat or lentils (Mahler-Slasky/Kislev 2010, 2478 f.; Riehl 2009). Moreover, the grass pea is resistant to pest infestation and the seeds are very nutritious and flavoursome (Mahler-Slasky/Kislev 2010, 2478 f.). Despite these advantages, *Lathyrus sativus* and the other *Lathyrus* species are quite rare in the archaeobotanical record of the southern Levant. This might be due to the toxic effect to the human body when *Lathyrus* seeds are consumed in very high amount. However, the cooking and soaking of seeds in water washes out the toxic amino acids which cause neurolathyrism (Mahler-Slasky/Kislev 2010, 2478 f.; Orendi et al. 2017, 181; Weiss et al. 2019, 95).

Ethnobotanical studies have revealed the medicinal and ritual use of grass pea seeds in different parts of the world. In Bangladesh, the leaves and stems of *Lathyrus sativus* are used to relieve bloating and constipation (Rahmatulla et al. 2011, table 1). In the mountainous regions in Catalonia, the grass pea was used as an analeptic (Agelet et al. 2000, 302, table 1). The ritual aspect becomes apparent in the following examples: in Burgos (Spain), a stew made of grass pea seeds is consumed on January 17<sup>th</sup> in honour of St. Antonius; on May 15<sup>th</sup> a handful of almonds and roasted grass pea seeds is offered to St. Isidor, the protector of the peasants in the village of Villahermosa in Spain (Peña-Chocarro/Zapata Peña 1999); and in the Ethiopian highlands, the preparation of grass pea seeds was transmitted from generation to generation (Mahler-Slasky/Kislev 2010, 2483).

## 1.2.2 The *Lathyrus* finds from the Late Bronze Age Shephelah

In the Late Bronze Age, *Lathyrus* finds are documented in high quantities at several sites in the Shephelah. Archaeological investigations have shown that this region was a densely settled area since the Chalcolithic period. In fact, major sites such as Lachish, Tell es-Safi/Gath, Tel Azekah, Tel Beth Shemesh and Khirbet Qeiyafa are only a few kilometres distance from Tel Burna. The environmental conditions of the Shephelah allow extensive agricultural activities (Zohary 1962, 11 f., map 3) that are visible in the archaeobotanical record at various sites (fig. 2).<sup>3</sup>

Four sites in the Shephelah must be presented in detail: Tel Batash, Tel Beth Shemesh, Tel Miqne/Ekron and Tel Burna. Besides these, other sites<sup>4</sup> with *Lathyrus* finds dating to the Late Bronze Age provide only a low number of vetchling seeds. Prior to the Late Bronze Age, vetchlings in low numbers were found at single sites. Only the finds of the Spanish vetchling (*Lathyrus clymenum*) from Middle Bronze Age Tel Nami stand out in relation to the legume finds from this period (Kislev et al. 1993). Besides the Early and the Middle Bronze Ages, the *Lathyrus* finds from the Iron Ages are also scarce and scattered throughout the southern Levant. Exceptions include the recovery of approximately 170 seeds of *Lathyrus cicera/sativus* from Iron Age I Tel Qasile (Kislev/Hopf 1985) and some thousands of grass pea seeds from Philistine Ashkelon, which date to the Iron Age IIC (Weiss et al. 2011, table 23.2).

The finds of vetchlings from Late Bronze Age Shephelah are exceptional in the archaeobotanical record of the southern Levant. Remarkably, all four sites are just a few kilometres apart from

<sup>3</sup> The Shephelah is one of the best studied regions of the southern Levant in regards of archaeobotanical data. The following sites provide plant material: Tel Burna (Orendi et al. 2017), Tel Beth Shemesh (Weiss et al. 2019), Tel Miqne/Ekron (Mahler-Slasky/Kislev 2010), Tel Batash (Kislev et al. 2006), Tel Yarmuth (Salavert 2008), Giv'at Sharef (Mahler-Slasky/Kislev 2010), Lachish (Helbaek 1958; Lipschitz 2004) and Khirbet er-Rasm (Weiss 2011).

<sup>4</sup> Sites such as Tall al-Umayri (Ramsey/Mueller 2016), Tell el-Burak (Riehl/Orendi 2019), Ashdod (Melamed 2013) and Kamid el-Loz (Behre 1970).

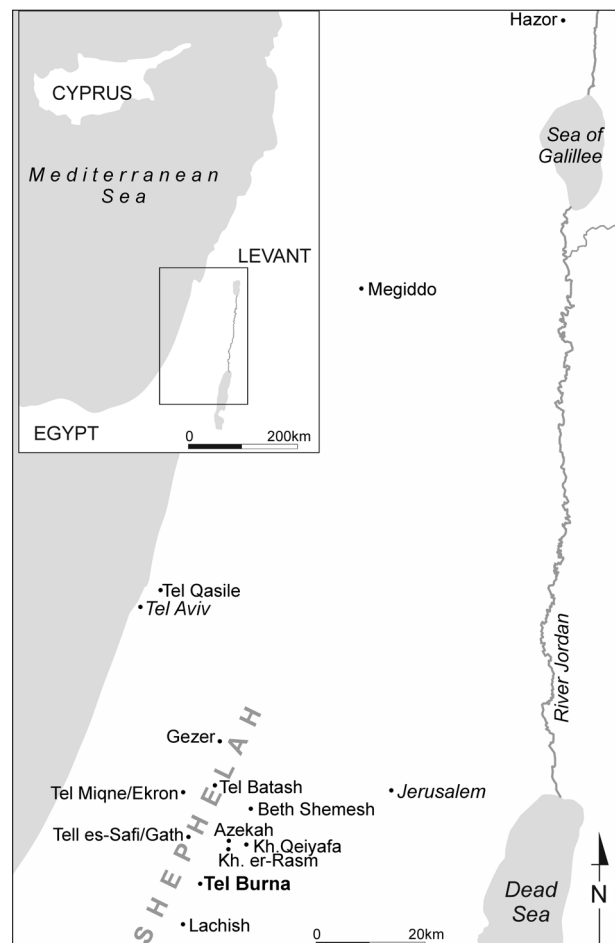
Site	Species	Date	N of seeds	% of whole assemblage	Context
Tel Batash	<i>Lathyrus sativus/cicera</i>	15 <sup>th</sup> cent. BCE	57	< 1%	elite residence building
Tel Beth Shemesh	<i>Lathyrus ochrus</i>	late 15 <sup>th</sup> /early 14 <sup>th</sup> cent. BCE	8062	14%	palace
Tel Burna	<i>Lathyrus sativus</i>	13 <sup>th</sup> cent. BCE	370	68.4%	cultic complex
Tel Miqne	<i>Lathyrus sativus/cicera</i>	first quarter 12 <sup>th</sup> cent. BCE	~600	100%	house on acropolis

**Table 1.** A comparison of the sites from the Late Bronze Age Shephelah with archaeobotanical finds of *Lathyrus*-seeds. N = total number of *Lathyrus*-seeds, % = percent proportion of *Lathyrus*-seeds within the whole archaeobotanical assemblage of the site and period (Tel Batash and Tel Miqne: Mahler-Slasky 2010; Tel Beth Shemesh: Weiss et al. 2019; Tel Burna: Orendi et al. 2017).

each other and the stratigraphic contexts resemble one another (table 1).

At Tel Batash, the seeds were found in destruction debris (in Area B, Stratum VIII) from a room (494) dating to the 15<sup>th</sup> cent. BCE. This room was located inside a building (475) which was interpreted as an elite residence (Mahler-Slasky/Kislev 2010, 2480; Mazar 1997, fig. 15; Mazar/Panitz-Cohen 2019, 94 f.).

At Tel Beth Shemesh, more than 8000 seeds of the Cyprus vetch (*Lathyrus ochrus*) were found in a room (L1505, identified as a storeroom) with the scattered remains of about 50 pottery vessels, many of them storage jars. The *Lathyrus* seeds were found in two concentrations (find concentration 6062.04 and 6242.07) in the middle of the room mixed with wheat grains, other legumes and seeds of wild plant species. The large building in which the seeds were found has been identified as a palace complex dating to the late 15<sup>th</sup>/early 14<sup>th</sup> cent. BCE (Late Bronze Age IIA). The large palace was covered with a thick layer of secondary burnt mudbricks, sealing the palace structures and its contents. The room (L1505) in which the *Lathyrus* finds were exposed is located next to an inner courtyard (L1489) with structures and finds pointing to food preparation. Room L1556/L1530, also adjacent to the courtyard, revealed unique pottery and artefact assemblages including two Late Minoan cups, one bronze straw-tip strainer, Cypriot Base-Ring I juglets with residues of aromatic oils and medicinal ingredients, zoomorphic figurines and a plaque figurine which has been connected to feasting and ritual activities



**Fig. 2.** Location of Tel Burna with other sites of the Shephelah.

(Weiss et al. 2019, 85 f., 91). Although the grass pea seeds only show low values of percent proportion in regard to the whole archaeobotanical assemblage (< 1% for Tel Batash and 14% for Tel Beth Shemesh), the number of finds (Tel Batash: N=57; Tel Beth Shemesh: > 8000) and the find contexts

at both sites clearly point to a high significance of these grass pea finds within the archaeobotanical datasets of the southern Levant.

At Tel Miqne/Ekron, the storage of grass pea seeds was found inside a destruction layer (Field I Stratum VIIIA) of a building (150) located on the acropolis of the settlement mound. The seeds were stored in a locally made bowl dating to the last phase of the Late Bronze Age III (first quarter of the 12<sup>th</sup> cent. BCE; Mahler-Slasky/Kislev 2010, 2480 f.; Meehl et al. 2006).

## 2 Results

### 2.1 The Site of Tel Burna

Tel Burna is located in the foothills west of the Judean hill country about 30km southwest of Jerusalem (fig. 2). The excavations at Tel Burna started in 2010 and are still ongoing. Until now, seven areas have been opened on the tell and its vicinity. These excavations have mainly revealed occupations from the Late Bronze Age to the end of the Iron Age II, namely from the 13<sup>th</sup> cent. to the 6<sup>th</sup> cent. BCE. Pottery finds from survey data indicate that the settlement mound was also populated from the Early Bronze Age onward until the Persian period (Uziel/Shai 2010; Shai/Uziel 2014; Orendi et al. 2017, 167–169). So far, the Late Bronze Age remains consist of a monumental building (Building 29305) which is located on a lower plateau on the western side of the hill (fig. 3). The building remains date to the final phase of the Late Bronze Age, known as Late Bronze Age IIB, and dates to the 13<sup>th</sup> cent. BCE. The building complex is made up of a central courtyard (L33211) which was surrounded by several rooms. The monumental character of this complex is attested to first by its size of at least 25m x 25m and of the construction technique and thickness (ca. 3m) of some of its walls. From the sediments of the courtyard, many animal bones, cooking vessels and two *tabuns* (L29104, L53403) were exposed, which point to cooking activities at this spot. Amongst the pottery finds were bowls, goblets and chalices as well as imported Mycenaean and Cypriot vessels. In addition, other objects like ceramic masks and plaque figurines are connected to ritual activities (e.g.

Shai et al. 2015; Sharp et al. 2015; Shai et al. 2019; Shai/McKinny 2020). The pottery together with the hints to cooking practices refer to the cultic character of the Late Bronze Age monumental building at Tel Burna (Shai et al. 2015, 117–127). But the cultic enclosure from Tel Burna is not alone in the cultic landscape of the Late Bronze Age. Recent publications (Faust 2019, 5; Greener 2019) list about 20 cultic sites distributed throughout the southern Levant.

### 2.2 Archaeobotany at Tel Burna

The archaeobotanical remains of Tel Burna have been investigated since 2011. Systematic sampling of the excavated layers and features provide insight into the agricultural landscape of Tel Burna and its surroundings. The plant remains from the Late Bronze Age cultic enclosure Building 29305 were scarce in number, but exceptionally well preserved. Amongst the few remains of cereals and wild plants, about 370 carbonised seeds of *Lathyrus sativus* (fig. 4a, b), commonly known as grass pea, were exposed. The seeds were found *in situ* along the western wall (W43105) of the temple complex, just to the west of the courtyard (L33211) where intensive cooking and cultic activities took place (fig. 3). These archaeobotanical finds of grass pea were found with three *in situ* (but smashed) locally produced storage jars in which the grass pea seeds were likely stored (fig. 5; Orendi et al. 2017, 171 f.).<sup>5</sup> Interestingly, these storage jars were found in a north-south line next to W43105 and stone stoppers were also found in this context. It seems likely that Building 29305 was destroyed by a fire and a mudbrick superstructure collapsed on top of these storage jars, which scattered the grass pea seeds but kept them *in situ* between the mudbrick destruction debris and the bedrock surface. Indeed, the grass pea seeds do show signs of

<sup>5</sup> Due to the cultic nature and richness of the assemblage of finds in Area B1 at Tel Burna, many sediment samples for flotation and archaeobotanical analysis were taken. Almost all of the sediment from the area of the discovery of *Lathyrus sativus* underwent flotation and archaeobotanical analysis. The sifting of the sediment from this part of the excavation area also led to the discovery of small finds such as a cylinder seal.

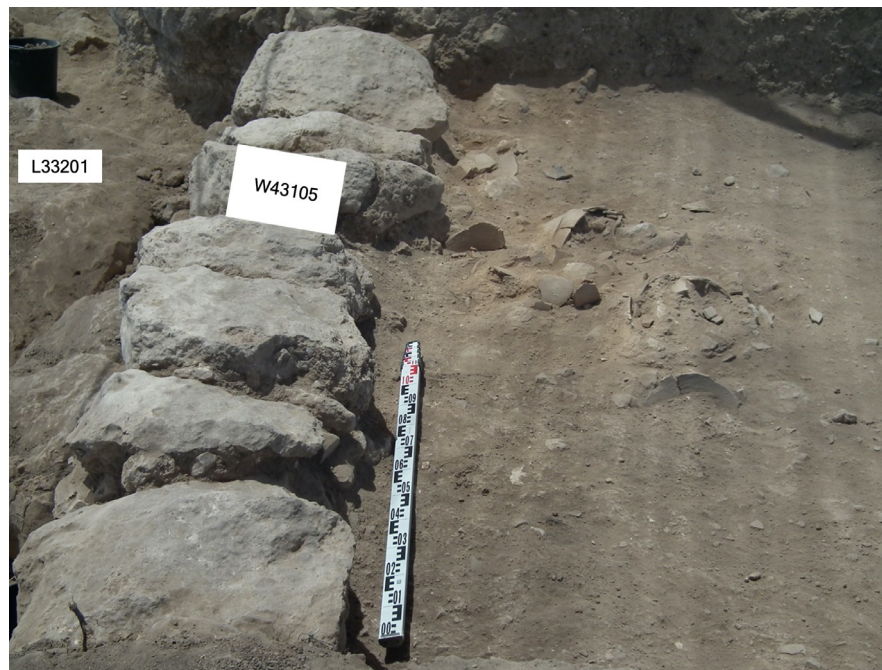




**Fig. 3.** Site plan of Area B1, Tel Burna. The red line marks the location of the discovery of grass pea seeds.



**Fig. 4.** Seeds of *Lathyrus sativus* (grass pea) from the Late Bronze Age monumental building at Tel Burna. a) lateral view; b) ventral view.



**Fig. 5.** The LBA storage jars found smashed next to W43105 of Building 29305, Area B1 at Tel Burna.

burning, but their existence indicates that they were not wholly consumed by the fire. The high number of finds (68.4% of the whole archaeobotanical assemblage from the Late Bronze Age contexts of Tel Burna) and the nature of the find context are comparable to the nearby sites mentioned above (see section 1.2.2). Together with Tel Burna, those sites from the Shephelah stand out of the archaeobotanical record of the whole Late Bronze Age southern Levant by the number of grass pea finds and the peculiarity of the find situations.

### 3 Discussion

#### 3.1 Archaeological Evidence for Feasting at Tel Burna

In hierarchical societies, communal feasts were organised by the palace or temple representatives to legitimate their political and religious power (Zuckerman, 2007, 186, 191). Zuckerman's list of indications for feasting (2007, 187 f.) finds several parallels within the Late Bronze Age cultic enclosure at Tel Burna. First, the grass pea seeds were found inside the enclosure. According to Zuckerman (2007, 187), plant (and/or animal) remains might be part of feasting activities when they are found in unusual abundance, are exotic to the region and are labour-intensive to prepare. Indeed, the grass pea finds of Tel Burna (and the Shephelah) are exceptional and fit these criteria. The grass pea finds are high in number (N=370, proportion: 68.4% and ubiquity: 5%), outnumbering the other archaeobotanical remains from the Late Bronze Age sediments at Tel Burna by far. The preparation of the grass pea seeds was also labour-intensive as the toxins need to be washed out before consumption. It is obvious that the different *Lathyrus* species show a connotation to elite environments and ritual activities due to the contexts in which the vetchlings have been found.

Second, the pottery remains indicate feasting practices. The locally produced storage jars, which stored the grass pea seeds, would likely have been utilised in the cultic courtyard where a variety of locally produced and imported bowls were also retrieved. The imported finds were mainly from Cyprus in the form of White Slip ware bowls, as

well as Base Ring ware bowls and zoomorphic vessels.<sup>6</sup> This assemblage also includes bowls imported from the Lebanese coast (S. Kleiman personal communication). Some of these vessels were stored within large Cypriot pithoi (Shai et al. 2019), which were sunk into fissures in the bedrock of the courtyard to the north and west of a *tabun* (L29104). These were also located in very close proximity to a large and quite unique standing stone made from chalk that may have been constructed to resemble an anchor (Shai/McKinny 2020). Samet et al.'s (2017, 134, fig. 2) study showed that the pottery assemblages from different Late Bronze Age temple complexes<sup>7</sup> mainly contained serving vessels like bowls, and further types of pottery of cult like chalices or decorated goblets were also present, although in smaller quantities. Therefore, the presenting and offering of food and drink was a primary activity at temples. Among the pottery finds from Tel Burna, there were numerous complete bowls, goblets and chalices which represent the standard tableware of feasting ceremonies.<sup>8</sup>

Third, the feasting practices – in which the grass peas might have been integrated – took place within the Late Bronze Age cultic enclosure of Tel Burna. This monumental building was located on the western plateau below the summit of the tell – in an area that allowed monitoring of the Nahal Guvrin with a wide view of the Coastal Plain.

Fourth, the assemblage of the Late Bronze Age also includes prestige items such as a cylinder seal and a scarab. Lastly, the cup and saucers, as well as the mask fragments and figurines, can be connected with ritual activity (Shai et al. 2015, 128 f.).

<sup>6</sup> Several sherds of Mycenaean imports were also found, including the head of a bull-figurine (Sharp et al. 2015, fig. 5, 67 f.). Also, a complete Mycenaean IIIB bowl was discovered in a tomb north of the site (as reported by local kibbutz members from Kibbutz Beit Nir) in the dump of an illicit excavation. This find attests both to Tel Burna's connection to the Aegean world and a 14<sup>th</sup> cent. BCE/Late Bronze IIA layer that has thus far not been discovered. Although, it is possible that the layer in Area B1 was initially founded in the Late Bronze IIA (see discussion in McKinny et al. 2019).

<sup>7</sup> Samet et al. (2017, fig. 2) analysed the pottery of different strata and temple complexes from four sites: Tel Beth Shean, Hazor, Tel Mevorakh and Lachish.

<sup>8</sup> Thus far, at least seven chalices and goblets have been distinguished among the finds from the cultic courtyard L33211.

A preliminary analysis of the bone assemblage from Building 29305 follows normal domestic handling like trading, management and consumption of domesticated animals such as sheep, goat and cattle. Therefore, the zoological assemblage at this point does not provide further indication of feasting (Greenfield et al. 2017, 440). This may change with further analysis.<sup>9</sup> It must always be kept in mind that the grass pea seeds might come from different scenarios than the ritual one. In fact, the grass pea plants are known as common fodder for domestic animals, and it cannot be excluded that the grass pea plants were primarily cultivated for the maintenance of the livestock. Moreover, palaeo-climate studies on pollen cores from Lake Kinneret point to a short and intense drought at the end of the Late Bronze Age (13<sup>th</sup>/12<sup>th</sup> cent. BCE; Langgut et al. 2013, fig. 3) contemporary to the archaeobotanical finds from Tel Burna and Tel Miqne. Similar results come from <sup>18</sup>O-isotope analyses on speleothems from Soreq Cave pointing to less precipitation during this period (Bar-Matthews/Ayalon 2004, fig. 12). The reconstruction of the Dead Sea lake levels as well as the pollen data from Dead Sea cores, however, indicate more arid conditions already since the beginning of the Late Bronze Age (Migowski et al. 2006; Neumann et al. 2010). As the grass pea is tolerant to less water supply (Riehl 2009, table 1), it is also possible that the plants were cultivated in drier conditions to diminish the risk of crop failure. The storage and distribution of foodstuffs during times of crisis might be the duty of the elite and religious groups of Late Bronze Age Canaan, yet increased *Lathyrus*-finds only come from the sites located in the Shephelah. Other sites of the southern Levant located in areas with a semiarid climate should have received less precipitation as well, but the archaeobotanical data from those sites (e.g. Tell es-Safi, Tel Beth Shean, Tell Abu Haraz and Tell Deir ‘Alla) do not show the cultivation of special drought crops like bitter vetch and grass pea (Mahler-Slasky/Kislev 2012; Simchoni/Kislev 2006; Simchoni et al. 2007; Kislev et al. 2009; Holden 1994; van Zeist/Heeres 1973).

### 3.2 The Relationship Between Tel Burna, the Other Sites of the Shephelah and the Aegean

Even though there are no local textual sources telling about the feasting practices in Canaan and at Tel Burna in particular, the pottery assemblages of Middle and Late Bronze Age temple complexes indicate that feasting was a prominent factor of Late Bronze Age ritual activities and increased in frequency from the Middle to the Late Bronze Age (Susnow 2019, 269–273). Samet et al. (2017, 145) also point out that the increasing amount of feasting pottery at Late Bronze Age palace complexes would suggest that the Canaanite elites wanted to support and secure their authority under the Egyptian suzerainty.

The grass pea finds from Tel Burna are in close connection to the other Late Bronze Age *Lathyrus* finds of the Shephelah. The *Lathyrus* seeds were all found in ritual or elite contexts. Following Dietler’s logic (2011, 182), it might be considered if there was a social connection between these four sites in the Shephelah. Moreover, was there a political link or affinity between the elite class present at these four sites from the Shephelah and the Aegean territory? In asking the question, it must also be kept in mind that only a part of the puzzle is looked at, as many other Late Bronze Age sites in the region may have also possessed *Lathyrus* seeds, yet they were not revealed in excavations for various reasons, including the lack of archaeobotanical analysis. At least the three sites in the northern part of the Shephelah – Tel Miqne/Ekron, Tel Batash and Tel Beth Shemesh – were certainly in close contact to each other as they were all located in Nahal Sorek. The political organisation of the southern Levant depended on the city-state system and Egyptian sovereignty over Canaan. Two of the Amarna letters (EA 273, 274) may indicate that Tel Beth Shemesh was one of the city-states located in the Shephelah. Although Tel Beth Shemesh is not named in the Amarna letters, it is described that a city-state under the rule of Bēlit-labi’at was situated at the eastern rim of Gezer’s territory. Na’aman (2011, 283), followed by the excavators (Bunimovitz et al. 2013, 53 f., 61), identifies Tel Beth Shemesh as the settlement under the rule

<sup>9</sup> For a discussion of the contextualisation of cultural values pertaining to faunal, botanical and other materials, see Sieler (this volume).

of Belit-labi'at.<sup>10</sup> The sites of Tel Miqne/Ekron and Tel Batash are about 10 to 15km northwest of Tel Beth-Shemesh. They are located in between the major city-state of Gezer and Tel Beth Shemesh. Whether Tel Miqne and Tel Batash were affiliated settlements to the city-state of Tel Beth-Shemesh or maybe to Gezer is not known (see discussion e.g. in Goren et al. 2004). Only their proximity to Tel Beth Shemesh might advocate for their connection to this town. Tel Burna, on the other hand, is located in the southern part of the Shephelah in proximity to the city-state of Lachish (Na'aman 2011, fig. 1). Even though it is difficult to clarify the extent of relations among the sites because the archaeological remains date to different periods within the Late Bronze Age (meaning that not all the sites are directly contemporary to each other; *table 1*), there is a pattern of contacts among them. Still, given the relative lack of grass pea seeds in the preceding and subsequent periods, it is worth noting that these four sites date to the Late Bronze Age (15<sup>th</sup>–13<sup>th</sup> cent. BCE), are located in the same region (the Shephelah) and all revealed grass pea seeds within the context of an elite or cultic building.

Nevertheless, the southern Levant and the Shephelah were integrated into local, regional and interregional networks of extensive economic, cultural and political exchanges that characterise the whole eastern Mediterranean during the Late Bronze Age (Panitz-Cohen 2014; Shai et al. 2019). Studies on possible connections between the Levant and the Aegean rely mainly on textual and archaeological data (e.g. Uluburun shipwreck, Pulak 2001). As mentioned above, the southern Levant does not provide any textual sources for these connections, and the Linear B archives of the Aegean do not refer directly to exchange between the East Mediterranean regions (Millek 2019, 123, 126). The archaeological evidence relies on non-local finds. On the Aegean mainland, the most numerous non-local finds are attributed to Canaanite storage jars. In the southern Levant, nearly 3000 sherds of Mycenaean and Minoan pottery have been found

and the majority was retrieved from ten sites,<sup>11</sup> while most sites count less than ten Mycenaean and Minoan sherds (Millek 2019, 127–129, 200). The four sites of the Shephelah are part of the sites listed with imported pottery from the Aegean, only containing a few Mycenaean and Minoan sherds, with Tel Beth Shemesh providing 40 fragments (Millek 2019, table 11). Aegean imported pottery was also detected at Tel Burna. Mycenaean bowls (see context above) alongside Cypriot wares of many varieties (e.g. White Slip, White Shaved, Monochrome, Base Ring etc.), including the wavy-band Cypriot pithoi, were sunk into fissures within the bedrock courtyard of the cultic enclosure (Shai et al. 2015, 117–127). Across the archaeobotanical dataset of Tel Burna and Tel Beth Shemesh, there is further information of a cultural contact between the Aegean and Canaan. As mentioned before, the cultivation of *Lathyrus* species was probably adapted from the Aegean territories as early as the Middle Bronze Age, as indicated by the finds of *Lathyrus clymenum* at Tel Nami. The only finds of the Spanish vetch – besides Tel Nami – were found in Aegean sites like at the West House of Akrotiri, in a Late Minoan House at Knossos, and possible finds from Phylakopi, Melos (Kislev et al. 1993, 151 f.). The same is true for Tel Beth Shemesh. Weiss et al. (2019, 97–100) argue that the introduction of Cyprus vetch to the (southern) Levant started in the Late Bronze Age, as *Lathyrus ochrus* was only found at two sites in the eastern Mediterranean area. One assemblage comes from Late Minoan Knossos (ca. 14<sup>th</sup> cent. BCE) and the other one from the afore mentioned palace complex at Tel Beth Shemesh. Therefore, according to the pottery and the archaeobotanical data, there was contact between the Aegean and Tel Burna, Tel Beth Shemesh, Tel Miqne/Ekron and Tel Batash. However, the degree and intensity of this contact is unfortunately unknown.

<sup>10</sup> The exact number and division of the southern Levantine city-states is under discussion and ranges from 13–14 to 22–27 city-states. For a summary of the discussion, see Panitz-Cohen 2014 and the references therein.

<sup>11</sup> Sixteen of 80 Late Bronze Ages sites provide more than 30 sherds of Mycenaean pottery: Tel Abu Hawam, Amman Airport, Lachish, Hazor, Beth-Shean, Megiddo, Tell el-Qadi, Tell el-Ajjul, Ashdod, Aphek, Akko, Tell Gemme, Deir el-Balah, Beth Shemesh, Gezer and Tell Beit Mirsim (Millek 2019, table 11). Many of these sites are located not far from Tel Burna.



#### 4 Conclusion

Many temple complexes with the pottery assemblages that point to feasting activities have been uncovered, indicating that feasts were an essential component of the political and ritual environment of Late Bronze Age Canaan. The inhabitants of Late Bronze Age Tel Burna clearly took part in these feasting practices, as indicated by the pottery and the archaeobotanical record. The pottery assemblage including masks, votive vessels and plaque figurines attest for ritual activities which took place in the monumental compound at Tel Burna. Besides, the many hundreds of grass pea seeds found *in situ* in the LBA layers of the cultic enclosure are in close connection to cooking and symbolic practices. The purpose of this paper was to investigate the increased presence of grass pea during the late Bronze Age and its relationship with cultic or ritual activities. As we have demonstrated, the grass pea finds from the cultic complex of Tel Burna point to connections with three other Late Bronze Age sites located in the Shephelah (Tel Batash, Tel Beth Shemesh and Tel Migne/Ekron) which stand out from many other excavated sites throughout the southern Levant due to the discovery of *Lathyrus* seeds connected to elite and ritual contexts. Moreover, the vetchling seeds suggest a commercial relationship between the Shephelah and the Aegean. Thus far, in the Late Bronze Age archaeobotanical finds of Cyprus vetch were only found in the Aegean and the southern Levant,

strengthening the argument of a possible affiliation between these two regions. Even though the occasions of feasting at Tel Burna are not yet entirely clear, it can be suggested that these ritual activities were used not only for reinforcing the authority of the Canaanite elite at this site, but may also have helped to strengthen the bonds between the Late Bronze Age sites of the Shephelah and the Aegean.

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Doğa Karakaya

## Cultivating the Seeds of Sanctity

### Interpretation of Archaeobotanical Remains from Building XVI at Tell Tayinat (8<sup>th</sup> and 7<sup>th</sup> Centuries BCE), South-Central Turkey

Keywords: temple, plants, food, ritual, archaeobotany

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#### Summary

Current archaeological research has increasingly started to explore the role of plants within a wider cultural and historical context through characterising how past food practices are significant to individual and/or communal motivations. Following this trend, the present paper focuses on the plant remains from the newly excavated ruins of an Iron Age temple, Building XVI at Tell Tayinat. The archaeobotanical analysis in this study aims to document contextual information on plant macroremains in and around Building XVI. The study shows that the plant remains inside the temple

consist of pure crop concentrations of bread/*durum* wheat and bitter vetch. On the other hand, the samples recovered outside the temple are rich in crop processing residues with an abundance of wild/weedy taxa. Taphonomical considerations and ritual use of plants were discussed providing insights for ritual deposition in comparable contexts in the Near East.

#### 1 Introduction

Food not only provides an essential biological constant to sustain life, but it also represents an important marker of social status, gender roles, religious and ethnic affiliations. Current archaeological research has increasingly started to explore how past food practices were reflected through culturally expressive behaviours in the material record (Bray 2003; Dietler/Hayden 2001; Hastorf 2016; Palmer/van der Veen 2002; Pollock 2012; Twiss 2007). Several archaeological sources are available to gain information on symbolic and material dispositions of food practices including visual depictions on artefacts, written records and zooarchaeological studies (Collon 1992; Lev-Tov/McGeough 2007; Twiss 2012; Zuckerman 2007). A growing number of archaeobotanical studies have also systematically examined the plant evidence for food practices. Archaeobotanical research contributed intensively to two areas of investigations that are interconnected in many ways. The first research focus covers the recent methodological advances on the identifications of processed organic findings. The recognition

of these processed food remains (e.g. bread) represents a new pathway for identifying past food practices in archaeological record (Heiss et al. 2017; 2020; Primavera et al. 2019; Valamoti et al. 2019). A second research focus comprises the inherent connections between the plant remains and the archaeological contexts. Cultic settings such as temples, burials, pits and foundation deposits drew considerable attention among archaeobotanists to recognise ritual behaviour on food practices, although studies on this topic largely vary in terms of time period and geographical location under investigation (Fairbairn et al. 2019; Genz et al. 2010; Marinova et al. 2012a for Anatolia and the Levant; see Hansson/Heiss 2014 for an overview; also informative case studies from other regions by Antolin/Buxó 2011; Cagnato 2018; Heiss 2014; Hristova 2015; Kucan 1995; Margaritis 2014; Megaloudi 2005; van Zeist 1983).

The present paper deals with the archaeobotanical evidence from an Iron Age temple at Tell Tayinat, Building XVI (*fig. 1*), which contributes significantly to our knowledge on involvement of plant remains in the cultic settings in the Near East during the Iron Age. The present paper will first describe the spatial and temporal occurrences of plant remains (i.e. seeds, fruits and chaffs) in relation to their contexts in and around the temple. Secondly, it focuses on the question how the plants were deposited, incorporated and became fossilised in the studied context. The information obtained by contextual and taphonomical analyses are used to enhance the understanding of the formation processes of archaeobotanical assemblages in such cultic contexts.

## 2 Archaeological Settings

Tell Tayinat is a multi-period site which was occupied in the late 3<sup>rd</sup> mill. BCE and resettled during the Iron Age (ca. 1200–600 BCE) after an occupational gap during the Middle and Late Bronze Ages. Tayinat was the capital town – called Kunulua or alternatively Kinalia, and possibly biblical Calno – of a Neo-Hittite kingdom during the Iron Age II period, variously mentioned as Patina or Unqi in contemporary textual records (Harrison/Osborne 2012). Later, the town was transformed

into a provincial capital under the rule of the Neo-Assyrians by Tiglath-Pileser III in 738 BCE.<sup>1</sup>

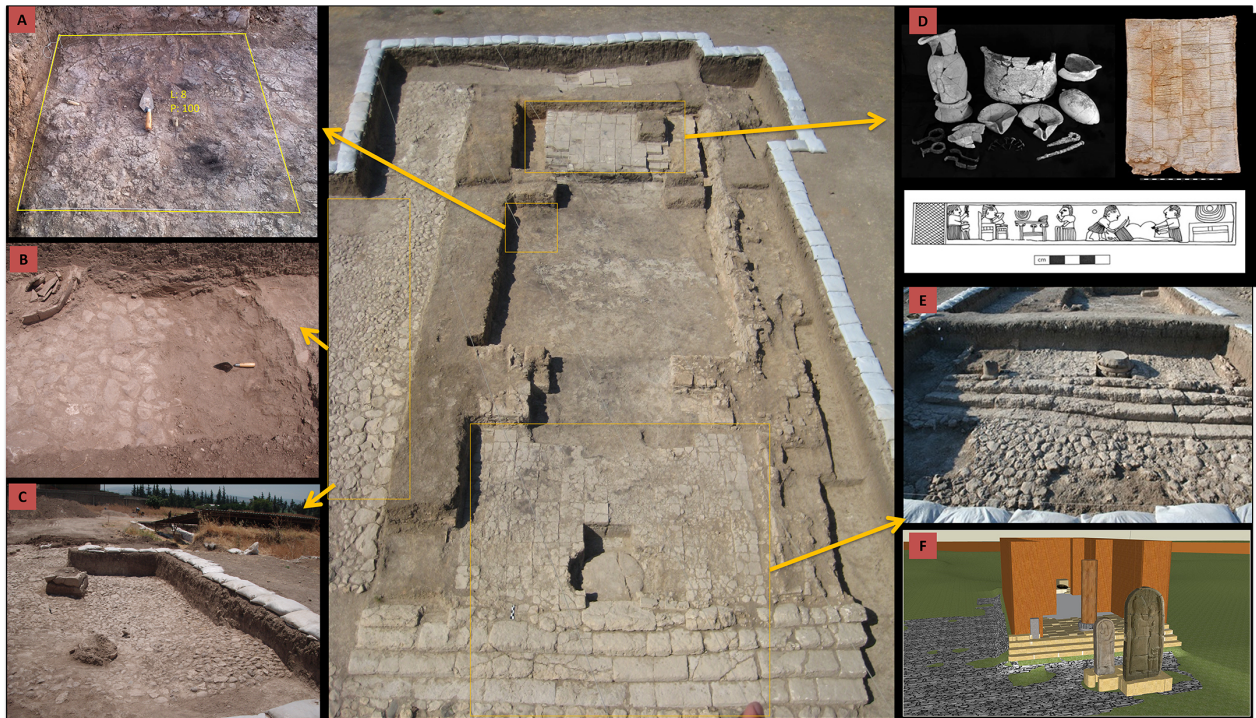
Building XVI is a small tripartite temple that was positioned within a larger religious complex alongside another temple ‘Building II’ to the southwest during the Iron Age (Harrison 2012; Harrison/Osborne 2012). The temple was unearthed during the 2008 and 2009 excavation seasons. Additionally, an exploratory probe was conducted inside the structure in 2011. Stratigraphic evaluation inside Building XVI enabled the Tayinat team to confirm two separate phases of construction: an earlier one associated with the Neo-Hittites, and the later one related to the Assyrians, which includes several renovations in and around Building XVI during the late 8<sup>th</sup> or early 7<sup>th</sup> cent. BCE (Harrison/Osborne 2012). No earlier surface predating these two phases has been encountered (Harrison 2012, 16; Harrison/Osborne 2012; Osborne et al. 2019). Building XVI and its cultic objects were heavily burned during its final use. The material culture was preserved with little disturbance in a thick layer of burnt mudbrick mixed with ash when the building collapsed. Additionally, no evidence of burnt brick around the monument was encountered by archaeologists. This may indicate that the fire was set from the inside of the temple; most probably closer to the eastern N/S wall regarding the greater degree of conflagration at this part of the monument (Osborne et al. 2019).

The southern part of Building XVI is characterised by various features such as a square-shaped platform with finely-dressed stone blocks<sup>2</sup> in front of the monument, a wide limestone staircase and a single column base on the portico (*fig. 1E* and *1F*) which is identical in size, shape and decoration to those found in the portico of the *bit-hilani* palace (Building I). To the left, a small basalt column was

<sup>1</sup> Tell Tayinat and some other sites in this region were excavated in the 1930’s by the University of Chicago’s Oriental Institute, Syrian-Hittite expedition. These earlier excavations lasted four seasons from 1935 to 1938 and documented five distinct architectural phases of the Iron II and III levels on the site (see Haines 1971). In 2004, the University of Toronto’s Department of Near and Middle Eastern Civilizations resumed the excavations.

<sup>2</sup> This archaeological feature was unearthed by the Syrian-Hittite expedition during their last excavation season at the site; however, the excavators did not extend this trench further (see Haines 1971).





**Fig. 1.** Archaeological features and artefacts from inside and around Building XVI; A) Surface of the central room; B) Pithos seen under the baulk and occupational debris on top of cobble-stone surface; C) Pithos and stone installation, looking south; D) Some artefacts from the inner sanctum, including Esarhaddon's Succession Treaty, and pyxis with depiction of a feasting scene; E) Porch, stairs, column base and an altar in front; F) Proposed isometric representation of the temple during the Neo-Assyrian period, looking north (sources: OCHRE database, Photo credits for figure 1b and 1c: Liz Warkentin, <sites.utoronto.ca/tap> [last access: 02.11.2017]; central image is modified from: Harrison/Osborne 2012, 134, Fig. 5).

found in front of the southern end of the western N/S wall. There is also a smashed vessel found *in situ* to the east of the portico. Furthermore, the portico is separated from the central room by two brick piers (Harrison 2012, 15). Three heavily burnt wooden beams were recovered between the two piers. One seems to have been set directly into the floor. A thick deposit of destruction debris was uncovered on the floor surfaces of the central room due to the conflagration (*fig. 1A*). No artifact or pottery finds were recovered from the central room, but only small finds such as fragments of gold and silver foil and ivory inlays near the eastern N/S wall. Excavators suggest that the material culture can be related to a sort of wooden installation inlaid with embellishments (Harrison/Osborne 2012, 16).

The inner sanctum is separated from the central room by another set of mudbrick piers with a wood-lined threshold which was installed during the Neo-Assyrian occupation (Harrison/Osborne 2012; Osborne et al. 2019). A rectangular platform

is in the centre of the room against the back wall. The inner sanctum contains a vast array of artefacts and tablets recovered either *in situ* or with little disturbance from their original locations. Numerous vessels, oil lamps and cuneiform tablets were found in this part of the building (see *fig. 1D*; Harrison 2012, 16). An elaborately carved pyxis with a feasting scene was found on the steps of the platform. The ceramic finds have close parallels to 7<sup>th</sup> cent. BCE pottery assemblages in the Assyrian heartland (Harrison/Osborne 2012). One of the most noteworthy epigraphic finds is a copy of the Esarhaddon Succession Treaty (classified as T-1801; see also Harrison/Osborne 2012; Osborne et al. 2019 on the artefactual finds and construction techniques; Lauinger 2011; 2012 on the epigraphic evidence).

To the west of the temple, additional archaeological features were unearthed. A pithos was recovered above a cobble-stone surface (*fig. 1B*), and a rectangular stone installation was found to the south of this pithos (*fig. 1C*). It should be noted

FIELD PHASES	FP2A			FP2B				
DATING	Iron Age III (ca. 738–600 BCE)			Iron Age II (ca. 900–738 BCE)				
SUBPHASES	FP2A1	FP2A2	Total - FP2A	FP2B1	FP2B2	FP2B3	Total - FP2B	Total - FP2A & FP2B
TOTAL NUMBER OF SAMPLES	32	12	44	19	4	9	32	76
TOTAL SEDIMENT VOLUME PROCESSED	212	98	310	162	47	79	288	597
TOTAL COUNTS	172	12	184	113	21	354	488	672
FIND DENSITIES	0.81	0.12	0.59	0.70	0.45	4.50	1.70	1.13

**Table 1.** The number of samples, the amount of sediment volume processed, absolute counts and find densities associated with FP2A, FP2B and their subphases.

that this rectangular stone installation sits on top of the accumulated debris (G4.37 L. 7; see *fig. 1B*), not on the cobble-stone surface (G4.37 L. 9). Thus, this stone installation was not associated with the earlier, but rather the later use phase of the temple (Osborne et al. 2019). Various locally produced ceramic sherds from this accumulated debris were unearthed on top of the exterior cobble-stone surface which predominantly includes drinking cups, serving vessels, but also small finds such as eye-inlay, fibulae and fragmented Luwian inscriptions (Osborne et al. 2019).

The Esarhaddon Succession Treaty (see *fig. 1D*) provides a *terminus post quem* of 672 BCE for the destruction of Building XVI (Harrison 2012; Harrison/Osborne 2012). Furthermore, the stratigraphic sequence, on the base of archaeological observations, ceramic chronology and radiocarbon dates, has been associated with three field phases (FP): a post-abandonment phase including the topsoil and modern activity such as agricultural activities likely of recent age (FP1), an early and late use phase of the temple (FP2) and a pre-temple phase (FP3). In turn, chronological subphases have been distinguished within these three major phases.

### 3 Materials and Methods

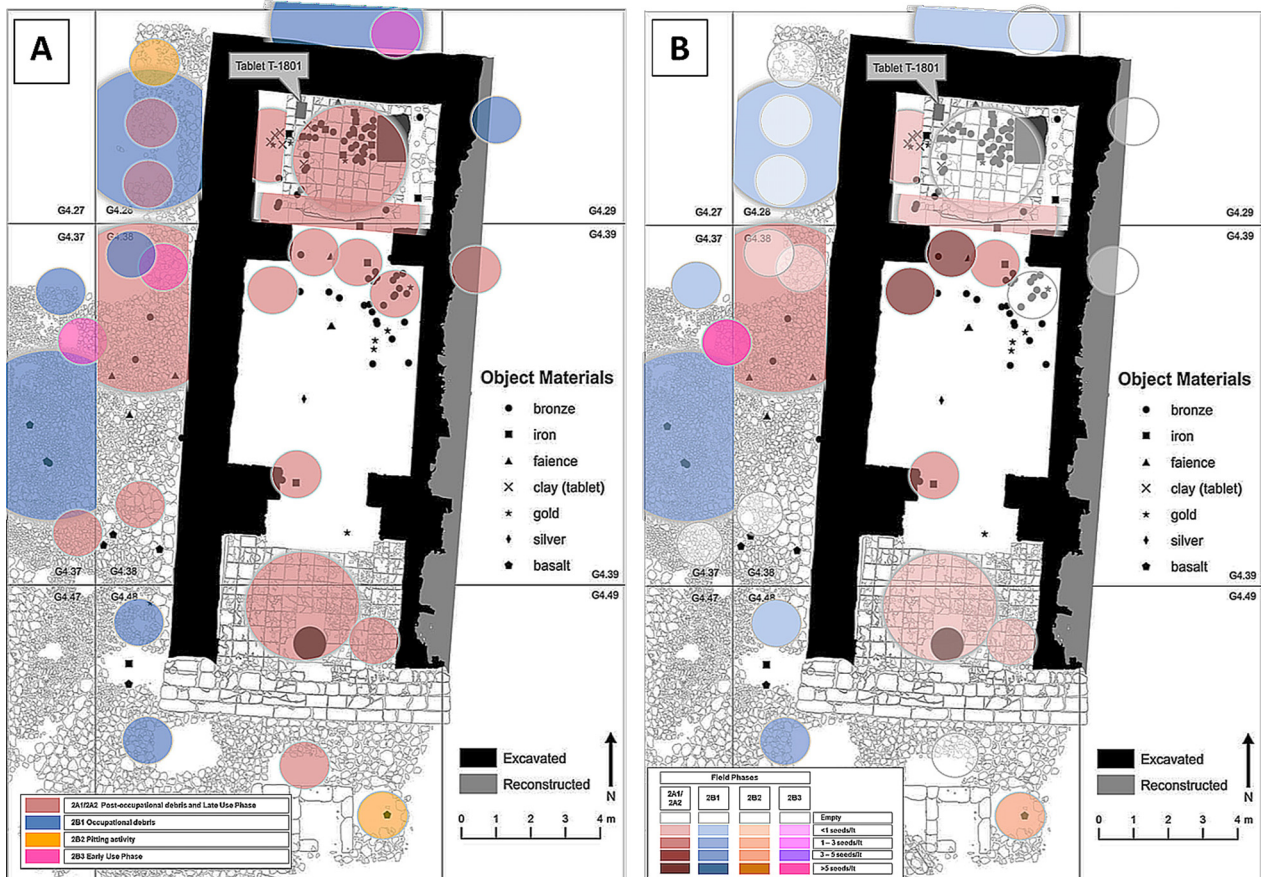
Flotation of sediments was undertaken in the 2008, 2009 and 2014 seasons with an Ankara-flotation machine. A 1mm plastic mesh has been placed on the first tank to pour the sediment down. Afterwards, buoyant plant materials have been collected into a cloth with openings small enough to retain the tiniest remains less than 0.50mm in length. In addition, the heavy residues were sorted

in the field allowing for any bioarchaeological remains (micro-faunal finds) and material culture (diagnostic pottery sherds, small finds, metal slags) to be secured.

The sampling was predominantly judgmental depending upon excavator's observations on-site. All archaeobotanical samples from all three field phases (n=196) were checked for macro-botanical remains from the study area. Scanning the contents of all 196 samples showed that FP1 and FP3 samples do not yield reliable plant data because of their high degree of contamination by modern seeds, stem fragments and roots. Some samples of these phases contain several slightly carbonised plant remains which may be the product of recent wildfires on the site since none of these objects were ever encountered in the plant assemblage of Tayinat studied so far (Karakaya 2019).

As a result, only samples from FP2 (subphases FP2A and FP2B) provided a reliable amount of plant macro-remains and have been included in this analysis (see *table 1* and *fig. 2*). The contexts in FP2 can be divided into two categories by a possible age relationship in connection to the archaeological observations and radiocarbon datings (see Osborne et al. 2019 and Manning et al. 2020 about the newest phasing scheme). Many samples recovered from the interior surfaces of the temple correspond to the late use phase during the Neo-Assyrian period (subphases FP2A1 and FP2A2) during Iron Age III (ca. 738–600 BCE). Also, a limited number of samples from this field phase were recovered outside the temple. The pithos, pit features and accumulated debris (subphases FP2B3, FP2B2 and FP2B1 respectively) are located in the exterior surfaces which are related to the early use phase of the temple





**Fig. 2.** A) The spatial distribution of archaeobotanical samples across studied contexts. The inset shows different subphases in the study area. Larger circles indicate multiple samples; B) the find density of plant remains inside and around Building XVI according to the subphases of Phase 2. The inset is colour-scaled according to the five different levels of find density, and every field phase is represented by a different colour in the figure (modified from Harrison/Osborne 2012, 138, fig. 8).

before the Neo-Assyrian annexation during Iron Age II (ca. 900–738).<sup>3</sup>

In total, 45 samples were analysed by the author. Additionally, six hand-picked samples as well as 25 samples previously analysed by Capper (2012) were added to the dataset. In total, all 76 samples correspond to 597 litres of soil sediment. Of these 76 samples, 28 contain no

archaeobotanical remains. Out of the remaining 48 samples, 672 archaeobotanical remains were identified into 63 analytical categories. All remains were carbonised (*table 1*).

The identification of plant remains was carried out in the archaeobotanical laboratory in the Institute for Archaeological Sciences, University of Tübingen. The reference seed collections in the Laboratory of Archaeobotany at the University of Tübingen and identification manuals were used for taxa determinations. The plant remains were identified using a Euromex binocular with 10–60x magnification. During the laboratory process, the samples were divided into fractions (2mm, 1mm, 0.63mm and 0.050mm sieves) for an efficient sorting process. For quantification of the dataset, ubiquity score, proportions and find density analyses were used. The ubiquity score is a method to comprehend the percentage occurrences of

<sup>3</sup> It is worth noting that a C<sup>14</sup> date obtained from a short-lived sample (olive stone) in the central room of the temple provides an earlier date than the expected Assyrian age. That probably indicates the presence of residual material and some degree of mixture of deposits overlaying each other. Therefore, for the sake of clarity, the samples from FP2A subphases were reported together in this manuscript, while FP2B subphases supposedly represent an earlier phase of temple use, were examined together. It is highly likely that the chronological window between both phases would be very close to each other. I would like to thank one of the reviewers for bringing this inconsistency to my attention.

certain taxon across the total number of samples within a particular timeframe (Miller 1988). Find density is the quantity of botanical finds relative to the soil sediment processed (Jones 1991). This is recorded as the number of objects divided by the volume of the sediment. The proportions, on the other hand, describe the percentage occurrences of a plant taxon compared to the same morphological category (e.g. crops) and/or to the whole dataset.

## 4 Results<sup>4</sup>

### 4.1 Overall Characteristics of Plant Assemblage at Building XVI

The studied samples have a low density of plant finds with a mean of 1.13 objects per 1l of sediment across all studied phases. The samples of the later subphases (FP2A–2B except 2B3) are characterised by a density between 0.12 and 0.81 per 1l. The overall density of finds is the highest for the subphase FP2B3 with 4.50 objects per 1l of sediment (table 1). Otherwise, the ubiquity scores of crop plants are rather low in all subphases. Olive (*Olea europaea*) finds show the highest ubiquity score among crops with 21%. Free-threshing wheat (*Triticum aestivum/durum*) shows lower ubiquities than barley. Most of the barley (*Hordeum vulgare*) finds were recovered from the pithos and the accumulated debris in G4.37.7, including a few grains from the inner sanctum between the platform and the western N/S wall. Bitter vetch (*Vicia ervilia*) is the main pulse in the assemblage with a ubiquity score of 9.2%. Also, the other crop plants have significantly low ubiquity scores in general. No single emmer wheat (*Triticum dicoccum*) grain was found. Only two lentil (*Lens culinaris*) seeds were encountered in the current analysis (table 2).

Some crop categories show higher proportions in the whole assemblage. These crop finds are free-threshing wheat, bitter vetch and olive pits (*Olea europaea*). In terms of wild plants,

three categories compose 43% of the assemblage: darnel (*Lolium* sp.), canarygrass (*Phalaris* sp.) and aggregate clovers (*Melilotus/Trifolium*). Further wild plants identified with ubiquities over 5% are sea club-rush (*Scirpus maritimus*), docks (*Rumex*), timothy grass (*Phleum* cf. *phleoides*), hare's ears (*Bupleurum* sp.) and several unidentified remains from the madder family (Rubiaceae). Unidentified large and medium-seeded grasses were very common and proportionally accounted for 13% of the whole assemblage. There are 36 other identified taxa which have ubiquity scores under 5% (table 2).

### 4.2 Sample Descriptions

#### 4.2.1 Plant Macro-Remains from Field Phase 2A

Four samples from the portico of the temple contain nine seeds including bitter vetch (n=2), unidentified large and medium grasses and legumes, docks and field madder (*Sherardia arvensis*). The samples collected from the *in situ* smashed vessel close to the E wall are completely devoid of plant finds. Capper (2012, 121) describes two samples collected between the first set of piers separating the portico and the central room (see above), which show a concentration of bitter vetch (n=12), together with a single seed of aggregate clovers category from under a large fragment of a cedar beam.

In the central room (G4.38), seven samples were recovered close to the second set of piers placed between the inner sanctum and the central room, from L. 4 and L. 7. Four of these samples were collected close to the eastern N/S wall, where several small finds were recovered (L. 4). They include only nine plant remains, among which cultivated wheat (*Triticum* sp.), several unidentified large and medium grasses as well as singular findings of canarygrass, medicks (*Medicago* sp.) and aggregate clovers. Capper (2012) reported free-threshing wheat remains and several unidentified large-seeded grasses in the samples close to the western N/S wall (L. 7). The three samples include 36 objects with a concentration of free-threshing wheat (n=15) and cultivated

<sup>4</sup> A sample-by-sample analysis of plant remains and locus descriptions can be found in Karakaya 2019 in Appendix C1 and C2.

wheat (n=6). The remaining objects are unidentified large and medium grasses, canarygrass, medicks and an unidentified nutlet from the sedge family (Cyperaceae). In parallel, the section of the temple surface (G4.38.8) examined in a probe in 2011 and analysed in this study coincides well with the plant data reported earlier by Capper (2012). The destruction debris on surface L. 8 in our analysis contains free-threshing wheat grains (n=13) as well as several unidentified cultivated wheat specimens (n=66) without any additional wild plant taxa. Another sample recovered from the area of second architectural piers contains additional six unidentified large-seeded grass remains. In total, this amounts to 75 unidentified large-seeded grass finds recovered from this single context.

The samples from the inner sanctum are largely devoid of plant remains. Seven samples collected from on top of the podium do not contain any plant macro-remains except for a singular object of fig (*Ficus carica*). On the other hand, more plant macro-remains were recovered from the accumulation at the sides of the podium. Capper (2012) identified three flax seeds from the debris between the podium and the western N/S wall. In this sample, there are also remains of barley, ryegrass, canarygrass and aggregate docks. Four samples collected from the accumulation between the front part of the podium and the wood-lined architectural piers include only four objects: bitter vetch (n=1) and sea club-rush (n=3).

The rectangular stone installation to the west of the monument belongs to this phase according to the archaeological observations (Osborne et al. 2019). The two samples collected from inside this feature were completely devoid of plant remains except one nutlet of sea club-rush.

#### 4.2.2 Plant Macro-Remains from Field Phases 2B

The earliest subphase (FP2B3) primarily covers the contents of the pithos (G4.37.9) with six samples (ca. 53l of soil sediment) which are full of seeds and fruits that have a greater find density (ca. seven counts per litre) compared to the average density of the entire assemblage. The density

of plant finds becomes the highest at the bottom of the pithos with a decreasing trend towards the upper parts of the pithos. Barley, free-threshing wheat and flax/linseed (n=3) objects were recovered from inside the pithos as well as a rich diversity of wild/weedy plants. Three wild taxa (ryegrass, canarygrass and aggregate clovers) are abundant in this deposit (*table 1*). Furthermore, three additional samples are associated with this subphase. A single sample to the north of the temple bears no plant remains. The other two samples were collected from the 2011 probe that cuts through the W wall downward to further reach lower architectural levels under the wall. One of these two samples contains nothing, but the other one yielded ten plant remains including barley, free-threshing wheat and wild/cultivated einkorn wheat (*Triticum boeoticum/monococcum*), five olive pits. Additional taxa are ryegrass, unidentified medium grasses and aggregate clovers.

In FP2B2, eight pit features with grey ashy deposits were identified to the west and south of the temple. Four samples were collected from two pits in this subphase. The soil sediment in G4.28.14 produced three samples. These samples are devoid of plant remains, except one with four seeds, and demonstrate modern root intrusions. Each of these objects is wild taxa: ryegrass, scorpion's-tail (*Scorpiurus* sp.), sparrow-worts (*Thymelaea* sp.) and spurge (*Euphorbia* sp.). Another pit deposit to the south of the temple's portico next to the limestone installation provides more plant evidence (G4.48 L. 20). The sample contains olive pits (n=6), bitter vetch (n=2), unidentified medium-seeded grasses (n=5) and wild plants such as ryegrass, canarygrass and sea club-rush.

FP2B3 contains the accumulated debris above the previous two subphases from the cobble-stone surface in G4.37, G4.38, G4.48 and G4.28. There are 19 samples from this subphase. Four samples were collected by hand-picking by the excavators. In square G4.37, one sample from L. 6 contains only three seeds (ryegrass and two unidentified pulse and cereal grains). The six samples recovered from G4.37.7 represent comparatively rich finds (n=69). 27 of these 69 seeds are cultivated crops. The cultivated taxa in G4.37.7 include cereals and pulse grains including seven olive pits. Additional three olive pits were found

LIST OF PLANT TAXA	COUNTS			UBIQUITY SCORES			PROPORTIONS		
	FP2A	FP2B	Total	FP2A	FP2B	Total	FP2A	FP2B	Total
<i>Hordeum vulgare</i>	2	17	19	4.5	34.4	17.1	1.1	3.5	2.8
<i>Hordeum vulgare</i> (rachis segment)	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Triticum aestivum/durum</i>	30	13	43	9.1	15.6	11.8	16.3	2.7	6.4
Free-threshing wheat (spi. base)	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Triticum</i> spp. (fr. thres/gl.)	9	11	20	4.5	18.8	10.5	4.9	2.3	3.0
<i>Vicia ervilia</i>	15	4	19	9.1	9.4	9.2	8.2	0.8	2.8
<i>Lathyrus sativus/cicera</i>	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Lens culinaris</i>	0	2	2	0.0	6.3	2.6	0.0	0.4	0.3
<i>Olea europaea</i>	3	20	23	6.8	40.6	21.1	1.6	4.1	3.4
<i>Vitis vinifera</i> (pip)	1	9	10	2.3	18.8	9.2	0.5	1.8	1.5
<i>Vitis vinifera</i> (berry)	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Vitis vinifera</i> (stalk)	0	3	3	0.0	9.4	3.9	0.0	0.6	0.4
<i>Ficus carica</i>	3	1	4	6.8	3.1	5.3	1.6	0.2	0.6
<b>WILD PLANTS</b>									
<i>Hordeum spontaneum</i>	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Hordeum</i> spp. (wild. >4 mm)	0	2	2	0.0	6.3	2.6	0.0	0.4	0.3
<i>Hordeum</i> spp. (frag. grains)	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Triticum monococcum/</i> <i>boeoticum</i>	0	2	2	0.0	6.3	2.6	0.0	0.4	0.3
<i>Lolium</i> sp.	4	195	199	6.8	62.5	30.3	2.2	40.0	29.6
<i>Phalaris</i> sp.	6	41	47	11.4	34.4	21.1	3.3	8.4	7.0
<i>Phleum</i> sp.	0	16	16	0.0	12.5	5.3	0.0	3.3	2.4
<i>Aeluropus</i> cf. <i>littoralis</i>	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Poa</i> cf. <i>trivialis</i>	0	5	5	0.0	9.4	3.9	0.0	1.0	0.7
Poaceae, indet. (large)	79	10	89	13.6	18.8	15.8	42.9	2.0	13.2
Poaceae, indet. (medium)	8	14	22	6.8	15.6	10.5	4.3	2.9	3.3
Poaceae, indet. (small)	2	5	7	2.3	6.3	3.9	1.1	1.0	1.0
<i>Coronilla</i> sp.	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Scorpiurus</i> sp.	0	2	2	0.0	6.3	2.6	0.0	0.4	0.3
<i>Securigera</i> cf. <i>securigeda</i>	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Medicago</i> sp.	2	0	2	4.5	0.0	2.6	1.1	0.0	0.3
<i>Melilotus/Trifolium</i>	4	40	44	6.8	34.4	18.4	2.2	8.2	6.5

LIST OF PLANT TAXA	COUNTS			UBIQUITY SCORES			PROPORTIONS		
	FP2A	FP2B	Total	FP2A	FP2B	Total	FP2A	FP2B	Total
Fabaceae, indet (large)	1	0	1	2.3	0.0	1.3	0.5	0.0	0.1
Fabaceae, indet (medium)	1	1	2	2.3	3.1	2.6	0.5	0.2	0.3
<i>Linum usitatissimum</i>	3	3	6	2.3	6.3	3.9	1.6	0.6	0.9
<i>Bupleurum</i> sp.	0	8	8	0.0	12.5	5.3	0.0	1.6	1.2
<i>Bupleurum subovatum</i>	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Torilis leptophylla</i>	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
Asteraceae, indet	1	1	2	2.3	3.1	2.6	0.5	0.2	0.3
Brassicaceae, indet.	0	2	2	0.0	6.3	2.6	0.0	0.4	0.3
<i>Vaccaria</i> cf. <i>pyramidata</i>	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Scirpus maritimus</i>	4	6	10	6.8	18.8	11.8	2.2	1.2	1.5
<i>Rumex</i> sp.	2	5	7	4.5	15.6	9.2	1.1	1.0	1.0
Cyperaceae, indet.	1	2	3	2.3	3.1	2.6	0.5	0.4	0.4
<i>Galium spurium</i> type	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Sherardia arvensis</i>	1	0	1	2.3	0.0	1.3	0.5	0.0	0.1
Rubiaceae, indet. (fragmented)	0	7	7	0.0	6.3	2.6	0.0	1.4	1.0
Rubiaceae, indet. (large/medium seeded)	0	2	2	0.0	6.3	2.6	0.0	0.4	0.3
Rubiaceae, indet. (small seeded)	0	8	8	0.0	18.8	7.9	0.0	1.6	1.2
<i>Thymelaea</i> sp.	1	2	3	2.3	6.3	3.9	0.5	0.4	0.4
<i>Chenopodium murale</i>	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Malva</i> sp.	0	2	2	0.0	3.1	1.3	0.0	0.4	0.3
<i>Euphorbia</i> sp.	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Anagallis</i> sp.	1	0	1	2.3	0.0	1.3	0.5	0.0	0.1
<i>Papaver</i> sp.	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Adonis</i> cf. <i>annua</i>	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
Verbascum/Scrophularia	0	2	2	0.0	3.1	1.3	0.0	0.4	0.3
<i>Cephalaria</i> type	0	2	2	0.0	3.1	1.3	0.0	0.4	0.3
<i>Ranunculus</i> sp.	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
<i>Ranunculus</i> cf. <i>arvensis</i>	0	2	2	0.0	3.1	1.3	0.0	0.4	0.3
TT-unidentified-taxon-2	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
TT-unidentified-taxon-5	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1
TT-unidentified-taxon-6	0	1	1	0.0	3.1	1.3	0.0	0.2	0.1

**Table 2.** The absolute counts, ubiquity scores and percentages of the identified plant taxa associated with FP2A, FP2B and their subphases.

in neighbouring samples from G4.38 and G4.48. A concentration of grape pips is also visible in this accumulated debris, with six pips, one unidentified grape object and two stalks. Wild plants are confined largely to ryegrass, canarygrass and aggregate clovers categories. Other taxa appearing in low counts are sea club-rush, cow soapwort (*Vaccaria cf. pyramidata*) and specimens from the madder family.

The deposits covering the outside of the temple in G4.28 associated with subphase FP2C contain fewer plant remains and the evidence becomes fragmentary. Two hand-picked samples were collected by the excavators, consisting of barley and free-threshing wheat grains. Two out of six other samples on top of the cobble-stone surface are devoid of macro-botanical remains in G4.28. The other four samples contain grape, olive and barley as well as the typical weeds (ryegrass, canary grass and clovers). All appear in low quantity. Another sample recovered in G4.29 north of the temple is devoid of any plant macro-remains.

## 5 Discussion

### 5.1 Taphonomical Considerations of Plant Remains

The deposition of plant remains inside of Building XVI is primarily due to disturbance by fire and appears to have resulted from a single destruction event. In this regard, we see that all three crop categories identified in this context, bread/*durum* wheat, bitter vetch and flax, are distributed close to the west N/S wall of the temple. Since the archaeological observations indicate a higher degree of conflagration at the east N/S wall of the monument, it is highly possible that the grains might have spilled westward from their original provenance during the initial destruction of the building while it is uncertain where these crops were originally located. It could be that the bitter vetch grains were spilled from the *in situ* smashed vessel on the portico towards the floor surfaces. In case of free-threshing wheat, the original provenance could be either the *pyxis* in the inner sanctum (fig. 1D) or possibly the destroyed wooden installation in the central room.

Archaeobotanical investigation demonstrates that a severe burning event substantially affected the preservation conditions. The large-seeded grass grains (identified as Poaceae, indet. in table 1) from the central room remained unidentified due to a high degree of morphological deformation. It is likely that these macro-remains also belong to the same wheat taxon (*Triticum aestivum/durum*) and were scattered from the same source deposit. Recovered bitter vetch finds were possibly only preserved because of having been trapped under a section of the cedar beam. Similarly, the severe conflagration in the inner sanctum might have consumed most flax seeds because of their rich oil contents. It is also noteworthy to mention that some plant finds could derive from disintegrated mudbrick in this setting (e.g. van der Veen 1996; Marinova et al. 2012b), such as the wild plants found in the inner sanctum.

### 5.2 Ritual Use of Plants at the Study Site

Concentrated crop deposits have been previously identified in several cultic settings in the Near East. Kislev and Hopf report a *pyxis* containing about 300 six-rowed hulled barley grains in the Philistine Temple 131 dated to the 11<sup>th</sup> cent. BCE at Tell Qasile in the southern Levant (Kislev/Hopf 1985, 140). At the Urartian fortress Ayanis, several different objects found in the temple (e.g. quiver) were intentionally filled with broomcorn millet (*Panicum miliaceum*; Çilingiroğlu 2004). The Late Bronze Age ‘Stele Building’ at Kilise Tepe (Turkey) represents a similar example, where a central ‘stele room’ yielded concentrated barley finds near the altar, while several other crop species were in other smaller rooms/extensions surrounding this central room (Bending/Colledge 2007). The grains of grass pea (*Lathyrus sativus*), another poisonous plant for humans (like bitter vetch in Building XVI), was recovered from a layer of smashed vessels *in situ* in front of a cultic monument at Late Bronze Age Tel Burna (Orendi et al. 2017, 172).

The processes that cause the presence of plant remains around Building XVI – if, for example, due to cultic activities that took place outside the temple – remain uncertain. The outer sides of temples were usually allocated for cultic activities,



with the presence of rich cultic paraphernalia (Mazzoni 2015), a variety of installations such as pithoi (Hoffner 1995, 111) and pits (Ökse 2015). Taking this into consideration, the accumulated debris, pit features and pithos represent intriguing insights for the depositional characteristics of plant remains around Building XVI.

It is noteworthy that the accumulated debris is particularly rich in crop finds; almost half of the plant remains are crops. Olive pits, for instance, reach a ubiquity score of ca. 50% in the accumulated debris.<sup>5</sup> The same deposits contained a greater number of grape pips and stalks. Similarly, the pit, which is in front of the building abutting the stone installation, contained several olive stones in addition to high quantities of cattle bones (D. Lipovitch, personal communication). Such patterning may reflect cultic use of this feature. Although comparable archaeobotanical evidence is still missing from such pit and midden features near temples, unusually rich animal bone deposits were discovered from the vicinity of similar stone installations at two other sites: Tel Hazor (Lev-Tov/McGeough 2007; Zuckerman 2007) and Tel Bazi (Otto 2012, 184).

The pithos contains predominantly wild plants including typical weedy plants and a wide array of other wild taxa. Samples with similar species composition usually recovered elsewhere at the site; especially in the Early Bronze Age IV and Iron Age I pits (Karakaya 2019). This assemblage resembles most the residues from the final crop processing stage with cleaning the last contaminants before food preparation. This is rather interesting since none of the food preparation installations like ovens and hearths exist around Building XVI unlike temple complexes in southern Mesopotamia (Otto 2012; Sallaberger 2012, 165). A similar pattern with abundant occurrences of wild/weedy plant remains has been previously identified in a cultic context at Büklükale in Central Anatolia (Fairbairn et al. 2019). At Büklükale, the presence

of carbonised wild plant remains in a certain 'shaft-like' architectural unit was attributed to the ceremonial food consumption as '[...] the refuse of social gatherings after which the residue from cooking fires etc. were discarded into R62 alongside the cups and other serving paraphernalia as a commemoration of the event' (Fairbairn et al. 2019, 341). The accumulation of these wild/weedy taxa in the pithos would also be due to the fact that they would have been considered impurities that should be eliminated by intentional burning and careful deposition in designated pits or containers, as suggested by the concept of 'ceremonial trash' (Walker 1995).

## 6 Conclusions

The archaeobotanical analysis from Building XVI demonstrates the importance of contextualising the plant remains in cultic settings. The plant evidence from Building XVI suggests that the formation processes of archaeobotanical deposits that took place in the structure are complex. The temple is not devoid of plant remains, and concentrations of bread/durum wheat and bitter vetch were found in the central room. It can be assumed that the plant remains recovered from inside Building XVI are predominantly from the final use phase of the temple, thereby coinciding with the Neo-Assyrian occupation. It appears that all plants had spilled westward onto the floor from their original location during the final destruction of the temple. The samples collected from sides of the temple (i.e. samples associated with the stone installation) attributed to this later field phase (FP2A) did not yield sufficient botanical results. On the other hand, the samples from the exterior surfaces and features of the building dated to the earlier use phase of the temple seem to have accumulated over a longer period, although no concentrated plant finds are documented in this part of the study area. However, the accumulated debris, the pits and the pithos are rich in taxa diversity, notably for the presence of several olive pits and grape pips. In addition to the general abundance of crop plants in this part of the study area, the pithos contains a wealth of wild/weedy plants. The present archaeobotanical analysis of

<sup>5</sup> This may be the result of preservation conditions since hard-shelled olive pits may survive the post-depositional disturbances better. It is important to note that collecting by hand-picking for some samples may also have resulted in this biased pattern towards over-representation of olive pits in this context.

plant macro-remains in Building XVI does not allow definite answers on the significance of crops/grains in ritual activities due to the lack of comparable plant data. However, it demonstrates the potential of more systematic attention to the cultic settings to identify possible non-subsistence related patterns in archaeobotany.

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Heribert Beckmann

## Beyond Subsistence and Human Agency

### Value-Making in Relation to Rice in Rural Tamil Nadu, India

Keywords: value, human-environment relationships, ritual, gender, auspiciousness, relations of production, agriculture, Tamil Nadu

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#### Summary

In the Kaveri Delta in the South Indian state of Tamil Nadu, rice has been cultivated for over two millennia (see Sattar et al. 2010, 236; Kingwell-Banham 2019, 6485–6490) and a complex and finely integrated system of relations between humans, rice and other non-human actors and entities has developed over time. These interactions feature prominently in local socio-economic relations as well as in cultural concepts and practices. In this paper, drawing on Graeber's value-theory (Graeber 2001), I illustrate how basic activities and relationships linked to cultivating rice, raising children, and managing and 'cultivating' families and households in a rice-cultivating village in the Kaveri Delta can be understood as both embedded in and generative of complex cultural symbolisms and social relationships that emerge from and extend beyond the realms of subsistence and immediate family relations.

I argue that, within these activities and relationships, the significance of rice beyond being the staple food and an important source of income prominently lies in the roles it plays in the pursuit of 'auspiciousness' (*maṅgalam*, *cubam*) and in the expression of social distinction (*mariyāḍai*). These two values have implications both pertaining to and moving beyond subsistence and are further entangled with processes of social value-making and ranking.

I further show that my interlocutors attributed agency in the production of rice, the raising of children and the prospering of families not only to humans, but also to various non-human<sup>1</sup> actors, such as deities, ancestors, rice, or the sun. Drawing on Descola (2013), I show how within these different activities, similar ways of interacting and relating were engaged in between humans and other beings. I suggest that 1) these ways of interacting involve the cultivation and 'harvesting' of auspicious qualities, the transmission of blessings and the giving and receiving of care and respect and that 2) within these interactions, essential social relations, positions and roles within and beyond 'human' society are continuously produced and reproduced.

<sup>1</sup> I use the term 'human' in this article to refer to living human beings and 'non-human' to refer to all other beings, actors and entities described here. I make this distinction for purely analytical purposes and it is not to be understood as reflecting the views of my interlocutors. It is further not meant to imply that actors, such as ancestors, should not be considered 'human'.

## Introduction

Rice has historically occupied a central position in the lives of agriculturalists in the Kaveri Delta and continues to do so in the present. Accordingly, the relations of production in the rice economy have influenced the gendered division of labour as well as the division of society into different caste groups with different socio-economic and religious statuses, obligations and privileges and differential access to – and control over – resources, such as land (see Athreya et al. 1990; Gough 1981; Kapadia 1995; Ludden 1985; Menon 1979; Narayanan 1988; Stein 1984; Veluthat 2009). A long history of intensive rice cultivation has further significantly shaped the local and regional ecology, and both husked and unhusked rice (paddy) as well as different rice-based foods have strong social and religious connotations, as will be partially outlined below.<sup>2</sup>

In this paper, which is based on long-term, social anthropological research in and around Kaveripuram, a rice-cultivating village in the Kaveri Delta,<sup>3</sup> several points about the interrelationship between subsistence-related activities and fundamental values and meanings<sup>4</sup> shall be discussed and illustrated by focusing on ritual practices and different tasks and roles involved in the activities of cultivating rice, raising children and managing and developing families and

households.<sup>5</sup> Drawing on Graeber's value-theory (Graeber 2001), I argue that these 'subsistence' activities, rather than simply being locally understood as reproductive labour, were to a significant extent conceptualised by – and became meaningful for – my Hindu interlocutors in relation to the central values of 'auspiciousness' (*maṅgalam, cubam*) and distinction (*mariyādai*). As will be demonstrated, these two values are intertwined with and inseparable from basic subsistence and reproductive activities, such as rice cultivation, child rearing and the maintenance of the family and household. I argue that inherent in both these values is simultaneously a fundamental assumption of – and orientation towards – growth and multiplication. They thus transcend the idea of 'subsistence' or reproduction in that they also carry in them the incentive to cultivate, develop and accumulate. The above-mentioned activities, as I further argue, involve processes of value-making and social ranking in relation to these central values.

I further show that my interlocutors attributed agency in the cultivation of rice and other activities described here not only to humans, but also to non-human actors, to many of whom they ascribed central positions in these activities. Similarly, my interlocutors engaged in social relations not just with other humans, but also with various other actors. Thus, drawing on Descola (2013), I attempt to show that the activities described in this paper entail social interactions between – and the distribution of roles and tasks across – different human and non-human actors that have to be actively maintained, for example, by virtue of their acknowledgment and renewal in rituals. Before delving into these aspects in more detail, it is

<sup>2</sup> See Beckmann 2022 for a detailed description of various perceptions and meanings of rice as well as of the agricultural landscape in the area where the research was conducted.

<sup>3</sup> The village's name has been changed for purposes of anonymisation.

<sup>4</sup> 'Subsistence' is understood here as subsuming all activities pertaining to '[...] the acquisition, transport, and storage of all products of agriculture, herding, hunting, fishing, and gathering, for use or exchange', including 'wage labour and trade' (Bradley et al. 1990, 448, paraphrasing Murdock and Morrow's (1970) understanding of 'subsistence economy'). It should also be noted that Kaveripuram is thoroughly integrated into the surrounding market economy and its inhabitants mostly procure goods, including food items or rice seeds and fertilisers, from private vendors or shops or government-run facilities. Rice cultivation as a source of food or income is also generally combined with other sources of income, such as cultivating other crops for the market, engaging in employment or carrying out daily wage labour (for detailed descriptions see Beckmann 2022).

<sup>5</sup> The research consisted of approximately twelve months of fieldwork carried out between 2014 and 2017 and involving participant observation and interviews with various stakeholders as the main research methods (see Beckmann 2022, 50–54). Most information in this article that is based on the research thus emerged from within the context of particular interactions in a particular area, is influenced by my interpretations and understandings and is not intended to be representative of the larger region or of Tamil Nadu or India as a whole.



necessary to outline Graeber's value theory<sup>6</sup> and Descola's 'modes of relation' approach, on which subsequent analysis will draw.

### Graeber's Theory of Value and Descola's 'Modes of Relation'

Graeber argues that a theory of value needs to take into account that the physical world is in constant flux and that categories such as 'society' or 'structure' do not have an agency of their own. The latter categories, he explains, are simply aggregations of actions performed by individual actors as part of a constant process of creative engagement with each other and their environment (Graeber 2001, 50–60). According to Graeber, all productive and reproductive activities constitute conscious efforts by individual human beings at fulfilling perceived needs. This involves engaging with different things or resources practically as well as conceptualising them and thinking about how to use them. It also involves humans' coordinating tasks between one another and thereby establishing social groups, rules of behaviour, divisions of labour, property regimes and so on. By engaging in productive activities in coordination with others, different people also partially develop and recognise themselves as certain kinds of people, who have specific skills and tasks and who possess certain kinds of agency in relation to other human beings, things and circumstances (Graeber 2001, 58 f.). By acting in order to fulfil their needs, human individuals continuously produce, maintain and alter subsistence resources as well as the social relations, groups and identities that surround the production, distribution and consumption of the former. In this process, they further come to understand their own role and significance as well as that of others (Bartelheim et al. 2015, 39–41; Beckmann 2022, 22; Graeber 2001, 58 f.). Accordingly, Graeber argues that the value of someone or something, whether

it is resources, social groups or individuals, is constantly created and understood by human actors through their own and other people's actions in specific social-environmental circumstances (Graeber 2001, 52–60). The value of someone or something shall be defined here<sup>7</sup> as the meaning and importance that the actions, properties or qualities of that being or entity take on in relation to the actions and properties of others within a 'social whole'. In other words, human beings come to understand and ascribe meaning and purpose (or value) to themselves and to others as part of their productive engagement with each other, with other beings and things as well as with their environment. It is thus by virtue of this constant productive and reproductive engagement that the interactions between different human beings and between humans and other beings as well as things become structured and thus, the illusion of an overarching 'social structure' or 'society' is created, both for the individuals involved and for any observer (Graeber 2001, 50–60; see also Law 1992).<sup>8</sup> It is these perceived encompassing social units or structures that Graeber subsumes under the term 'social whole' in his definition of value, since they constitute the perceived social context for individuals to evaluate themselves and others (Graeber 2001, 86–88).

According to Graeber, one of the reasons that such perceived 'social wholes' come to appear as (more or less) coherent and structured to both their members and scientific observers is that most human actors in a 'social whole' pursue, or are made to pursue, activities and goals that are related to a few 'key values', which I will refer to here as central values. Accordingly, most individuals understand the value of their actions significantly through two or three central values. Generally, one of these values is 'more socially

<sup>6</sup> Part of Graeber's theory is based significantly on Terence Turner's (for example 1997) theoretical and ethnographic work, many of whose writings, as Graeber points out, are unfortunately not easily accessible to a larger audience (Graeber 2001, 49).

<sup>7</sup> This is an idiosyncratic interpretation of Graeber's approach. He himself argues that, since it is human action that creates it, value can be seen as the importance of actions relative to the importance of other actions. He thus defines value as '[...] the way in which an individual actor's actions take on meaning, for the actor herself, by being incorporated into a larger social whole' (Graeber 2001, 67).

<sup>8</sup> As Graeber puts it, '[...] "structure" is identical with the process of its own construction. Complex, abstract systems are simply the way actors come to understand the logic of their own interactions with the world' (Graeber 2001, 61).

encompassing' and might also be seen as related to – or originating from – supernatural or divine actors or entities, while the other central value or values are more expressive of 'individual assertion' or status (Graeber 2001, 74 f., 18–20). The first value thus could be interpreted as more long-term-oriented and transcendent, while the other value or values become important in more immediate and localised contexts (Graeber 2001, 18–20, 71–83). When speaking of a value here, Graeber (2001, 78) means something akin to Kluckhohn's understanding of values. According to Kluckhohn, a value is '[...] a conception [...] of the desirable which influences the selection from available modes, means, and ends of action' (Kluckhohn 1959, 395, original italics).<sup>9</sup> Thus, values themselves are not the 'desirable' or what is effectively pursued, but the ideas that motivate the pursuit or make what is pursued meaningful (Kluckhohn 1959, 396–399). Central values thus become important in comparing and measuring the success, social position or rank – and therefore ultimately the value – of individuals or groups in relation to one another (Graeber 2001, 71–78).

These values are not to be understood as solely pre-existing or merely guiding actions, but are also continuously produced by the coordinated activities of individuals in interaction with each other and their environment. Thus, it is further postulated that in each society, there are certain fundamental ways of interacting and relating that underlie the social production of these values and thus also have a stark impact on the identities and roles of – and relationships between – different actors (Graeber 2001, 71–73). It will be shown here that such ways of interacting and relating exist not only between humans, but across species and different kinds of actors and entities, including deities, rice, and the sun. Descola calls such fundamental ways of interactive behaviour that involve human and non-human actors and cannot

be classified as either natural or cultural or either social or ecological processes, 'modes of relation', 'relational schemata' or 'forms of attachment' (Descola 2013, 309 f.). He writes that:

'A relational schema becomes dominant in a collective when activated in a whole range of very different circumstances in relations with humans and non-humans. The effect of this is to subject all relations to its particular logic, either by limiting their field of application or by subordinating this to the achievement of the ends that the dominant schema embodies' (Descola 2013, 310).

A collective, according to Descola, is not a pre-defined or imagined category like 'society' or 'nation', but a network held together by interactive relationships. Descola distinguishes between modes of relation that imply a 'mutual' relationship between two parties and those that are not mutual. He further argues that there are modes of relation which imply the ontological equivalence of the two entities involved and those which do not. Additionally, he proposes that some modes of relation are potentially reversible, while others are not (Descola 2013, 310 f.). Following Graeber's theory, such 'modes of relation' are, of course, also constantly created as part of activities (Graeber 2001, 68–83). It can thus be reasoned that it is in important productive activities, like rice cultivation, child rearing or the management of the household, that fundamental 'modes of relation' and central values are constantly recreated, and that people come to experience and understand their own roles, meaning and value *vis-à-vis* others – as well as the nature of their relationships with others – most profoundly.

Applying Graeber's theory to the context of Kaveripuram, it shall be argued here that 'auspiciousness' (*maṅgalam, cubam*)<sup>10</sup> should be seen as the 'socially encompassing' central value (Graeber 2001, 74) produced in the activities that will be described here as well as in many others. While I understand 'auspiciousness' to be the primary value

<sup>9</sup> Values, according to Kluckhohn, express preferences that are seen as morally, pragmatically or aesthetically justified and are thus of a normative character, while they also carry 'existential prepositions', that is assumptions about how things are or how the cosmos works, and moral and aesthetic assumptions about how things ought to be (Kluckhohn 1959, 390–395).

<sup>10</sup> My interlocutors seemed to mostly use the word *nalla* ('good') in relation to auspicious times, days or occasions or to the well-being of people (compare Moffatt 1979, 227).

that gives the activities and aims pursued by individual actors – and the other actors and entities who are involved in this pursuit – ‘social meaning’ and makes the former’s efforts comparable to those of other individuals, I further argue that social distinction (*mariyādai*) can be seen as another central value that is produced in many social interactions in and beyond the village, and is more related to ‘individual assertion’ (see Graeber 2001, 74).<sup>11</sup>

### The Values of Auspiciousness and Distinction

According to Carman, auspiciousness for Hindus can be understood as “‘Good Luck’ or well-being in the present temporal world [...]’ (Carman 1985, 114). It is ‘the divine blessing which makes life itself possible’ and manifests itself through ‘fertility, prosperity, health and happiness’ (Tingey 1993, 55), while ‘inauspiciousness’ causes, and is embodied by, infertility, disease, crop failure, famine or other kinds of misfortunes (Tingey 1993, 55; Raheja 1988, 42–46). Auspiciousness therefore is associated with ‘[...] the well-being of persons, families, houses, and the village as a whole’ (Raheja 1988, 37), and also with the reproduction, growth and continuity of life (Apffel-Marglin 1985a, 19–21).

The idea of the centrality of ‘auspiciousness’ in the lives of rural (Hindu) Indians is not a new observation. Srinivas (2003 [1952], 69) has demonstrated the centrality of auspiciousness – and its intimate association with marriage as the most auspicious occasion – in his ethnography of a South Indian community. Raheja (1988), drawing on her meticulous ethnographic and linguistic research and analysis, has convincingly argued that achieving and maintaining auspiciousness as well as preventing or removing inauspiciousness with the help of rituals and ritual transactions were of the utmost importance for her North Indian interlocutors in relation to almost any major activity. Tingey (1993, 55) similarly claims that maintaining auspiciousness and avoiding inauspiciousness is a

vital concern for Hindus in Nepal, while Carman and Luke have argued that among Hindus in South India, ‘[...] it is the auspicious state which is the quintessence of normal life in society [...]’ (Carman/Luke 1968, 32, as cited in Apffel-Marglin 1985b, 2).

While auspiciousness is the ideal state of life, it needs to be regularly ‘reaffirmed’ or secured through rituals (Tingey 1993, 55; Raheja 1988). There are further astrologically determined times and time periods as well as certain days that are auspicious or inauspicious for carrying out particular activities. Accordingly, it is important to conduct certain rituals or begin certain important activities during the auspicious time of an auspicious day for the particular undertaking (see Tingey 1993, 55; Raheja 1988, 38–60).

As shall be seen in the remaining paper, auspiciousness and auspicious qualities are also a central concern in relation to the activities described here. Rice itself embodies the auspicious qualities of fertility and multiplication and is considered the most important source of vital essence or strength (*cattu*) and thus of energy, saturation and life for humans. A Thiruvalluvar Priest in a nearby city, for example, stated that one grain of paddy would become 100 grains of paddy and that there would be no humans without some kind of rice.

I speak here of auspicious qualities<sup>12</sup>, rather than qualities associated with auspiciousness, because it is my understanding that my interlocutors did not just use terms such as ‘auspicious’ or ‘good’ (*nalla*) as abstract concepts, but rather treated them as physical-moral qualities or ‘substance-code’ (Marriott 1976b). Marriott has famously argued that in ‘Indian thought’, there is no conceptual separation between physical substance, meaning and action, and that all of these are experienced as flows of morally and meaningfully coded substance or ‘substance-code’ (Marriott 1976b, 109–111). Actors, qualities or entities that are associated with auspiciousness therefore also

<sup>11</sup> See Mines (2005, 81–100) for a detailed ethnographic description and discussion of *mariyādai*.

<sup>12</sup> By ‘auspicious qualities’ I refer here both to qualities that are immediately synonymous with auspiciousness, such as wealth or abundance (Nagarajan 2007, 101), and to qualities that significantly contribute to the development, maintenance and flourishing of life and the well-being of the family (compare Apffel-Marglin 1985a, 19).

(partly) embody auspiciousness; they are auspicious and have auspicious effects (see e.g. Tingey 1993, 55, 66–70).<sup>13</sup>

While auspiciousness is related to the maintenance of well-being, it also pertains to increases in well-being, such as through the ‘pursuit and enjoyment of wealth and power’ or the ‘satisfaction of physical desires’ (Carman 1985, 114) and thus to multiplication or accumulation beyond reproduction or subsistence. As Marriott explains, ‘[...] the main explicit axis of Hindu striving is **to receive and cultivate the divine gift of life**, as opposed to death. [...] The values of the main life-axis are expressed in terms framing the whole purposes of ritual – [...] translated by us as promoting “bodily existence and well-being,” or “auspiciousness,” or “a higher quality of life” – and extending onward to salvation’ (Marriott 1976a, 194, bold added). Thus, the main value related to subsistence activities, such as providing food, ensuring survival and reproduction or maintaining health, at the same time includes within it the impetus for the growth of and increase in well-being or the ‘cultivation’ of life.

*Mariyādai*, which can be translated as ‘honour’, ‘respect’, ‘deference’ or ‘distinction’, is given and received as part of many social interactions in rural Tamil Nadu (Béteille 2012, 38 f.; Mines 2005, 93–95). Béteille reports how social interaction in the Tamil village in which he carried out his research in the early 1960s prominently involved considerations of status through giving or expecting to be given *mariyādai* (Béteille 2012, 38 f.). This centrality of *mariyādai* in social interactions is also carefully and convincingly illustrated by Mines in her ethnography of a village in Tamil Nadu (Mines 2005).

Giving *mariyādai* means expressing deference or respect for someone by performing particular acts and gestures. Apart from making deferential or respectful gestures and using particular speech forms to address someone respectfully,

important ways of giving *mariyādai*, depending on the context, might for example pertain to presenting someone with a certain item in a particular manner, including someone in certain practices or inviting someone into certain spaces (compare Mines 2005, 81–100).

While different terms can be used, Mines (2005, 81–96) speaks of ‘distinction’ because *mariyādai* is not given equally to everyone, but assumes its significance through differences in the degrees of respect or deference that are given to different persons (this can mean gradation, but also inclusion versus exclusion), thereby creating social distinctions or hierarchies between them. *Mariyādai* is thus always relational and comparative (Mines 2005, 81–96). As such, *mariyādai* hierarchies or distinctions can reflect – or be influenced by – indicators like caste, class and gender, but also other factors, such as, for example, kinship, age, profession, power or wealth (see Béteille 2012, 38 f.; Mines 2005, 89–96). Giving *mariyādai* can thus be a way of affirming pre-assumed social hierarchies, but also of deliberately creating or altering such hierarchies (Mines 2005, 84–89). Again, distinction (*mariyādai*) is a value in Graeber and Kluckhohn’s sense in that it is not directly pursued, but makes desired social statuses, states and categories socially meaningful and rankable.

Having introduced the values of auspiciousness and distinction, I now proceed to describing my interpretation of how the central values of auspiciousness and distinction as well as fundamental social relationships and roles are experienced and reproduced in the activities described here.

### Rice Cultivation and Cultivation Rituals

The cultivation of rice in and around Kaveripuram usually takes place in either one (*cambā*) or two consecutive seasons (*kuruvai* and *tāḷaṭi*) per year (see Punithavathi et al. 2012, 46–47). Rice cultivation is organised in different stages. After ploughing, rice seeds are sown in a designated corner of the field. This activity is usually carried out by male farmers themselves or by hired male agricultural labourers. About 30 to 35 days later, the

<sup>13</sup> The same can be said for inauspiciousness. Raheja states that the terms used for inauspiciousness among her interlocutors ‘[...] denote qualities and substances that themselves are the causes, or more precisely, the embodiments of ill-being’ (Raheja 1988, 42).

young saplings are pulled out of the soil and tied together in bundles that are then assembled in large and heavy bunches and carried to the main field.<sup>14</sup> This is done by male agricultural labourers, some of whom also disassemble the bunches and distribute the sapling bundles across the main field by throwing them into different places.<sup>15</sup> The sapling bundles are then untied and transplanted manually by female Dalit<sup>16</sup> agricultural labourers. About 15 and 30 days later, respectively, female agricultural labourers are hired to walk through the fields and manually remove weeds.

The rice saplings require a lot of care throughout the cultivation process. My interlocutors placed particular emphasis on the need to provide the saplings with the right kinds of nutrition (fertilisers) in the right doses and at the right times. This was seen as essential for making them grow and develop into strong and healthy plants. The growth and health of the plants being of great importance to them, cultivators would consistently check the physical status of the plants, investigating them for signs of well-being or sickness by assessing different physical qualities in them, such as the colour of the leaves and the height or foliar strength of the plants.<sup>17</sup> As can be seen here, the relationship between cultivators and the saplings can in part be described as one of nurturing and caring.<sup>18</sup>

Apart from the activities described above, an important part of rice cultivation are rituals that

are conducted before entering different stages in the cultivation process, for example for each year's first transplantation, in order to ask for and ensure the proper development of the seeds, saplings and plants, embodied in their proper, healthy growth as well as the plentiful development of ears and grains, and an abundant harvest.<sup>19</sup> These rituals are conducted during the auspicious time of a day that is deemed auspicious for the particular undertaking (see Raheja 1988, 38).

What can be seen here is that the cultivation of rice is simultaneously a cultivation of bio-physically measurable qualities, such as foliar strength, and of auspicious qualities, such as multiplication, fertility, abundance and high yield (wealth), in the rice plants and grains. Furthermore, gratitude is expressed after the successful completion of cultivation. For instance, during the festival of *tai poṅgal* at the beginning of the Tamil month *tai* (in mid-January), which is around the time of the main harvest, the Sun God (*cūriyaṅ*) is offered milky rice dishes called *cakra poṅgal* ('sugar *poṅgal*') and *veṅ poṅgal* ('white *poṅgal*') along with other agricultural products or food items in a ritual of worship to thank him for the abundant yield.

### Cultivating the Household and Family

Once rice is harvested, its 'economic' significance lies in its role as the main staple food and also an important source of income for a household. My interlocutors stated that rice was their main and most important source of essence or strength (*cattu*), which was required for their own bodies to remain strong and healthy and for their children to grow well and develop into strong and healthy adults. Among my interlocutors, rice was considered an essential part of young children's diets

<sup>14</sup> This activity is exclusively carried out by men from the Dalit castes of the village.

<sup>15</sup> Shortly before this moving of the saplings, the main field is flooded and ploughed and levelled with a power tiller conducted by a man, and a few male agricultural labourers use their large hoes to additionally level the field manually and build strong mud bunds at the edges of the field.

<sup>16</sup> Dalit, meaning 'ground down' or 'broken to pieces', is a term used to designate members of the so-called former 'untouchable' castes. It refers to their common experiences of violence and discrimination and is used to subsume these various marginalised groups under one pan-Indian identity (Rao 2008, 11).

<sup>17</sup> Caring for the saplings also involves monitoring irrigation, taking measures against insects, pests and other plants that might affect the rice or compete with it and chasing away animals coming to feed on the rice.

<sup>18</sup> The term 'cultivators' here includes agricultural labourers, who carry out many tasks in rice cultivation.

<sup>19</sup> In Kaveripuram, the great majority of the rice cultivated was produced in order to be sold. Indeed, many cultivators sold their harvest and bought rice from shops for consumption. Despite this stark influence of the market economy, cultivators still conducted the rituals. However, some of them did complain that with increasing time pressure, they found less and less time for the rituals.

from a young age. Throughout the life of a child and subsequent adult, several auspicious life-stage rituals are conducted in relation to the development of the child and the transition into a good marriage and family life, involving procreation and the raising of healthy children, for the adult (see e.g. Alex 2016; Kapadia 1995; Petitet/Vellore 2007 for descriptions of different life-stage rituals in rural Tamil Nadu). At such rituals, rice generally features as an important ritual item together with various other ritual items. Human guests also give blessings, for example during weddings. Generally, life-stage rituals also involve the giving and receiving of distinction (*mariyādai*) between humans. Mines describes how life-stage rituals among her interlocutors involved the articulation of ‘ranked distinctions’ between different attending relatives as well as other guests, for example through the order in which different people gave gifts (Mines 2005, 85 f.). Furthermore, one essential part of hosting to the guests is offering them rice-based meals to ensure that they eat well.<sup>20</sup>

As an auspicious food grain and the main staple food, the presence of rice in a household is considered auspicious and associated with nourishment. Some people also referred to rice as an embodiment of Lakshmi, the Goddess of auspiciousness (Nagarajan 2007, 101). According to the prevalent ideal, a family should have children, who should develop well, and the household’s wealth should grow, as should the success in work, employment or business and education of the household members, who should also be and remain healthy. ‘Cultivating’ or developing the family and household and continuing the husband’s lineage constitute major goals of marriage (see Carman 1985, 114; Marriott 1976a, 194; Trawick Egnor 1978, 164 f.). This ‘cultivation’ of the family and household and the good development of children and adults also involves non-human actors. In Kaveripuram, deities and ancestors, for example, play a vital and active role in blessing families and their members. In various

rituals, offerings, which might include rice-based food, are made to household or lineage deities, while rice-based food is also an important ritual offering for ancestors (compare Kent 2013; Moffatt 1979, 226–229). Other deities are also worshipped in order to receive blessings. Offering rice as food to small animals like birds or insects, for example by creating an image made of rice flour (*kōlam*) on the ground in front of the house, is also rewarded with blessings from the deities or ‘religious merit’ (*punṇiyam*; Laine 2009, 128 f.).

In the case of ritual and celebratory events conducted by a family and involving the invitation of guests, rice-based foods and meals are served to relatives and other guests, as part of hosting them well, as described earlier. The quality of the food served to the guests and the ways in which they are cared for will be remembered and talked about by the guests afterwards and influence how the family is perceived by the other households that are engaged in relations with it. An important part of a good meal is that the rice used has to be of good quality, which will be appreciated by the guests (Beckmann 2022, 174–179).

Rice, therefore, brings auspiciousness or auspicious qualities into the household and is essential for maintaining vital social relationships with various actors, who are also essential for the auspicious development of the family and household. Here, too, the actors involved in bringing auspicious qualities into the household as well as in cultivating the children and their auspicious qualities are humans as well as non-human actors and entities, all of whom have to be cared for and respected. As has been shown, the securing of auspiciousness for the household pertains both to its subsistence and to its growth and development. Indeed, these two aspects are inseparable in how they are ritually enacted.

### **An Analysis of Basic Forms of Relating and Value-Making**

Cultivating rice, raising and nourishing children and contributing to the flourishing of the family and household involves many actors and entities. Deities, ancestors, the sun and others – as well

<sup>20</sup> For a description of the important roles of certain relatives for a family and their children as well as information regarding important ‘gifts’ at life-stage rituals, see Kapadia 1995, 13–29.

as human relatives – are all recognised as vital agents and are socially engaged with.<sup>21</sup> Applying the terms of analysis from Descola to the relations of production discussed here, I suggest that the cultivation of ‘the divine gift of life’ (Marriott 1976a, 194) and the cultivation of auspicious qualities can be understood as the ‘dominant schema’ and that we can discern two essential kinds of roles or relationships.

Firstly, there is the role of those who provide care and protection and allow someone or something to develop auspiciously, such as parents – particularly mothers – or wives who provide care, nourishment and protection to their children or care and nourishment to their husbands. Similarly, cultivators nourish and take care of the rice saplings.

It can be said that within and beyond (Hindu) marriage, auspiciousness is, indeed, prominently embodied by women (Apffel-Marglin 1985a, 19–21) and ‘[...] most clearly symbolized in the emblems which the married woman is allowed and expected to wear’ (Carman/Luke 1968, 32, as cited in Apffel-Marglin 1985b, 2). After marriage, a main task of a wife is to nourish her new family and attract wealth as well as good fortunes into her new household. Indeed, a Chakkiliyar<sup>22</sup> ritual specialist explained to me that just like paddy seeds grow and become mothers to new paddy seeds, a girl should grow up to become a mother. According to my male and female interlocutors, it is overwhelmingly a woman’s task to care for, feed and raise children. Thus, the main agency for bringing about many kinds of positive developments in a household and in children lies with the woman of the house. Women are seen as possessing and bringing into the household the same auspicious qualities as those described above. For one thing, a wife is responsible for the preparation of food. She embodies nourishment, care and generosity as she feeds the family and holds it together (Nagarajan

2007, 88–91, 100–103; Palriwala 1999, 60–67). Another perceived central auspicious quality (and duty) of a wife is being able to take care of her husband and keep him alive (Nagarajan 2007, 87–91). According to Nagarajan, ‘[a] woman is considered to have the ability to keep her husband alive, and therein lies some of her power as the bearer and container of auspiciousness’ (2007, 91; see also Apffel-Marglin 1985a, 19; Carman 1985, 114). Another very important perceived auspicious quality of a wife is her ability to bear children and thereby continue her husband’s patrilineage (Trawick Egnor 1978, 164 f.; Tingey 1993, 66–70). Success in realising these qualities is crucially tied to a woman’s status.<sup>23</sup> While in Kaveripuram men were seen to be primarily responsible for earning money and cultivating crops, women were seen as primarily responsible for ‘cultivating’ the family, that is making the family prosper with their auspicious qualities, and were also associated with the Goddess Lakshmi.<sup>24</sup>

Similar auspicious qualities are also embodied and brought into the household by rice once it is harvested. As described previously, rice also embodies fertility, multiplication and nourishment and is also associated with the Goddess Lakshmi. Rice nourishes the family as the main staple food, grows to become a mother for new rice grains when planted and plays an important role during auspicious rituals and social events.

Secondly, there is the role of beings to be cared for or children who are to be nourished, cared for and educated and to grow into healthy, successful, well-mannered and fertile adults. Particularly in women, the auspicious qualities of fertility and motherly care need to be present, so that they can channel them into their family and household

<sup>21</sup> Agricultural labourers are, of course, also essential actors in rice cultivation. Descriptions of relations between different human actors in rice agriculture in Kaveripuram can be found in Beckmann 2022.

<sup>22</sup> Chakkiliyars are one of the Dalit castes in Tamil Nadu (see Moffatt 1979, 151–153).

<sup>23</sup> As Palriwala states for Tamil Nadu and Rajasthan, ‘[...] selfhood, respectability and status are tied to wifehood and motherhood in more exacting ways than they are to being a husband and/or father. A single man or a man without children is seen as unfortunate, but a woman in a similar situation is inauspicious, possibly dangerous’ (Palriwala 1999, 53).

<sup>24</sup> As Nagarajan writes: ‘[...] the woman of the house if often referred to as the Lakshmi of the house. Like the goddess, the woman has the power to attract wealth and prosperity into the household and to prevent poverty from crossing the threshold’ (Nagarajan 2007, 101).

when they marry and become wives and mothers. Similarly, rice saplings are nourished, cared for and cultivated so that they grow healthily and develop plentiful grains that embody the qualities of multiplication and nourishment. Both humans and rice thus partly take on both of these roles.

Deities provide blessings to the humans and are offered food and other items as ritual offerings by the latter, who worship them with devotion. Similarly, ancestors provide blessings and are given ritual offerings and are thereby revered and cared for. Small animals, such as birds and insects, are beings to be cared for, which provides religious merit to those feeding them.

Returning to Graeber's value theory, this approach allows us to understand better how central values, such as auspiciousness and distinction, as well as fundamental roles and relationships, are created in this 'collective'; a 'collective' of human and non-human actors and entities on a village-level, which is made up of different smaller collectives built around individual families or households that engage in cultivating and 'harvesting' auspicious qualities. This cultivation becomes the main end of the 'dominant schema' (Descola 2013, 310). Indeed, the creation of value can be understood as the conversion of qualities created in interactions between cultivators and rice – and mothers and children – into qualities relevant in a more elaborate social unit, the family or the household.<sup>25</sup> The aim is for the family and household to develop auspiciously through the cultivation of 'the divine gift of life' (Marriott 1976a, 194). Within the larger collective, households can be compared to other households based on their success in this undertaking. Life-stage rituals for children and adults are prominently celebrated, since reaching another stage of development is something to be celebrated and shown to others. The healthy development of children and the accumulation of wealth, education, good jobs, positions of power

and so on are seen as characteristics of a successful household. At the same time, the family's members have to behave in socially appropriate ways and, when interacting with other people, give and receive the appropriate forms and amounts of distinction (*maryādai*). All of this is important for families' social standing in their caste community but also for their status in the larger village. Cultivating the household thus also means creating one's own and the other family members' value in the larger human community.

### Conclusion

In this paper, I have demonstrated how basic, subsistence-related activities can draw on, reproduce and hold together an entire collective of different actors and entities. These activities and interactions entail both subsistence matters and matters beyond subsistence. They are socially and ritually enacted; they are aimed at cultivation, development, continuity and reproduction of life in addition to maintenance as well as improvement of one's social status. Indeed, reproduction, growth, subsistence and expansion are not separated in this understanding. Neither can a clear distinction be drawn between human society on the one hand and natural, subsistence resources on the other. Instead, I demonstrated that auspicious qualities are cultivated, blessings transmitted and care and respect are given and received in interactions between actors such as deities, ancestors, human cultivators, their families and relatives, animals, rice, and so on. Humans and non-human actors take on similar roles and embody shared qualities in these interactions. In the interactions between the various actors, auspicious qualities are cultivated across species and different kinds of actors.

Applying Graeber's theory of value allows us to not only uncover how basic relationships and central values can be related to both subsistence and expansion or accumulation, making these activities meaningful for people beyond the need for survival. It also shows how the production of social ranking and distinctions among people – through the giving and receiving of *maryādai* – can be an essential component of such activities

<sup>25</sup> It is important to note here that more than half of the households in Kaveripuram did not own or command over agricultural lands for carrying out their own rice cultivation. They, of course, also engaged in the other practices and processes outlined in this paper, drawing on various sources of income (see Beckmann 2022, 54–56).



and that the relations of production involved in these activities can be unequal in nature, as is, for example, the division of labour between men and women in the household described here, or the relationship between cultivators and rice.

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Maike Melles

## Iberian Ham

### A Landscape Luxury

Keywords: Iberian ham, luxury, heritage, *dehesa*, landscape, Spain

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#### Summary

Iberian ham is not only one of Spain’s most famous culinary trademarks but also turns out to be an exclusive gourmet product. While its production has vastly expanded in recent years, a certain proportion of these produced hams are recognised as luxury items from their high prices. In their production, heritage and marketing, the hams have a close connection to the *dehesa*, a landscape in southwestern Spain. This contribution seeks to explore the contingent luxury character of *jamón ibérico* by embedding it in past and present ResourceComplexes revolving around the *dehesa* and the Iberian pig. Until the middle of the 20<sup>th</sup> cent.,

semi-feudal relations made the production and consumption of ham as such a luxury. Meanwhile, the terms for luxury and social distinction have changed: The protection of Iberian ham by European Protected Designations of Origin together with the heritagisation of *jamón ibérico* in museums, touristic events and discourses contribute to the image of Iberian ham as a basic foodstuff, which stands in stark contrast to the memories of working-class villagers. While it is true that the consumption of hams labelled as ‘Iberian’ today has expanded, it is a production based on landscape and thus on the Spanish *dehesa* that makes for an authentic *jamón ibérico*.

#### 1 Introduction

The following reflections on the luxury character of Iberian ham and its interrelation with landscape are based on a year-long fieldwork conducted in the years 2018 and 2019 in rural southwestern Spain. The *dehesa* is a savannah-like landscape consisting of pastureland and a sparse layer of trees, mainly holm and cork oaks.<sup>1</sup> With regard to the quality of soils and pastures, the *dehesas* vary greatly across the Spanish territory. Primarily used for the extensive livestock farming of cattle, pigs, sheep and goats, the *dehesa* is divided into farms (*fincas*). One of the most common animals kept in the *dehesa* is the Iberian pig from which the

<sup>1</sup> The same landscape covers major parts of Portugal, too, where it is known under the name *montado*. The *dehesa* is a landscape unique to the Iberian Peninsula and minor parts of North Africa. The regional focus of this study is on the Spanish regions Andalusia and Extremadura.



**Fig. 1.** A landscape full of trees and history: *dehesa* in Extremadura (photo by author).



**Fig. 2.** The characteristically dark Iberian pigs in search of acorns in the *dehesa* during the months of the *montanera* (Extremadura) (photo by author).

renowned Iberian ham, *jamón ibérico*, is produced. In its premium version, the ham is the hind leg of a purebred Iberian pig that has lived in free-ranging farming for two years and which, in the last two months of its life, is fattened primarily on acorns. Due to this, Iberian ham from its initial conception is inextricably linked to a certain landscape, as only the *dehesa* with its abundant trees is able to provide the sufficient amount of acorns (*fig. 1*).

As one of Spain's most famous culinary trademarks, Iberian ham is protected by national and international economic policies and is also at the heart of complex and interrelated heritage processes. Museums and tourist events often give the impression that ham as a basic foodstuff was procured during the annual slaughtering of the Iberian pig (*matanza*) and was part of the everyday culture of many rural families. At the same time, the ham is advertised and presented in many places as an exquisite luxury product. A closer look at the Iberian ham market reveals considerable differences in quality and price among different hams. Regardless of whether they are available at a price of 150€ or 600€ and more, all hams are marketed with images of dark pigs grazing peacefully under the *dehesa's* oak trees (*fig. 2*). These apparent paradoxes give rise to the questions of why some hams are more valuable than others and what exactly constitutes the luxury character of *jamón ibérico*. While luxury is often thought of as the opposite of necessity, anthropologists turn their attention to the ethnographic contexts and processes of valuation in which luxuries are identified.

In the following, the luxury character of Iberian ham and its context will be examined in more detail. After a short section on possible approaches to luxury from an anthropological perspective, questioning and embedding the simple juxtaposition of luxury and necessity (section 2), a more detailed ethnographic account of the *dehesa* and its interrelation with ham production and consumption will be given (section 3). Defining ham and landscape as elements of past and present ResourceComplexes allows for the comparison of social structures and valuation processes over the last seven decades (section 3.1). It will be demonstrated that (Iberian) ham has always been a luxury that served social distinction not only in the past (section 3.2) but continues to do so in the present (section 3.3). Section 4 will briefly discuss how the terms of luxury have changed throughout time, from a dialectical relation with necessity to an economic and social differentiation in which criteria of authenticity hold sway. The findings will be summarised in the conclusion (section 5).

## 2 Luxury as a Means and Expression of Social Distinction

Anthropological accounts of luxury criticise the commonplace and simplistic juxtaposition of luxuries and necessities as it falls short of analysing the complex social practices involved in the identification of luxuries or prestigious goods (Appadurai 1986, 38). In the same vein, anthropologists know

that what counts as ‘necessity’ does not adhere to a universal definition (Hahn 2007, 208). That certain goods are labelled luxuries is not due to any of their inherent qualities, nor are there any external determinants for luxuries that would apply in the same manner across all contexts; rather, luxuries are the contingent outcome of an interplay between a range of social, religious, moral, aesthetic and economic factors emanating from a certain context, so that what in one context is defined as a prestigious good may be irrelevant or even considered negative in another (Hildebrandt et al. 2014, 238). Importantly, the comparison of societies reveals that all of them have a notion of prestigious or luxury goods, and in all of them these goods function as a means of social distinction (Appadurai 1986, 38; Bourdieu 1984).

In contexts marked by strict social hierarchies, the access to luxury goods is restricted to certain individuals or social groups by means of sumptuary control; in market societies, luxuries become recognisable by their high price so that the disposable income or budget seems the only restrictive factor to their obtainment (Appadurai 1986, 25). Yet even in contemporary capitalist societies, money is not a guarantee that a rise on the social ladder comes with the purchase of luxury items alone. Social upward mobility is further restricted by knowledge and, importantly, the inertia of habitus which constitutes both a distinctive lifestyle and the very preference for it even after an increase in income (Bourdieu 1984, 169 f.). According to Appadurai, luxury can be understood as ‘a special “register” of consumption’ (Appadurai 1986, 38). Instead of inhering in them, the luxury character of goods emerges from a complex sociocultural construction that results from one or more of the following classificatory moves: Their consumption is the exclusive reserve of specific groups and regulated ‘either by price or by law’ (Appadurai 1986, 38). Frequently, the acquisition of goods designated as luxury is complex, which may or may not reflect their actual rarity. The property of luxury goods to communicate social hierarchies is what Appadurai calls their ‘semiotic virtuosity’ (Appadurai 1986, 38). In addition to their restriction and expression of social inequality, luxury goods often require specialised and restricted forms of knowledge that allow ‘for “appropriate”

consumption, that is, regulation by fashion’ (Appadurai 1986, 38). Finally, luxury goods exert ‘a high degree of linkage of their consumption to body, person, and personality’ (Appadurai 1986, 38).

Again, the sociocultural idiosyncrasies are important here. What could, for example, be the ‘complex social message’ (Appadurai 1986, 38) entailed in the consumption of Iberian ham? Since the identification of luxuries is embedded in a regime of value (Appadurai 1986, 15), luxuries and the social distinction marked by their consumption are fundamentally political for Appadurai. Established relations of class and privilege rarely go unchallenged as diverging interests – in maintaining or replacing the current regime of value – constantly reproduce or modify value hierarchies and social relations (Appadurai 1986, 57). For Bourdieu, a critic of the 1960s French society, the consumption of luxuries is an expression of economic power which is ‘first and foremost a power to keep economic necessity at arm’s length’ (Bourdieu 1984, 55). While this ‘claim to aristocracy’ is underpinned by the sheer costliness of luxury items like whisky or paintings, distinction in times of ‘democratised’ consumption is also the result of a regime of fashion and connoisseurship (Bourdieu 1984, 104; Appadurai 1986, 44).

The analytical interest that guides the remainder of this contribution is directed towards the terms of valuation which constitute the luxury character of a certain good, and the kind of social distinction it expresses and serves to uphold. To approximate possible answers, the ethnographic context in which luxury arises needs scrutiny. The identification and description of ResourceComplexes may provide information about the context of valuation and the definition of luxuries at different times.

### 3 Ham and the Landscape

#### 3.1 A ResourceComplex throughout Time

The story of the Iberian pig and ham is unthinkable without the *dehesa* of southwestern Spain. It is a wood-pasture equipped with numerous holm and cork oaks which provide the huge amounts of acorns needed to fatten the pig during two to four





**Fig. 3.** The indispensable basis for an Iberian ham of premium quality: ripening acorns of a holm oak (photo by author).

months in winter (*fig. 3*). The *montanera* constitutes the final phase of the pig's life that has lasted for two years before it is slaughtered in the period between late December and early March. The consumption of 8–10kg of acorns a day over the course of weeks causes the pig to gain 40% of its final slaughter weight, and imbues the ham with its characteristic flavour, which results from an infiltration of a high proportion of oleic acid, a monounsaturated fatty acid, into the meat. After the pig's slaughter, the hind legs (*jamonés*) and forelegs (*paletas*) are separated and soaked in salt for several days (one day per kilo of ham). The hams are then transferred to a cooling chamber where they stay at constant humidity for a few months before they dry-cure in a cellar (*bodega*), protected from light and heat, for another one and a half to three years. In this way, at least five years elapse between the birth of the pig and the consumption of its hind leg.

The *dehesa* may also be defined as a resource in the sense of the collaborative research centre SFB 1070 RESSOURCENKULTUREN, according to which

'[r]esources are the means to create, sustain and alter social relations, units and identities within the framework of cultural ideas and practices' (Hardenberg et al. 2017, 14). Instead of defining them narrowly as raw materials awaiting exploitation by the human being within a purely economic context, resources become an analytical category of sociocultural scope and placed at the centre of social relations and cultural valuation. According to Hardenberg, 'the study of resources will in the end reveal processes concerning the assignation of meaning, the transformation of value and social change' (Hardenberg 2016, 84). For a resource to be effective as such, it has to 'interact with other resources and elements' (Teuber/Schweizer 2020, 12). This notion resonates strongly with the actor-network theory proposed by Latour. A network or ResourceComplex should accordingly be considered a tool to provoke thoughts or 'a mode of inquiry that learns to list [...] the unexpected things necessary for any entity to exist' (Latour 2011, 799). A ResourceComplex is a functional concept in the best sense of the word, since a broader picture is given with the inclusion of intangible elements such as knowledge, skills, values, hierarchies, discourses and representations (Teuber/Schweizer 2020, 12) beyond the mechanical prerequisites which enable the use of a resource – in this case of the *dehesa* in connection with the Iberian pig.<sup>2</sup> This allows the inclusion of narratives in the analysis which form an inherent part in the identification, use and valuation of a resource.

Analysing the *dehesa* as a resource and comparing past and present ResourceComplexes reveals some insightful changes concerning land-ownership, land use and the terms of its valuation: The *dehesa* used to be part and parcel of semi-feudal relations until as late as the middle of the 20<sup>th</sup> cent. Whereas a few wealthy people owned

<sup>2</sup> There is more than one ResourceComplex revolving around the *dehesa*. Another case of this landscape is provided in the northeast of the region Extremadura. There the Iberian pig is hardly heard of and extensive livestock farming has traditionally been connected to (transhumant) sheep herding. This has important implications for, among other factors, landscape use and soil quality, people's cultural memory and their perception of the *dehesa* in the temporalities they refer to, as well as for the heritagisation of the region.



huge proportions of land, there were many farm-workers and day labourers who raised a variety of animals, carried out diverse agricultural tasks, took care of the numerous oak trees and serviced the landowners' households. Consequently, many elderly villagers do not only hold positive memories of agriculture as a shared activity but remember the *dehesa* as a place of hard work and the bodily pains they endured.<sup>3</sup> While a large proportion of land continues to be inherited within the same families, capitalist structures have also allowed other private individuals with entrepreneurial success to make a fortune and purchase land. Therefore, land ownership has diversified to some extent, with farming businesses ranging from small to large scale.

Until the 1950s and 1960s, the *dehesas* were roamed by shepherds and their flocks, who were joined in autumn by the swineherds in search for acorns to fatten the pigs. Where possible, portions of the *dehesa* were cultivated. Replacing the trees, which were used to produce firewood and charcoal, with new saplings was a central task of the workers. Today, the *dehesas* continue to be a site of extensive livestock farming, but fences have been drawn to subdivide them into enclosed pastures. Instead of the complementary grazing by cattle, pigs, sheep and goats, there is usually a specialisation in one species to achieve greater economies of scale. In addition, the *dehesas*' function has narrowed down from an agrosilvopastoral system combining agriculture, livestock farming and forestry to a simpler wood-pasture. Large-scale agriculture is carried out on the more fertile soils of Extremadura and Andalusia such as in the Guadalquivir Valley. The *dehesas*, on the other hand, suffer from overageing, as the rejuvenation of the tree stock has been neglected in many places. Usually, only one or two employees take care of one farm.

As landownership and land use change, so does the valuation of the *dehesa*. In the past, as in the present, the meaning of the *dehesa* varied greatly between people. It previously expressed

status within the feudalist framework, and this may also hold true for today's capitalist society. While some remember the *dehesa* as a site of hard work and pain, to those workers who lived in that landscape in often rudimentary shelters, it also provided livelihood, as they usually subsisted on whatever they found at their doorstep. Memories of family and friendship are also attached to the *dehesa*. Today, the *dehesa* is embedded in the economic and cultural policy framework of heritage in many places. Some *dehesas* form part of natural parks and biosphere reserves and within tourist activities such as hikes, they become appreciated as a site of recreation open to 'everybody'. Narratives of the public heritage of – the mostly privately owned – *dehesas* as well as its integration into discourses on sustainability and biodiversity give rise to new and more broadly shared forms of its valuation.<sup>4</sup>

Of course, there is a lot more to say on the similarities and differences between the past and present ResourceComplexes. One may think of and add more factors or expand on single components such as farming practices, farm management and infrastructure or the set of skills required. Crucially, without the Iberian pig and the related farming practices, discourses, representations and valuation, the *dehesa* would not be what it is. If only one element of the ResourceComplex transforms or even ceases to exist, the *dehesa* changes its character. Nowadays, pig and landscape have become aligned to each other within the expanding production of *jamón ibérico* and have been treated and marketed as a supposedly indivisible unit, an image which is strongly supported by their heritagisation (see below). In the following sections, the analytical lens will be placed on ham and the role it plays in past and present social distinction.

<sup>3</sup> In addition to physical exhaustion, interviewees recalled loneliness, e.g. during shepherding, hunger and even (sexual) abuse by the signiors.

<sup>4</sup> A certain part of the area covered with *dehesa* was declared an UNESCO biosphere reserve in 2002 (*Las Dehesas de Sierra Morena*). The *dehesa* has not yet been listed as a candidate for UNESCO cultural landscape, whereas the *montado*, the Portuguese denomination of the same landscape but on Portuguese territory, was included in October 2017 (UNESCO 2020). The Spanish-Portuguese EU Interreg cooperation project 'Prodehesa Montado' aims at a joint candidacy for the *dehesa/montado* cultural landscape at the UNESCO (Prodehesa Montado 2020).

### 3.2 'Either the ham was bad or you': Social Distinction in the Past

Until the middle of the 20<sup>th</sup> cent., southwestern rural Spain was what might be called a 'premodern' society in the sense that industrialisation occurred later in this part of Europe and the concurring 'crisis of traditional agriculture' in Spain is dated to the 1960s (Acosta Naranjo 2002, 50). Until then, social relations in the rural area were marked by feudalism: a wealthy few landowners employed a great many destitute families who worked on the farms to make ends meet. The modernisation of agriculture and the mass emigration from Andalusian and Extremaduran villages to cities such as Madrid and Barcelona where construction was booming gave rise to drastic socioeconomic changes. Families who, until then, had been dwelling in rudimentary stone huts on the farms were now able to build or even buy a house in the village. Some elderly villagers from working families remember the times of scarcity during the 1950s and early 1960s quite well. Households were lucky if they had a pig to fatten. The pig was usually slaughtered in the winter and the family made all kinds of sausages and cold meats which would serve as durable sources of proteins for the year to come.

Was ham a basic foodstuff in the past? Juan, a worker on a *dehesa* farm in Andalusia, contradicts the suggestion made by museums and ham producers that slaughtering of pigs at home and the consumption of ham were ubiquitous among the rural population:

J.: 'In the past, hams were only available to the rich. Those who had farms and who had a lot of money. They ate the ham then.'

M.M.: 'And who did home slaughtering?'

J.: 'Few people. Of working people in the past, there are few, no one. When perhaps one who had a pig would fatten it up in the patio, in the corral of the house – but very few. And the slaughtering, they [...] saved everything, the hams, the lard [...], the fat, they put it in salt and matured it all year round. But the one who had money ate the ham, the meat, the sausage, and the one who worked ate the fat. [...] In Spain there is a saying, in the past, when

there was no ham, he who had ham who did not have [money], and when he ate ham either the ham was bad or you. One of the two was bad.'

M.M.: 'And so it was always a rich man's thing [to eat ham]?'

J.: 'Yes, not of working people. [...] Maybe since '51 but ...'

M.M.: 'Today it is sold as quite a basic tradition of the villagers, but then it's not like that. It's changed.'

J.: 'Yes. But today anyone has ham. Because you buy one that's worth two hundred euros and you're already eating ham. Not so before. And if you ate well either the ham was bad or you were bad [laughs]. Yes, they say it was like that. It's the truth.'

Several insights can be gained from this short sequence. According to Juan, only a few households were lucky enough to own pigs for the *matanza*, the home slaughtering which today is still practised by some families (*fig. 4*). Most households could not afford to isolate the pig's hind legs and dry-cure them as hams. Not only does the home-curing of hams require certain ambient conditions such as protection from light and heat or constant humidity, but most families had to process all body parts of the animal right away out of necessity. For them, loin or ham 'were a luxury product ...[but]... the meat to be used for these pieces was minced and mixed with others of inferior quality and with other products to achieve a greater volume of sausages' (Acosta Naranjo 2002, 215, author's translation). Therefore, the consumption of ham dry-cured for years was a pleasure reserved for a few wealthy people, as was the consumption of the more valuable parts of the animal like the meats. By contrast, pork fat (*tocino*) was the main source of animal fat for the working poor, which is why the memories of interlocutors who are former shepherds and farm workers never include meat, let alone ham. This rigorous social distinction has coined the rule cited by Juan that 'either the ham was bad or you'.

Ham was not usually included in the diet of the ordinary villagers. Rather, its production and consumption as such served as a marker of social

distinction.<sup>5</sup> Apart from recalling the past and indicating the socioeconomic change that began in '[19]51', Juan also makes a reference to the present, noting that hams are readily available for 200€ nowadays. Yet this affordable kind of ham comes at a price. The next section will highlight the elements that contribute to the contemporary branding and heritage of *jamón ibérico* and how the latter establishes criteria for its authenticity.

### 3.3 *Jamón ibérico*: Heritage and Authenticity

*Jamón ibérico* is one of the most famous Spanish culinary trademarks since it gained profile when it was included in the list of Geographic Indications granted by the European Union. Because of its strong relation with the *dehesa* and its reliance on local skills, a portion of the produced Iberian ham is protected and marketed with a Protected Designation of Origin (PDO), the Geographic Indication which labels products 'that have the strongest links to the place in which they are made' (EC 2020b). In the case of Iberian ham, there are four PDOs, of which three were established in the 1990s and the last one in 2010. Apart from the clear geographical origination, the registration of a PDO requires that the product's 'quality or characteristics are essentially or exclusively due to a particular geographical environment with its inherent natural and human factors' and that its 'production steps [...] all take place in the defined geographical area' (EU 2020).

The defining characteristics of Iberian ham under the PDO also include the Iberian breed. As an autochthonous breed which usually appears as a dark or reddish creature, the Iberian pig is clearly distinguishable from the white pig that is



**Fig. 4.** During a traditional home slaughtering (*matanza*), the pig's body parts have been carefully separated and placed on a traditional wooden *bañera*. They include tongues, kidneys, belly fat and one of the hind legs (*jamón*) (photo by author).

predominant in the industrial production of pork. It is a heritage breed whose genetics are protected by a breed registry managed by the 'Spanish Association of Iberian Pig Breeders' (AECERIBER 2020). Curiously, most elderly interlocutors do not remember if they ever had an *ibérico* at home. Instead, their pigs were of any unspecified breed, if they were lucky enough to have a fattening pig at all, as Juan reports (see above). It may indeed be argued that Iberian ham is a 'European product' which without the EU's regulatory framework would not exist as such (Welz 2007, 334).<sup>6</sup> The definition of Iberian ham compares rather to a reassembling of elements and even the invention of tradition: while the harvest of acorns to fatten the pigs, the *montanera*, certainly dates back centuries or even millennia (Guzmán Álvarez 2016, 2), the *dehesas* used to be populated by a variety of animals and not just by the pigs which, in addition,

<sup>5</sup> A few decades ago, the ham was not necessarily called Iberian ham. In his description of the expansion of ham production from household to market level in the Sierra Morena, US geographer James T. Parsons refers to the local hams as '*jamones serranos*' (Parsons 1962, 230). Today, Serrano ham is clearly – and insistently – distinguished from Iberian ham. This is evident not least from its status as a Traditional Specialty Guaranteed (TSG) within the European Union since 1999. In 2016, Spain also applied for a declaration of *jamón serrano* as Protected Geographical Indication (PGI) (EC 2020a).

<sup>6</sup> Another criticism of the 'Europeanisation' of foodstuffs frequently brought forward is the threat it poses to small-scale producers in the form of standardisation and the imposition of new hygiene legislation (Welz 2007, 329). Their implementation can only be afforded by large companies, so that the necessary adjustment measures 'would considerably diminish the economic viability of many of [...] artisanal products' (Leitch 2003, 446). This complaint was also brought forward by some small-scale ham producers in southwestern Spain.



**Fig. 5.** An important Spanish culinary trademark, but a ‘European product’? *Jamón ibérico* in a festive setting (photo by author).

were herded and not surrounded by a pasture fence. Contrary to the ham’s contemporary stylisation as a gourmet product which demands razor-thin slicing with a specialised knife, the *cuchillo jamonero*, the village families used to cut thick cubes out of the ham and cook them in stews or soups (Amaya-Corchuelo et al. 2019, 57).

The establishment of the PDOs for *jamón ibérico* introduces the first distinction of the products (fig. 5). The PDOs distinguish between three standards of ham, each of which is indicated through a label of a different colour. Criteria for establishing the quality of a ham are the share of Iberian breed (which in the PDO may be either 100% or 75%) and the pig’s feeding in terms of whether or not it has passed the *montanera*. Either way, the pigs have to be kept in free-ranging farms and not in confinement; in the premium class each pig has to be granted at least one hectare to ensure free movement and a sufficient amount of acorns so that the pig preferably gains one kilo a day. A black label designates a premium ham that has been produced from a purebred Iberian pig that was fed on acorns for at least two months. The red label still requires the acorn feed, but the pig is only 75% Iberian breed. Green is the colour of ham labels when the pig did not or not sufficiently pass the *montanera*. This difference in quality is also reflected in the price of a ham, which is frequently sold as a whole piece of usually 6–9.5kg. The price per kilo of a premium-quality ham is, generally speaking, double the price per kilo of a red-labelled ham,

at least 55–60€/kg in contrast to roughly 30–45€/kg. Green-label hams is sold for 20–25€/kg.<sup>7</sup>

This locally embedded production, in which the ‘imagining’ of the ‘real pigs’ dwelling in the *dehesa* is in stark contrast to the factory-based industrial production of pork (Weiss 2016), is not the only effect of the PDO; it also plays a central role in the heritagisation of the ham. Following a processual understanding, heritage is a cultural practice in which the past is produced for the present (Harvey 2001, 336). As a process, heritage is historically contingent and embedded, interrelating with societal and/or technological changes and developments (Harvey 2001, 320). Important dimensions of how heritage is practised nowadays are its crucial role in the development of nationalist narratives, and its ‘overlapping [...] with economic models about the ownership (and objectification) of culture’ (Geismar 2015). Not only is a certain version of the past created – which may again be subject to controversy – but this version of the past must be marketable in order to promote the economic development of particularly rural regions through tourism and culinary arts. In this way, heritage is an instrument of economic policy involving different processes such as the protection of the product, its marketing and museumisation, tourism and the integration of ham and the *dehesa* in discourses on sustainability as well as their inextricable mutual linkage by rhetorical means.

One of the actors in the creation of the past for the present is the PDO. In January 2018, María, one of the representatives of the PDO Jabugo, explained the effect of the agency’s work as such:

‘When later on that public comes here to our sierra or buys our product, our companies realise the potential they have, don’t they? That’s work that’s been done for years, isn’t it? Because obviously we’ve gone from being a subsistence product that a family would depend on to [be able to] live to being a luxury product in the end.’

<sup>7</sup> Source: author’s own research in (online) stores. Prices vary greatly, depending on, for example, whether the ham is ‘organic’ which may even result in a price of 85€/kg. According to food blogger Eva Garcinuño (2020), the ‘best among the best pieces’ with black label may reach an overall price of 800€. Some red-labelled pieces may also be sold at 50–60€/kg. The indicated prices are therefore only approximations.





**Fig. 6.** Remembering tradition: museum exhibition of traditional utensils used for the *matanza*, information on spices used in the sausage products and movie recordings of first-hand reports on the feast's course (photo by author).

Apart from the economic valorisation that the ham and the region ('our sierra') undergo, there are at least two further interesting implications of María's statement. Firstly, there seems to be an 'always been'-manner of producing Iberian ham. Secondly, María suggests that Iberian ham used to be a basic foodstuff in the past, found on the subsistence level of people's nutrition, before it turned into an item of luxury.

The idea that the Iberian ham has always been produced in the same manner and served people as basic foodstuff is also depicted in the exhibitions of two local 'ham museums' in southwestern Spain.<sup>8</sup> Opened in 2005 and 2012 respectively, the museums are better characterised as visitor and marketing centres for Iberian ham and play a crucial role in its heritagisation. They have a similar structure and each comprise three exhibit areas. First, both museums give an introduction to the *dehesa* and its importance for the pig's feeding. The *dehesa* is depicted as a landscape and ecosystem void of humans but where only happy pig herds dwell so that past and present human experiences with the landscape are not represented.<sup>9</sup>

<sup>8</sup> More precisely, the museums are located in Aracena in the Andalusian province of Huelva and in Monesterio in the Badajoz province (Extremadura).

<sup>9</sup> For a more detailed account of the two ham museums' exhibitions and the implications of their depiction of the *dehesa* for the anthropological understanding of landscape, see Melles 2021.



**Fig. 7.** Local and external attendees of the *matanza didáctica* watching the dead pig's skin being burnt and rubbed off (photo by author).

Secondly, both museums juxtapose pig slaughter and the processing of pork in the past and present. To this end, they depict and describe the traditional home slaughtering or *matanza* of the pigs, during which each and every part of the animal was saved and consumed, including the pig's legs. According to the museums' narrative, the same process continues today but with modern technologies (*fig. 6*).

Thirdly, the culinary qualities of the Iberian ham are showcased. The nutritional value of Iberian ham is praised for its high content of unsaturated fat (55%). Its gourmet character takes centre stage when videos demonstrate the professional cutting of *jamón ibérico* with a *cuchillo jamonero* and its 'correct' presentation on the plate for the enjoyment of an exquisite product. Several festivals and tourist events such as 'ham days', ham fairs, culinary routes, tastings, visits of ham factories and public demonstrations in the form of a 'didactic slaughtering' of an Iberian pig in the Andalusian and Extremaduran villages enjoy great popularity among the local populations (*fig. 7*).

The events also contribute further to the stylisation of ham as a specialty and reinforce the regions' identities as places of origin of *jamón ibérico*. Due to its landscape-related and time-consuming production, the ham is readily integrated into food trends such as Slow Food and pastured pork. The symbolic unity of pig and landscape connects the consumption of ham as a regional product of quality to the preservation of the *dehesa* and its ecosystem services (Garrido et al. 2017).

Heritage, in this enhanced understanding, describes all the work undertaken to authenticate Iberian ham. PDOs, museums, tourist events and discursive connection of the *dehesa's* preservation and the consumption of ham all shape the brand *jamón ibérico*. At the same time, as was demonstrated, there is not only one version of Iberian ham, as María, the representative of the PDO Jabugo, confirms in the following statement: 'So that in the end what they [the ham producers] really appreciate is a public with a high purchasing power. [...] That's why the production inside the designation of origin is sold at other prices and in another way, right?' Here, María refers to the dual and paradoxical strategy that is pursued in the Spanish ham market: In 2014, a national quality standard (*norma de calidad*) for Iberian ham was introduced in addition to the PDOs which allowed for the vast expansion of production under the label *jamón ibérico*. While the PDO's ham is exclusively land-based and requires a share of the Iberian breed of at least 75%, the quality standard includes factory-based production and hybrids where the *ibérico* share is only 50%. An additional label of white colour was introduced to mark hams of pigs that have been kept in animal confinement and never seen daylight or an acorn in their life. Nowadays, 80% of all Iberian hams produced receive a white label (Maté/Ferrer Morini 2017). This means that 80% of the produced pieces sold as *jamón ibérico* do not meet the quality criteria for the valuable Iberian ham, namely the Iberian breed and the pig's acorn feed in the environment of the *dehesa*. The price for such a factory-based ham is about 15–20€/kg.

#### 4 Iberian Ham and the Terms of Luxury: From Necessity to Authenticity

The consumption of luxuries is a means and expression of social distinction. The notion that luxury may or may not form part of a dialectic with necessity can be demonstrated at the example of (Iberian) ham in southwestern Spain. In Appadurai's words, this society shifted from a system of sumptuary control, underpinned by simple technologies and forms of labour – the semi-feudal system that prevailed until the middle of the 20<sup>th</sup> cent. – to a capitalist market society where fashion, taste and connoisseurship continue to perpetuate social distinction among supposedly equal market participants. Sumptuary control, until a few decades ago, was exercised by the vast social inequalities between the wealthy land-owning class and the numerous and often destitute working-class members. While the former owned whole pig herds and could afford to wait for hams to dry-cure throughout years, the latter were lucky if they had a pig to fatten at all; in this case, they usually had to make immediate use of the meat products to provide for their families. Accordingly, the production and consumption of ham as such was a marker of social distinction, between wealthy and poor, between luxury and necessity.

In present times, the parameters of distinction have changed and exclusivity has given way to authenticity (Appadurai 1984, 44; Boltanski/Esquerre 2018, 39 f.). The distinction of products within the PDOs, and particularly the new quality standard, allows for the vastly expanded production of ham. Working-class members like Juan, for example, recount that 'today anyone has ham'. A ham for 200€ will most likely be white-labelled at the best, it has a green label and states that the share of Iberian breed is 50%. Either way, the pig has not sufficiently or not at all been fed on acorns in the *dehesa*, which is why this kind of ham may be considered the cheap substitute of an otherwise exquisite product (Bourdieu 1984, 386). At the premium end of the product range, prices are three to four times higher. Here, criteria for authenticity apply.

An exceptionally high price was reached when in the Andalusian province of Huelva a ham was sold for 4100€. It was labelled ‘the world’s most expensive ham’ (Limón 2016, author’s translation) and its high price is owed to a particular feature: the ham did not only stem from a purebred Iberian pig, but from a *manchado de Jabugo*, an endangered heritage breed of which only a few hundred animals are left. Therefore, in addition to being kept in the southern Spanish *dehesa*, the pig, in addition to being purebred, was also of exclusive lineage.

It is particularly noteworthy that only because working-class members like Juan may not be able to afford a luxury ham – to some, even the 200€ for a factory-based ham is a prohibitive price for a delicacy – they may still appreciate the qualities of a far-end *jamón ibérico* from a pig that has been kept in the *dehesa*: ‘The extensive[ly reared] [pig] goes, looks here, goes there, moves, the meat is different’, Juan explains the better quality of land-based in comparison to factory-based pork and ham. The heritage and marketing of Iberian ham make their contribution to an idealised version of the ham stemming from a pig that was reared in the *dehesa*. Not even 125,000 Iberian pigs per year are certified by the four PDOs, which is less than 5% of all Iberian pigs slaughtered annually: ‘It may seem paradoxical that it is in this limited certified production section where the greatest prestige of this product concentrates’ (Amaya-Corchuelo et al. 2019, 54, author’s translation). This pattern of social distinction, which is based on criteria of authenticity and reflected in product and price differentiation, is also recognisable in the commoditisation of knowledge about real, which means landscape-based, Iberian ham, as during factory tours and tastings (Appadurai 1986, 54).

To summarise, the consumption of ham served social distinction not only in the past but continues to do so in the present. While a few decades ago, luxury was defined in clear opposition to necessity, reflecting the clear social hierarchies of semi-feudal rural Spain, the parameters have changed. Nowadays, the mass production of Iberian hams

has made them much more affordable, though there are clear differences and distinctions between a factory-based and a *dehesa*-based *jamón ibérico*. While the relationship between the animal and the *dehesa* is always insinuated in the marketing of the ham, in reality, only a minority of hams fulfil pure breed and acorn feed as the criteria of authenticity.

## 5 Conclusion

Both in the recent past and in the present, the consumption of (Iberian) ham in rural southwestern Spain can be considered a political issue. Iberian ham is a luxury good and as such reflects existing social (power) relations and value regimes. Until the mid-20<sup>th</sup> cent., when the ResourceComplex *dehesa*-pig was embedded in semi-feudal relationships with large differences in status and unequal ownership, the consumption of ham as such marked the social distinction from the working class that struggled to meet their bare necessities. With socio-economic development and the expansion of production under the label *jamón ibérico*, new criteria for social distinction had to be found. While the masses, who can ‘only’ spend up to 200€ on a ham, are welcome to buy a ham from factory-based production, those with higher income are reserved the right to consume a ‘real’, *dehesa*-based, ham which serves all consumers as the desirable template. Contrary to the heritage narrative, the ‘real’ Iberian ham has never been a basic foodstuff but was and continues to be an element of social distinction.

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## Volatile Substances

### Human-Nature Interactions and Mercury Between Global Pollutant and Therapeutic Resource

**Keywords:** human-nature interaction, indigenous medicine, mercury, Minamata Convention, posthuman relationality, resource, South India, substance

#### Summary

How can interactions between humans, their environments and specific substances such as mercury be fruitfully theorised from a social scientific point of view? Are substances and chemical elements merely natural entities and thus external to society and culture? If so, how to deal with substances that impact social and environmental stability and human health and which thus prompt social responses? This contribution offers a reflection on some of the theory that has engaged with human-nature interactions in the recent years and attempts to apply it to specific ethnographic data. This data describes how and why mercury is seen as a therapeutic resource and important substance in South India. Such methodologies include ‘substance stories’ as well as some recent ‘turns’ that span a wide range of fields and disciplines, including the ‘material turn’ or new materialism, ‘the species turn’ and the related ‘resource turn’.

#### Introduction

The concept of subsistence, the topic of this volume, is based on economic theorising of human action, cultivation and nurturance. But what are ‘basic needs’ and what includes ways to meet them? Do such categories not vary greatly in

terms of social status, geography and culture? A more fruitful way of investigation might entail asking what constitutes and contextualises basic needs and ways of meeting them. In this vein, while I will not be preoccupied with subsistence as such in what follows, I hope to contribute to the overall theme of this edited volume by reflecting on the theory that has engaged with ideas of human-nature interactions in the recent years, and I will try to apply it to my ethnographic data. This data describes how and why mercury is seen in South India as a therapeutic agent and important substance. This is fundamentally different to how mercury matters in most other regions today, where it is a global health hazard due to its proven neurotoxicity. How can mercury, although understood by natural sciences as a universal category, be both cure and poison? This chapter demonstrates that this is possible. By drawing on a number of theoretical explorations that offer methodologies for decentring human action and agency, this chapter highlights that aspects of toxicity or safety of a substance such as mercury depend on a wider context, namely the specific human-nature relationships involved.

How do we best conceptualise interactions between humans, their environments and specific resources from a social scientific point of view and for a general understanding of substances? And why is this necessary? Non-humans have long been omitted from the ‘social’, a category usually understood as the arena of humans alone. From such a point of view, nature merely provides the basic space of possibilities in which human societies can unfold. A chemical element,

such as mercury, in particular, is usually considered a natural entity and, alongside other elements, the foundational material of the world. If we assume such an element to exist on a causal micro-level of matter, it would remain external to culture (Espahangizi/Orland 2014, 20). But with an ever-increasing threat of environmental catastrophe, which is also directly causally linked to human-nature interactions, the conventionally drawn boundaries between the natural and the social or cultural worlds appear as more and more blurry or outright artificial (Latour 1993). Certain substances, in particular, pose growing threats to social and environmental stability, as can be highlighted in the destructive aspects of greenhouse gases such as carbon dioxide or in the potentially harmful effects mercury poses to human health. In the light of such intermingling of nature and human sociality, the attempt to neatly separate the two can look ridiculous, as Anna Tsing (2013, 27) puts it.

As nonsensical the opposition may seem for some and as logical the interdependency of the social and the natural, as ingrained is its very separation into most of conventional and modern science. After all, this opposition is at the heart of the foundation of science and translates into the social sciences on the one side and the natural sciences on the other. By attempting to deal with often exclusively 'social' or 'natural' aspects, these disciplines positively function to uphold the separation. But while it is indeed possible and necessary to investigate a particular substance such as mercury from purely natural scientific perspectives of chemistry and inside a laboratory, and, at the same time, to investigate the substance only with a view to tracking its social aspects such as its impact on global policies, its socio-cultural significance etc., neither of these isolated vantage points provides a full description of the substance, as they can only provide cut-out sections of their objects of enquiry according to their respective questions and methods. Just as the socio-cultural significance of gold, for instance, does not necessarily have a bearing on its chemical composition or on its reaction with other materials, the analysis of its chemical properties does not conclusively explain its value in different cultural contexts or for spatial and temporal variations thereof.

But how are we to take into account this intermingling of the social/cultural and the natural in popular and scientific understanding? Discussing related aspects, some theorists have proposed different methodologies, and I will discuss some of these in what follows. I will draw specifically on recent 'turns' that span a wide range of fields and disciplines, including the 'material turn' or 'new materialism', the 'species turn' and the related 'resource turn'. Despite traversing a wide cross-section of social science fields, such theorisation shares as a common denominator the object of re-conceptualising relationships between humans and nonhumans. As such, they can be subsumed under the label 'posthuman relationality', as they reject what they regard as the dominant investigative standpoint, namely ontological anthropocentrism. Despite the popular turn toward materiality and posthuman relationality in the social sciences today, substances have been largely overlooked and have lingered at the margins of attention until now. Drawing on 'substance stories', a genre of writing focusing on substances and their particular histories and lifeworlds, I attempt to remedy this. Against this background, I also argue that the marginal role of substances in the turn towards materiality and relationality is not only unbecoming, but also that substances cannot be entirely and conclusively confronted as natural entities which exist isolated or in their own right. Rather, like other non-human and human agents, substances are part of 'unintended designs' (Tsing 2013, 36) and specific complexes. They determine and frame action and impacts of substances as well as how humans engage with these substances.

This can be underscored by describing different contexts in which diverse forms of the substance mercury are embedded. This includes the globally dominant perspective on mercury and its compounds, which is today largely apprehensive towards all mercury compounds, as expressed by international regulatory efforts. This is related to the neurotoxicity of some forms of mercury, elevated emissions of mercury into the environment through industrial applications and the resulting contamination of fish and other species. At the same time, different forms of mercury are valorised and used in medical applications in different

Asian medical traditions, such as in South Indian Siddha medicine. Despite a known poisonous potential of the substance, Siddha practitioners emphasise mercury's curative powers, they claim to detoxify it and harness its therapeutic properties. The last part of the chapter ponders these diverging substance ontologies in the case of mercury on the basis of the theoretical insights of the resource turn: I will argue that the value, meaning, applications and regulatory efforts as well as perils and safety of mercury depends on it being a part of different ResourceComplexes.

### Reconceptualising Human-Nature Interactions

Despite spanning a wide cross-section of social science fields, many of the recent efforts to reconceptualise relationships between humans and nonhumans can be subsumed under the label 'posthuman relationality'. This attempts to transcend the established dichotomies of nature and culture, of subject and object, by recognising agency to be distributed and both material and semiotic (Niewöhner/Lock 2018, 683). In what follows, I will offer a brief overview of ideas to have emanated from posthuman relationality. This will highlight that relational understandings of the social explicitly include the non-human in the forms of plants, animals and things. Substances have largely remained overlooked so far. Therefore, a special contemplation of substances will be required. 'Substance stories', a genre of writing on substances within specific contexts, which aim at presenting substances in more ways than merely laboratory-centred frames, in this regard, are instructive and will be discussed below as well.

At the heart of many posthuman relational studies is the recognition that 'social' means 'made in entangling relations with significant others' (Tsing 2013, 27) and that this category can hardly be reduced to humans alone. Bruno Latour (2005), in this regard, has called for a 'sociology of associations'. The actor-network-theory (ANT) developed by Latour and colleagues thus rejects imposing an *a priori* asymmetry between human intentional action and a material world of causal relations. Rather, agency, earlier seen as a prerogative of human actors, is understood to be distributed across

a network made up of human and non-human actors (Latour 2005, 76). This is found to resonate in the 'material turn' or the field of 'new materialism' as well as to represent a return to matter, albeit by collapsing the natural and cultural, mind and matter. As Espahangizi/Orland (2014, 15) point out, the research on and of materiality of the past three decades that has come to be termed 'material turn' is a broad field spanning various disciplines. Despite diverse origins and interests, the core contribution of the field is perhaps the supposition that materiality can no longer be understood autonomously as something external to society, but only in relation to other constitutive dimensions such as culture, knowledge, technology, economics, communication and politics (Espahangizi/Orland 2014, 15). For Henare et al. (2007, 8), '[t]he question then becomes not just how human phenomena may be illuminated [...] but rather how the phenomena in question may themselves offer illumination'. As Dolphijn and Van der Tuin have put it, studies that fall into this genre 'propose [...] to study the biological and the sociological as intra-acting, thus as relating, rather than as two independent relata that might interact' (Dolphijn/Van der Tuin 2012, 114). They draw on Karen Barad's concept of 'intra-action' (2007, 3), which rejects the notion of pre-existing entities, instead expressing that entities are the product of their very relations to other entities. Matter and meaning, physical and social reality, thus do not constitute separate elements, as both evolve through intra-action. Tim Ingold expresses this relationality thus: 'things are active [...] *because* of ways in which they are caught up in [...] currents of the lifeworld. The properties of materials, then, are not fixed attributes of matter but are processual and relational' (Ingold 2007, 1; emphasis added).

In a similar vein, animals have come to be reevaluated. In the 'species turn' or 'multispecies ethnography', studies refrain from restricting the enquiry to the human realm alone but are concerned with the effects of human entanglements with other kinds of living selves, from animals to microbes (Kirksey/Helmreich 2010; Kohn 2013; Tsing 2015). They highlight that humans cannot be described in isolation from other species and *vice versa*. Such studies are hence not anymore about how man makes his world, but are attentive to

how agents – a category not restricted to humans – never emerge, sustain, change or decline in isolation, but in what Donna Haraway terms ‘becomings’, i.e. emerging, sustaining, changing and declining in conjunction (Haraway 2008). Human nature, far from being an isolated affair, is an interspecies relationship in this sense. This concurs with recent findings from natural sciences, especially biology. A close look at the human microbiome, for instance, the collection of microbes living inside and on humans that make up an important and enormous part of any individual, demonstrates humans to be entangled creatures (Dethlefsen et al. 2007). Symbiosis is increasingly being recognised as an evolutionary factor alongside genetic aspects, as plants, animals and even the immune and nervous systems interact decisively with symbiotic microorganisms (Eisthen/Theis 2016).

Recent investigations into human-environment interactions in the social sciences have stressed the contextual, processual and recursive nature of their field. In attempting to chart out what a more-than-human society looks like and how to enquire into such, Tsing takes as her example the landscape of the *satoyama* forests, which, through its multispecies setup, is both a product of particular human and non-human constellations and which produces particular forms of beings, such as providing a home to the Japanese red pine. *Satoyama*'s particular multispecies setup and, as Tsing calls it, ‘unintended design’ (Tsing 2013, 36) is not a product of human intervention, nor of the landscape or the trees in it as being human tools. Rather, it is both product and producer of dynamic relations, with entangled histories ‘human and otherwise’ (Tsing 2013, 36). In sketching ways of describing more than human socialities in the case of a landscape to be studied, Tsing suggests ‘critical description’ (Tsing 2013, 28) as the way to do science across the divide of actors and across nature/social divides. Tsing advises that for the researcher and for the study, ‘Human plans would be important, but we would not just follow human plans; humans would be one of many historical agents’ (Tsing 2013, 34).

Also interesting in this regard is the concept of ‘situated biologies’, created by anthropologist Margaret Lock ‘to conceptualise the mutual

constitution of subjective bodily experience, language usage, and historical, political, social and medical contexts’ (Niewöhner/Lock 2018, 684). With this concept, Lock intended to comprehend local or situated variations of biological manifestations of diseases and symptoms, such as menopause, which is known to regionally vary. Opposing the view of a universal human body by highlighting the continuous interactions among bodies, environments and socio-political factors, situated biologies explain the material and the social to be contingent and thus account for diverging biologies. Drawing on this and similar relational insight, medical anthropologist Elisabeth Hsu writes, ‘[a]ccordingly, a herbal drug’s therapeutic effectiveness is neither solely a function of plant chemistry nor of the culture-specific theory of the practitioner who applies the plant, nor of the expectations of the patient. Rather, it results from a skilled practice of putting practitioner-patient-plant-in-the-environment into interaction’ (Heu 2010, 35).

In summary, the posthuman relationality approach considers human and non-human actors of different forms to co-produce themselves and their environments. The integration of non-human actors and specifically the interfaces between humans and non-humans offer important insights for reconceptualising human-nature relationships and for our case study of mercury which will follow shortly. Substances have so far inadequately been recognised as non-human actors and hence have not received prominent attention in relational accounts of human/non-human interactions.

### **Substances: Absence and Relevance**

Surprisingly, despite recent trends towards materiality, the matter under discussion is usually limited to objects and things, and substance materials tend to be overlooked (Hahn/Soentgen 2011, 19; Espahangizi/Orland 2014, 16). Hahn/Soentgen define substances as ‘matter without form’ and differentiate this from ‘matter with form’, i.e. things, artefacts, etc., as made by humans. One could argue that despite the material turn’s emphatic declaration to de-centre the human and to steer a less anthropocentric course, its attention

to things-made-by-humans essentially constitutes a 'material turn light' by effectively still revolving around human agency without actually challenging conventional anthropological enquiry. But why are substances largely being neglected at the expense of things? And should the material turn stop here?

Drawing on Aristotle, a host of philosophers have treated substances as 'things which exist in their own right', as 'unified material objects', as 'natural stuffs' and thus as 'the ultimate objects of scientific inquiry' (Ayers 1998, 205). In short, substances, in Western philosophical tradition, are seen as independent realities on which secondary categories such as sensory experience, emotions and things depend. This means that conventional philosophy and science typically accept substances as natural and fixed objects. According to the Merriam-Webster dictionary, the term 'substance' denotes an 'essential nature, real or essential part' and is etymologically derived from Old French *substance*, 'goods, possessions; nature, composition'; from Latin *substantia*, 'being, essence, material'; and from Latin *substans*, present participle of *substare*, 'stand firm, stand or be under'.<sup>1</sup> Substance, in this sense, is what is underneath, basic and essential, but also that which remains constant, unchangeable and passive. This seems to be at the heart of the notion of understanding substances as 'matter without form', as opposed to 'matter with form' in the form of things and artefacts, and its legacy seems to persist even in recent matter-focused accounts of non-human society.

Hacker aptly cautions that the concept of substance in fact 'is exceedingly vague and flexible' (Hacker 2004, 50). Of course, things and substances can be distinguished clearly in some aspects. As Espahangizi/Orland compellingly show, the grammar of substances is different from the grammar of things: things can be counted, substances can only be portioned (Espahangizi/Orland 2014, 18 f.). One can divide substances without losing their identity, something that is not possible with things. For instance, gold can be cut in half, resulting in

two lumps of gold instead of one, and water, if proportioned, is still water, showing the same characteristics as before. A bicycle, on the other hand, if sawed in half, will not produce other, smaller bicycles, as is the case with other things. Substances can moreover be in different places at the same time and occur in different states of aggregation (Hahn/Soentgen 2011, 26).

But, quite similar to things in general, substances can potentially have several diverging attributes: as Hahn/Soentgen argue, '[i]t is precisely through the often implicit embedding of a substance into social and cultural contexts that it differs from any general physical description of the same substance' (Hahn/Soentgen 2011, 24) and 'substances become charged with implicit social meanings' (Hahn/Soentgen 2011, 30). This is also why substances have a potential for exhibiting surprising, hitherto unanticipated behaviours or effects when entering new contexts (Hahn/Soentgen 2011, 27). This is how, for instance, the status of asbestos could change dramatically within a matter of decades, as it went from being a valued construction material due to its fireproofing properties to being feared as a health hazard due to its unexpected carcinogenic effects when inhaled as dust. Thus, it would be wrong to understand natural substances in general as passive and only moved by human intervention: as substances are also 'self-acting', they may 'move and transform by themselves' (Soentgen 2017, 231). Drawing on Leibniz, Hahn/Soentgen (2011, 27) explain that substances have tendencies and suitabilities: a substance's tendency circumscribes whether the substance tends to rust, evaporate, liquify, etc. Its suitability is its character to lend itself to certain actions and transformations more or less easily. This idea can also be illuminated using James Gibson's concept of 'affordances' (Gibson 1979; Fox et al. 2015, 67) by pointing out that affordance is not an absolute property of materiality or of a thing, but highly relational: affordance is a relational concept as affordances are the products of relations. This means that a substance may afford different kinds of engagement and usage, depending not only on its inert quality, but relative to the environment, culture, history, etc.

Given the ambition of the material turn, the neglect of substances at the prioritisation of things

<sup>1</sup> The Merriam-Webster.com Dictionary, s. v. Substance, last updated 08.01.2020, <<https://www.merriam-webster.com/dictionary/substance>> (last access: 16.01.2020).

is all the more surprising, as substances, in contrast to things, tend to have a direct, invasive relation with human beings: they can be consumed, swallowed, inhaled, absorbed, etc. They can impact the being with nutritious, healing or impairing, even deadly effect. Substances often become part of the body in such processes. And humans engage with substances and attempt to control or use them. This is especially true for mercury, as recent surveys show: regardless of where we live or what we do, all of us are exposed to mercury, more or less dramatically, through our diet or occupation (UNEP 2019b). Substances like mercury, being an element, are moreover strikingly persistent: they cannot be eliminated, only their structures and states may change (Karunasagar et al. 2018, 153).

Janet Carsten (2004) in her monograph 'After Kinship' deals with yet another meaning of substance, one which deserves to be mentioned here as well. Carsten describes a shift from the concept of kinship to relatedness in 1980s American anthropology, starting from David Schneider's influential study 'American Kinship' in which he drew heavily on 'substance' as a keyword of kinship. Some of his students, most notably McKim Marriott and his colleagues, applied this concept to kin- and other relationships in India. This allowed them to fruitfully analyse the ways in which persons in India are constituted through the relations to one another as well as to places or (food-) substances ingested. In this sense, substance is not limited to a material realm, but rather connects a material substance to an immaterial, intangible substance in the sense of a physical-spiritual essence (Marriott 1989; Daniel 1984).

Since the question of how to understand substances is relevant to a study of mercury, a discussion of 'substance stories' (in German 'Stoffgeschichten') seems helpful here. Proponents of this genre of writing tell stories by showing substances within the particular contexts of their actions and impacts and thus narrate a substance's social and ecological lives. To do this, proponents such as Jens Soentgen, a philosopher and chemist, primarily rely on ethnographic and historical methods, but do not limit their enquiries to these, as they usually factor in chemical and physical properties of the substances under review (Soentgen 2017, 231).

Substance stories are hence an interdisciplinary method for investigating socio-material worlds or the complex societal networks of substances. They complement the technical and quantitative methods of the natural sciences with more qualitatively based and socially instructed approaches of the social sciences. Substance stories thus highlight how persons, societies and substances are interrelated. Hence, substance stories resemble some of the contributions to the field of material history, such as Fernand Braudel's 'Civilization and Capitalism, 15<sup>th</sup>–18th Century: The Structure of Everyday Life' (Braudel 1985). Braudel, a representative of the French 'Annales school', was concerned in his book with a history of civilisation and capitalism, not as grounded in an assumed ideology or mental reasoning, but in what he calls 'material civilisation', i.e. the material and natural potentials and limitations at play in historical developments. A similar approach was exhibited by Sydney Mintz's 'Sweetness and Power: The Place of Sugar in Modern History' (Mintz 1985). This is a history of sugar and of how its production and trade was implicated in the production of inequality. For Mintz, Western imperial civilisation was not so much originating in Western countries, or in any ideology, but in the sugar colonies, through the material substances exploited and with human slave labour, a modern inheritance that for Mintz was still visibly producing the modern world. Mintz also demonstrated how far the study of a single substance is simultaneously a global history, deeply enmeshed with broader and wide-ranging social webs.

In this sense, substance stories require and enable upsetting conventional subject-object positions which traditionally define the relation between humans and substances. As Espahangizi/Oreland (2014, 20) point out, a chemical element such as fluorine is usually considered a natural entity. But does nature merely provide the foundation on which human societies can unfold? Does a chemical element remain external to culture? Substance stories 'cannot presume a fixed, solid identity, neither with respect to the name, nor with respect to the concept, nor with respect to the "real" substance' (Soentgen 2017, 231). One example is that of 'rare earths', geological deposits rich in certain minerals required for producing lighting equipment, magnets, high-tech electronic devices and



renewable energies. While highly sought-after, many rare earth minerals are combined with radioactive materials, which can be discharged into the environment, often alongside chemicals deployed in mining the minerals. This has led to grass-roots resistance movements against their mining, such as in Malaysia (Marschall/Holdinghausen 2018). The complete story of rare earths can thus only be described by factoring in global-political complexities, ecological impacts and socio-cultural responses into their usually technological and economically-focused depiction. Substance stories require an integrated and far-sighted vision of a substance, factoring in long time spans, geographical and cultural variations in addition to political implications and economic aspects in order to understand potentially manifold impacts on and interactions with humans and the substance's environments.

Accordingly, Böschen et al. argue that in order to investigate the significance of a substance, its chemical description alone is highly insufficient, as this would neglect different domains of practice and discourses in which substances are assigned a context-specific or discourse-specific significance (Böschen et al. 2004, 19). They are also critical of the fact that policies on handling and regulating substances are often founded on chemical and physical understandings. This can lead to a 'laboratory view' (Böschen et al. 2004, 20), as modern scientific enquiry is characterised by limiting enquiry to a specific setting: for chemistry, this is the description of a substance's aggregates and states. Other facets of a substance go beyond the competence of chemistry as a natural science. As Böschen et al. point out, the chemical understanding of substances originates from a certain context and has a certain interest, which limits the description of the substance, its contextualisation. Such contextualisation requires the connection of facts elaborated in the natural sciences with knowledge and methods of the humanities and social sciences and widening the perspectives to include both semantic and pragmatic contexts of human engagements with material substances (Böschen et al. 2004, 23). Substance stories thus turn to the ecological, social and political implications of substances and thus ultimately help to establish sustainable uses of resources. In this vein, the format's suitability as

a popular science tool has been explored through exhibitions and university and school education on substances such as carbon dioxide and nitrogen (Soentgen/Völzke 2006; Soentgen/Reller 2009). Specialised non-fiction books adhering to the style of substance stories have so far surveyed substances as diverse as milk (Fink-Kessler 2013), aluminium (Marschall 2008) and dirt (Montgomery 2012).

Substance stories explicitly highlight that '[s]ubstances are not only interpreted differently; they are in practice transformed and especially mobilized' (Soentgen 2017, 234). With mobilisation, Soentgen means the distribution of substances effected by human-nature interactions (Soentgen 2017, 239). Substances within different contexts are mobilised differently. In what follows, we will look at mercury, its different forms and compounds and how the substance matters, or rather how it is mobilised differently in different contexts or 'unintended designs'.

### **Mercury in Context(s): Mercury as a Global Threat**

Today, mercury is widely recognised as one of the biggest threats to human health and the environment (Sakamoto et al. 2018). In chemistry, biology, environmental sciences as well as in international trade and health policy, mercury is considered a 'pollutant' and 'contaminant of global concern' (Evers et al. 2016, 888). It is on the World Health Organization's list of the top ten chemicals of major public health concern (WHO 2017) and it is placed third behind arsenic and lead on the substance priority list of the Agency for Toxic Substances and Disease Registry, an agency of the US Department of Health and Human Services (ATSDR 2017). While occurring naturally, mercury emissions into the environment have been dramatically increased by anthropogenic industrial use in the recent decades (Hylander/Meili 2003, 14). Emissions are mostly caused by the chlor-alkali industry, but also by coal-fired powerplants, cement kilns, waste incinerators etc. Mercury was, and in some cases still is, used for a variety of applications. Many of these utilise its physical properties, being a

dense, liquid metal, in appliances such as laboratory equipment, thermometers and sphygmomanometers or in electrical switches. Making use of its chemical properties, like the capability to dissolve and amalgamate with many other metals, the substance was used in batteries, as an herbicide, insecticide, preservative, catalyst and antiseptic. Used in the manufacture of felt for hats from the 18<sup>th</sup> to the 19<sup>th</sup> cent., the neurotoxic effects of mercury vapours on the mental health of hat makers led to coining the term ‘mad as a hatter’ (Cox 2018). In the 20<sup>th</sup> cent., mercury was most prominently used in the chlor-alkali industry for producing chlorine and sodium hydroxide, commodity chemicals required by various industries. Mercury is also used in small-scale, artisanal gold-mining, where the substance is used for extracting gold from ore found in river systems utilising mercury’s ability to bind gold by forming amalgamates with it. Separating the gold from the amalgam and thereby distilling the mercury, often by hand or without protective measures, impacts both the miners’ health as well as the water and thus neighbouring communities (Esdaile/Chalker 2018). An estimated 10 to 19 million miners deploy mercury in more than 70 countries worldwide, especially in low-income communities in Asia, Africa and South America, making the practice one of the largest sources of mercury pollution today (Esdaile/Chalker 2018, 6905).

However, speaking of ‘mercury’ in such a generalising way, as indeed both popular discourse and scientific enquiry to some extent do, is imprecise as the substance exists in different and unequal forms: inorganic as in naturally occurring mercuric sulphide (HgS), metallic in the form of the well-known, liquid elemental mercury (Hg) and organic as methylmercury (MeHg), to name just a few. Mercury in its most commonly found natural occurrence is in the form of mercury sulphide, a kind of mercuric ore, usually red in colour, often with blackish, dark patches or stains. Its red is bright and intense, a shade well-known in many parts of the world, where the mineral, known as cinnabar, used to be ground and deployed as the pigment vermilion for colouring paintings, jewellery and more. Cinnabar, or cinnabarite as it is geologically known, occurs in regions of volcanic activity and has been mined at least since the

Neolithic age. From this mineral combination of mercury and sulphur, elemental mercury can be extracted (Gettens et al. 1972). Elemental mercury is the form of mercury best known. In fact, it is popularly recognised as the general representative of mercury *per se*. It is the enigmatic and fascinating liquid metal variety of mercury, which appears to combine aspects of water and metal, being shiny, volatile, yet heavy. But there are more forms. For instance, industrial emissions of forms of mercury into the surroundings, especially into water, are transformed by aquatic bacteria into methylmercury. This is an organic form of mercury and considered its most toxic appearance, as it can be absorbed and accumulated by organisms. It participates readily in biological cycles, it can biomagnify and bioaccumulate. This means it is easily absorbed by organisms and accumulates both within organisms and within food webs, processes well documented for contaminated seafood (Driscoll et al. 2013). In the 1950s, thousands of people living in Minamata Bay, Japan, developed a range of somatosensory and neurological symptoms and persisting, often deadly disorders, including ataxia, dysarthria and tremors, termed ‘Minamata disease’. This was observed after an industrial plant of the Chisso chemical company had dumped methylmercury-laden wastewater into the water systems in Minamata Bay over decades (Ekino et al. 2007).

Like other Asian countries, India has been described as a mercury hotspot due to high industrial emissions of the substance (Bose-O’Reilly et al. 2010), especially because of the burning of coal (UNEP 2019). Citing ToxicsLink, an Indian non-governmental organisation, Sharma (2003, 1050) reported that India imported over 250t of mercury annually, of which more than 220t leaked into the environment. India in this regard seems to be on the flipside of a movement towards reducing mercury use in industrialised nations, with concomitant cheap sales of mercury from those industrialised nations to India and other industrialising nations as a way of getting rid of the unwanted substance (UNEP 2019b). And India has its own episodes of mercury contaminations caused by industry: in 2001, a thermometer factory in Kodaikanal, run by the Hindustan Unilever company, had to close down after having polluted the popular South Indian tourist hill-resort over a period of

18 years (Karunasagar et al. 2018). The company had imported mercury from the US and exported thermometers to Europe and North America. While doing so, the company contaminated the surrounding forests and lakes in the area with lasting effect by exposing workers to mercury without protection and by neglecting precautionary measures when disposing of mercury waste (Karunasagar et al. 2018).

Due to the proven polluting and neurotoxic nature of most mercury compounds, the substance, currently used in industry and in devices such as lamps and thermometers, is hence supposed to be substituted and phased out (Mackey et al. 2014). The multilateral environmental agreement of the United Nations aiming at considerably curbing mercury pollution factors has been named ‘Minamata Convention’ in commemoration of the above-mentioned tragic event. It is designed to exert influence over mining, trade, industrial and other uses of mercury compounds, with a gradual phase-out of all mercury compounds on an international level by the year 2020 (UNEP 2019a). The convention requires that signatories disallow manufacture, import and export of mercury products and includes both mandatory and voluntary sanctions intended to minimise mercury sources and emissions (Coulter 2016).

### Mercury in Context(s): Mercury as Medicine

Medicinal use of mercury has been documented in numerous cultural contexts and across various periods, spanning ancient Greece, Persia, Arabia, China and South Asia (O’Shea 1990). In Europe, mercury was used for a wide variety of therapeutic applications from the 16<sup>th</sup> cent. CE, especially for treating syphilis, but fell largely into disuse in medicine. Some exceptions remain: mercury is, for example, used in dental amalgam fillings. While most health agencies and dentists’ associations negate the toxicity of amalgam fillings and in general do not dissuade its utilisation (FDA 2021; SCENIHR 2015), concerns over possible harmful effects remain. Mercury takes centre-stage in debates about vaccination-safety as the organomercurial preservative thiomersal in vaccines has been causally linked to autism related disorders in children by



**Fig. 1.** Mercury sulphide being ground in a mortar for production of a Siddha drug (Photo by Roman Sieler).

some studies (Kern et al. 2016), while such a link has been refuted by others (Wessel 2017).

Mercury as an ingredient of drug preparations is, however, found to be an important part of several traditional Asian medicines. This includes Chinese medical traditions, Ayurveda and Tibetan Medicine (Gerke 2013; Wujastyk 2015a; 2015b). Another medical tradition relying extensively on mercury as a therapeutic ingredient is called Siddha medicine (*fig. 1*). This is a medical practice found mainly in Tamil-speaking South India, recognised and supported by the Indian state (Sébastien 2015).<sup>2</sup> In Tamil, mercury is known as *pataracam*, or *iracam* for short, which literally means ‘essence’. It figures prominently in Siddha medical practice

<sup>2</sup> The ethnographic data on which these sections are based were gathered between 2017 and 2019 in the south-eastern Indian state of Tamil Nadu, as part of an investigation into resources of indigenous medicines. For this, I have interviewed practitioners of a variety of different backgrounds and training on their perception and use of mercury, and I have observed and participated in producing some of the drugs and items under review.

and textual tradition, where metals and minerals may have been preferred due to their independence from seasonal variation, in contrast to plant substances (Sujatha 2009, 78). Between the 8<sup>th</sup> and 17<sup>th</sup> cent., the Siddhars, the early forerunners and namesakes of the tradition, developed not only medical therapies, but, among others, also established techniques intended for preserving their bodies and extending their lives (Weiss 2009). Indeed, Siddhar means ‘accomplished one’, as such mystics and ascetics sought to attain immortality through yogic exercises, meditation and body transformations by means of alchemical procedures, many of which involved mercury or its compounds. This has been reported by South Asian textual sources as early as the 7<sup>th</sup> cent. CE, notably in the text ‘Aṣṭāṅgaḥṛdayasaṃhitā’ of the Indian scholar-doctor Vāgbhaṭa (Wujastyk 2015b, 1052). Marco Polo encountered ‘Yogi’ alchemists who were thought to be long-lived because they consumed mercuric preparations in the 13<sup>th</sup> cent. CE on the southwestern Indian coast (White 1996, 50). The Siddhars in this regard were probably in contact with other traditions valorising mercury for similar longevity and alchemical transmutation practices all over South Asia (White 1996), but also with Taoist traditions of China (Subbarayappa 2001), wherefrom mercury was likely imported in early periods. Mercury was the main ingredient for attaining immortality for the Siddhars, not least since the substance to them was a materialisation of the Hindu god Shiva’s semen. For many of the present-day practitioners that I have talked to, such a cosmology still matters. Certain ritual objects hence are sometimes made using mercury compounds, such as amulets or idols of gods, especially the phallic representation of god Shiva, also known as ‘linga’.

Today, Siddha medicine, alongside the better-known Ayurveda, is both a ‘traditional’ and a ‘modern’ medical system: it can be acquired as an apprentice from an experienced practitioner and it can be studied in a 5½ year course offered by recognised colleges earning graduates a Bachelor’s degree in Siddha Medicine and Surgery (Sieler 2015). Apprenticeship-trained physicians practice in a legal grey area but are generally tolerated, while institutional Siddha is a system of medicine officially recognised and supported by

the Indian state. In general alchemical precursors can still be felt in Siddha medicine today, some have argued, in the use and valorising of mercury (Subbarayappa 2001, 427–429). Siddha specialists appreciate mercury as both an important medical ingredient and a catalyst for increasing the efficacy of many, especially rejuvenating remedies. The live-bestowing quality of mercuric drugs according to Siddha medicine is mirrored by the shelf-life ascribed to them as some are said to last up to 500 years. Even though for many practitioners, mercury-based preparations constitute a therapeutic category of last resort due to the drugs’ potency and potential toxicity, many of the practitioners I have spoken with, both rural and urban, both college-educated and apprenticeship-trained, use mercury in their practice. Although apparently widespread, it is difficult to exactly determine the extent and amount of use, but Sébastia (2015, 945) has estimated that around 30% of Siddha recipes contain mercury, a number confirmed by many practitioners.

According to hereditarily trained Siddha physician Murugesan, mercury or *iracam* ‘is like the body’s electric current’. He ascribes many of the body’s vital functions to mercury, which he says occurs naturally in the body where it is vital to the heart’s palpitations and the circulation of blood; to the cleansing functions of liver, spleen and kidney; and to the balance of the three *doshas*, the vital psycho-physical functions of the body that produce health when in equilibrium and disease when unbalanced. Although no form of mercury or compound is a medicine on its own, but can only be a part of Siddha drug preparations, most practitioners state that mercury is the most effective therapeutic agent for ailments of the skin, eyes, ears, respiratory system, kidneys, heart, liver, pancreas, for cancer, diabetes etc. (Kannan et al. 2018). Mercury in its different forms is praised for being fast-acting, highly potent and widely applicable. Practitioners can frequently be heard to prioritise the substance saying, ‘without mercury, there is no [Siddha] medicine’. Some practitioners claim that mercury products can be administered continuously for three months or longer without any noticeable side effects. Many ascribe to mercury the potential to cure all diseases, arguably making the substance the most important ingredient of Siddha

medicine. To give an example: *Purna Cantirota-ya Centuram* is a preparation based on mercury, sulphur and gold, and considered a rejuvenation medicine. It has been tested on dementia-related symptoms on the hypothesis that it might help rejuvenate nerve cells, possibly curing Alzheimer's disease (Chitra et al. 2015). Other mercuric drugs have been adopted for a wide range of ailments, including but not limited to cancer, asthma or skin diseases. Having been tested on animals, some studies show promising preliminary results (Kannan et al. 2018).

For Siddha practitioners too, mercury is a potentially dangerous substance. Egilane, another Siddha practitioner, expresses this as follows: 'Everything is toxic. For example, many plants provide us with medicines, but at the same time, they are poisonous. [...] Take rice, for example. Did you know that the root of the rice plant is poisonous? Nonetheless, it provides food for the whole of India! [...] When it comes to mercury, we are dealing with one of the most dangerous poisons. But [...] if mercury is purified, it can become a medicine!' Five different forms of mercury, namely *viram* (mercuric perchloride), *puram* (mercury chloride/calomel), *iracam* (elemental mercury), *ilinkam* (mercury sulphide/cinnabar) and *iraca centuram* (red oxide of mercury), which are used, all count as mineral poisons used in Siddha. Practitioners emphasise the necessity to purify these before using them for medicinal preparations. Such purification methods are listed by scriptures and transmitted by teachers. The textual category of *nañcu murivu*, literally 'poison antidote', deals extensively with mercury, with symptoms of mercurial intoxication as well as with a range of antidotes to be administered in such a case, thus demonstrating that toxicity of mercury and intoxication risks were well known (Murugesu Mudaliar/Gurusironmani 1999). The texts describe a range of possible purification methods, *cuttikarippu*. All practitioners I have spoken to put emphasis on the need for *cuttikarippu* purification and that it has to be complete and done in accordance with the extant scriptures or teachers' guidance. Successful purification may involve several individual steps, such as trituration alongside other ingredients, and may take days or weeks, followed by preparation processes that are often equally time-consuming.

Given that the Minamata Convention, which aims to restrict trade of mercury and its gradual phase out on an international level, requires that signatories disallow manufacture, import and export of mercury products, it is not surprising that Siddha proponents and supporters have been concerned about such international regulatory efforts. A possible ratification of the convention by India sparked controversy as early as 2013. Since India has no domestic sources for obtaining mercury, but depends on import from other countries, commentators expressed their concern that a possible ban might affect traditional medicine adversely. Indeed, since 2006, regulations of Indian medicines and especially of mercuric compounds in pharmaceutical production for export have been increasingly regulated and controlled (Sébastien 2015). Such increased national and international pressure has led commentators to predict a future decline of mercury-use in Siddha medicine (Sébastien 2015; Baghel 2013). India in fact ratified the Minamata Convention in 2014 and it has come into force in 2018. The final version of the convention text provisionally excludes "products used in traditional or religious practices" (UNEP 2019a), and this applies to its use in medical traditions such as Siddha. Mercury in different forms is hence still available from shops selling raw products to Indian medical practitioners. Mercuric sulphide, for instance, is available from special shops and markets, with 100g costing approximately 1,500INR (19€), which is not cheap, but not prohibitively expensive either. Mercury-based preparations are expensive and time consuming and obviously more expensive than herbal preparations. Additional costs may also occur in the form of other ingredients, items for purifying mercury, materials needed for incineration processes and possibly even staff salary (compare with Chitra et al. 2015). Potentially high costs may be one of the reasons why some practitioners do not prepare mercurial remedies themselves but prefer to buy them from pharmaceutical companies. Despite international attempts to phase out mercury and national efforts to regulate its use in Indian drugs, my observation is that, so far, an abandoning of the substance for therapeutic application in indigenous Indian medicine is not in sight.

## Mercury ResourceComplexes

As we have seen, the substance mercury is a resource that can be perceived and utilised in strikingly dissimilar ways. The global regulatory trend towards limiting the applications of the substance and its anthropogenic emissions can be contrasted with the valorisation of mercury for therapeutic purposes in some Asian medical traditions, as we have seen in the case of Siddha. The diverging ontological status of mercury and its incompatible mattering between medicine and menace can be fruitfully investigated by considering another turn that has recently been proposed, namely the ‘resource turn’ (Hardenberg et al. 2017).

Both scholarly discourse and popular perception, usually based on a narrowly constructed economic or natural scientific understanding of resources, have arguably neglected socio-cultural dynamics connected to identifying and using resources. Researchers of the collaborative research centre SFB 1070 RESSOURCENKULTUREN at the University of Tübingen attempt to counter this. They understand resources not as comprehensively described by natural sciences or economic categories, but as integral parts of societies. In a truly relational approach to resources, the resource turn does not confine its investigation of resources by focusing on individual actors or individual resources, but instead puts emphasis on wider relationships, networks, institutions and systems, and highlights historical contingencies and cultural meanings in the identification of resources. Resources are hence not seen as isolated objects but always as part of larger assemblages which are combinations of things, persons, knowledge and practices. Resources and actors thus constitute each other in concrete temporal and spatial contexts. The contingent and historically grown combination of things, individuals, knowledge, technologies and practices can be called a ResourceComplex (Hardenberg et al. 2017, 15). This concept is written without hyphen or space between the words resource and complex, as this contraction underlines the inextricability of the two, overcoming the distinction between nature and culture. This means that the value and uses of a resource are contingent on the complex of which it is a part, and these in turn co-constitute

the complex. Within any ResourceComplex, a resource is linked to other resources, both tangible and intangible, such as tools and knowledge.

Interactions between resources and actors also form the basis for social dynamics and the development of new ways of life. The resource turn therefore understands resources as the tangible and intangible means by which social relations, units or identities are created, sustained or altered (Hardenberg et al. 2017, 14). Here lies an advantage over other relational approaches: new materialist theories have been charged with ‘too often submerg[ing] questions of value and differentiation within a vast field of intractable ecological interrelation’ (Murphy 2019, 7) and of shying away from political and ethical questions. In asking ‘what makes a resource to arise, persist or cease?’, the resource turn however explicitly includes questions of value and of how resources come to matter as part of politics. Some critiques of the posthuman relationality approach have argued that its theorising remains abstract and aloof from real world ecological and political relations. Used as a heuristic device, ideas derived from posthuman relationality and the resource turn enhance our ability to understand the constitution of varied ontological systems. This explains, for instance, how it is possible that mercury can be such a different substance, understanding this difference not with regard to an inert quality, but with regard to its embeddedness in a wider socio-natural context, in its ResourceComplex.

The concept and methodological framework of ResourceComplexes explicitly allows for capturing this relational mattering of human-society-substance. Some studies, which have investigated the issue of the bioavailability and toxicity of different forms of mercury, have demonstrated that mercuric sulphide shows relatively low toxic potential compared to other forms (Liu et al. 2008). Nikolaychuk (2016) similarly argues that mercury chloride or calomel, when ingested, contrary to widespread opinion and previous research, is relatively harmless due to its particular behaviour in the human stomach’s environment and to calomel’s low solubility. These mercury compounds, i.e. cinnabar and calomel, are among the most commonly used forms of the substance for Asian medicinal purposes. This may be further underscored by the fact

that, despite my having been exposed to some extent to different forms of mercury in the course of my fieldwork, which involved participating in processing and producing mercuric medicines, and despite having consumed mercury-based medicine on several occasions, a medical examination and toxicology screen upon my return from fieldwork did not show elevated amounts of organic or inorganic mercury.

This stresses that there are several different forms of the substance mercury. But popular discourse, news coverage, regulation policies and even scientific studies to some extent do not convey this multiplicity of mercury, which is usually discussed in the singular, evoking the sense of a uniform and consistent entity. In a strong physical sense mercury does not equal mercury. Inorganic mercury sulphide, the form most often used in traditional Asian medicines, proves to be relatively harmless, especially compared to mercury emitted by industries and transformed into toxic organic methylmercury in aquatic systems. Mercury affords to be used in industrial appliances, especially due to its chemical and physical attributes, but large-scale industries have emitted sizable amounts of mercury into nature as an unwanted by-product. Methylmercury's toxicity presses humans for regulatory efforts, which in turn have been made necessary by very specific human-mercury engagements, which emit the substance into the surroundings in large scales, where it is transformed by aquatic bacteria into the toxic organic form that can be absorbed and accumulated by organisms. This is reminiscent of new materialism theorist Jane Bennett's understanding of 'thing-power', the agential effect of things, which, however, is not to be seen as the potentiality of any entity by itself, but as a distributed effect (Bennett 2010), or, in Barad's words, as 'intra-action' (Brad 2007). In India, mercury, especially in the forms of mercuric sulphide/*ilinkam* and mercury chloride/*puram*, enables its use as an ingredient in drug production, its application for various ailments and its mattering in a Hindu-religious cosmology. Mercury in this sense is contingent on particular engagements with humans: whether in the form of organic methylmercury contaminating seafood or inorganic mercuric sulphide for medical application, it is the

human-substance interaction that qualifies the particular nature of the substance's action and human's perception of it.

Mercury is active, it acts, but not on its own – it interacts – within context. Drawing on insights from substance stories, mercury, I therefore argue, is not sufficiently described by looking at just one isolated context, the laboratory-centred chemical description of the substance Hg, for instance. By bringing into correspondence the different yet often overlapping ResourceComplexes, we widen the perspective of substances from a narrow, laboratory-centred perspective to one that includes more human associations with substances. This contributes to an understanding of this substance, as in its purely scientific, primarily chemical description, a part of the reality of the substance may be absent. Whether turning mercury through trituration and calcination into a detoxified medicine (*fig. 2*), or whether producing Hg emissions in industrial use, which is transformed through environmental interactions into a neurotoxic substance, mercury, through human-substance intra-action, is transformed at the same time physically and discursively. This is why, in regions where mercury is primarily perceived as a contaminant and toxin, medical application seems currently impossible. In the same vein, understanding the status of mercury, its featuring in Siddha and other medical traditions as merely metaphorical or symbolic, or as superstitious, would not be a sufficient grasp of the larger ResourceComplex that it is a part of. While social sciences in general and cultural anthropologists in particular have long been interested primarily in symbolic spheres, it is high time to fully recognise that symbolic spheres do not exist independently from material ones. Matter is more than merely representational, it is material and representational in its relationality.

Thus, mercury is a neurotoxic heavy metal. And mercury is a life-giving medicine. Both statements are true, provided the truth of these statements is not seen in isolation from its particular context. It is hence possible to describe the substance's functioning in its context, but translating one substance directly into another context poses difficulties and frictions, as the gap between mercury as an environmental/health hazard and mercury as a cure demonstrates. And since





**Fig. 2.** Liquid elemental mercury in a clay vessel after extraction from mercury sulphide through calcination (Photo by Roman Sieler).

mercury use in South India is relational and part of a complex, it can be assumed that merely calling the practice ‘superstitious’ is unlikely to alter its use directly, as it is connected to so many more links in the complex: a cosmology, ritual practices, body images and related health regimes, regional political networks and so on. This means that for writing a mercury substance story, we have to cut across both biological essentialisms and social constructivism: mercury is neither a universal natural substance nor has the *iracam* used in Siddha medicine nothing in common with Hg as described in Western chemical science and used in industries. The same is true for a comparative analysis of varying mercury ResourceComplexes. To think in terms of true/untrue in the case of mercury would be to remain trapped in dichotomies of nature-culture and mind-matter. We are arguably dealing with very different resources as both *iracam* and

Hg are the products of ongoing material/discursive intra-actions.

What counts as dangerous or toxic, then, rather than being ‘natural’, emerges and acts within historical, social and scientific constellations. In other words, no substance is in itself ‘dangerous’, but this label, alongside ways of regulation, depends on specific contexts and histories. Substances like mercury or arsenic are prime examples that highlight this context-dependency of toxicity, especially since they oscillate between poison and pharmaceutical drug. After all, the word ‘pharmakon’ means ‘medicine’ and ‘poison’, and we should not forget that mercury has a therapeutic history in Europe, too. It was a widely used treatment until the 20<sup>th</sup> cent. CE (O’Shea 1990). In fact, depending on the particular medico-social context, it still is in use, as in amalgam fillings in dental medicine or vaccines that contain organomercurial thiomersal.



After all, mercury compounds are recognised as being toxic in a Siddha ResourceComplex, too, but this toxicity can be neutralised and, within limits, inverted into therapeutic action. In contrast, while mercury once mattered as medicine in Europe, too, there, the current ResourceComplex disallows most medical application, regardless of limits or threshold values. Within the ResourceComplex surrounding environmental pollution and ill-effects on health caused by industrially caused organic mercury, hence set on curbing its use, there is currently no accepted safe level. This is despite the observation that many toxic substances in low doses trigger a positive effect on organisms, while higher doses exert detrimental, toxic effects. In a South Indian mercury complex, which recognises mercury as potentially harmful, but therapeutic under precautionary, detoxifying measures, this is possible. So, while the proverb ‘the dose makes the poison’ may apply, what constitutes a dose and what constitutes a poison are both contingent on a context as well.

Investigating mercury in its ResourceComplexes belies our conventional assumption of stable, predictable or inanimate substances, as we are reminded of the vibrancy and volatility of matter within different contexts. Analysing differing mercury ResourceComplexes moreover helps to comprehend that mercury does not always equal mercury. It helps to fathom different uses of mercury and underlying rationales, potentially suggesting methods for probing complex-specific understandings of ‘safe’ and ‘harmful’. In referring to Judith Butler, who has demonstrated in much of her work, especially by her book ‘Bodies that Matter’, how human bodies emerge and exist only in and through discursive settings and social contexts rather than being somehow pre-discursive or natural (Butler 1993), Balz et al. (2008, 5) argue that precarious materials and the very question of ‘precariousness’ only come into being within specific contexts in which they attain or change meaning. ‘Like “bodies that matter”, precarious matters emerge, are settled and act within historical/social/scientific constellations that assign criteria of precariousness to certain substances while simultaneously and continuously expanding the grid within which these substances can be identified, regulated and activated’ (Balz et al. 2008, 5). In other

words, no substance is in itself or inertly ‘precarious’, ‘dangerous’, ‘poisonous’, etc. This definition of ‘precarious’ as an analytical tool, rather than as a scientific criteria easily defined, is very important for the story of mercury, too. Instead of understanding ‘dangerous’, ‘toxic’ or ‘healing’ as inert or ‘natural’ characteristics of the substance, these labels are useful as keys for unlocking the wider complexes in which they exist and matter, thus revealing details about the substance-in-practice.

## Conclusion

The chemist Beletskaya recently wrote about mercury as thus: ‘People hate mercury. There would not be any other choice for the question: which is the most hateful and dreadful chemical element in the eyes of people? If there would ever be a humankind-wide vote for which element ought to be wiped away altogether from the face of Earth, mercury is guaranteed to win it’ (Beletskaya 2019, 7408). Beletskaya’s assessment is based on chemical properties and on the Western history of mining and industrial applications of mercury, which is loaded with accidents and toxic events. This is hardly a universal experience, as is manifest in Siddha practitioners praising mercury for its therapeutic potential. As Siddha practitioner Devendra told me, ‘Mercury is the greatest boon to humankind!’.

I would like to stress that I do not promote the therapeutic use of mercury. At the same time, I do not argue that concerns over mercury in the West and as exhibited by the Minamata Convention for reducing use of mercury is exaggerated. Both positions would miss the point of the argument here: indeed, one mercury-in-context is a hazardous substance in need of regulation and another mercury-in-context is potentially a therapeutic agent, the supposed curative action of which can be explored further within its specific context. Reducing industrial mercury emissions within the industrial complex for instance is indeed to be welcomed and necessary to prevent environmental pollution and health harms adding up. And there likely is no objective result on whether or not mercury compounds in medicine can be safely applied. As we learn from studying mercury within

its specific ResourceComplexes, this would only be possible within the confines of one complex, just as the labels of 'safe', 'curative' or 'toxic' intra-act with the variables of a particular complex.

It is important to note that different complexes are not isolated entities. Siddha medicine, like other medical traditions, including Ayurveda or Chinese medicine, is not isolated. With a globalised economy, drugs of Asian traditional medical provenance have entered foreign markets. At the same time, India has been described as a global mercury pollution hotspot due to exceptionally high rates of air emissions. This is due to a number of reasons, including asymmetrical global trade relations: industrialised states have sought to get rid of mercury compounds since the early 2000s and hence have conveniently sold them to industrialising nations. While the Indian state has committed to meeting the goals of the Minamata Convention, the challenges hence are high, also given the circumstance that application and emission of mercury by industries is largely unregulated. In this way, mercury highlights that it is a global trade good, ecological and political issue. It also highlights that different practice complexes cannot be understood in isolation from one another, nor from other complexes, including global and national health policies, environmental campaigns, economic and trade networks, etc. In the same vein, understanding the status of mercury, its featuring in ritual religious domains and its importance in Siddha and other Indian medicines as merely metaphorical or symbolic would not be a sufficient grasp of the larger ResourceComplex that mercury is a part of.

We can clearly see the insights of the posthuman relationality approach here: for example, agency is not the prerogative of an individual actor (human or otherwise), but the result of a network. The concept and methodological framework of ResourceComplexes explicitly allows for capturing this relational mattering of human-society-substance. Just as we begin to understand that humans are not unique or separated from other human and non-human lifeforms in their socialities, we must acknowledge the mutuality of relations and that substances are not merely natural substratum from which things can be made or on which social relations are built. Substances are not passive in nature. Contrary to a predominant

popular view, substances are far from static. They are potentially volatile and their characteristics may arise in connection with humans. They have agency – provided we understand agency as the result of relational and processual mutualisms within specific settings. By acknowledging a relational view of how humans interact with resources, it is possible to examine diverging mercury ontologies and to understand the apparent gaps between them. Substances, in this sense, are constituted by entanglements of the natural and the social, as are humans. This is important for our case at hand, especially in that it requires us to imagine mercury as more than a merely powerless object devoid of agency or as a mere metaphor for religious ideas or as a vehicle for superstitions. The posthuman relationality approach coupled with the recently proposed resource turn allows for investigating how mercury plays a role in social and practical compositions and how particular interactions between humans and a substance such as mercury is conducive of specific outcomes. The change of a substance from being cure to being toxic, from being valued to being feared, then, is concomitant with a change in context, that is, changes in human-nature relation. After all, substances such as mercury are differently mobilised within different contexts of human-nature interaction: a substance like methylmercury can be artificially synthesised, distributed and enter river systems or food chains. Despite the chemical proximity of MeHg, the extraction of Hg by means of trituration and calcination of HgS and its ingestion by human bodies in the form of inorganic mercury compounds differs considerably. In all stages of mercury production, use and emission, the substance is part of social, cultural, economic and ecological entanglements.

As Soentgen has pointed out, looking at the history of substances is prone to change our understanding of the history of ourselves, of humans, as well (Soentgen 2019, 166). As Böschen et al. (2004, 20) have argued, in order to investigate the significance of substances, not only their chemical description is necessary, but also the analysis of the different domains of practice and discourses in which substances are accorded context-specific or discourse-specific meanings and uses. Ingold (2007) argues that the properties of a material can only be grasped by telling its

stories. The different forms of mercury vary tremendously with regard to bioavailability (the way and amount of the substance being ingested and retained in the body when consumed), behaviour in nature and toxicity. But why are we, in general, so unaware of this, flinching, as most of us are, at the mention of mercury, as to its assumed general and apparently universal toxicity? Both popular discourse, scientific enquiry and policy perspectives usually apply a one-sided, generalising perspective to the substance that in reality manifests in different, unequal forms. On this basis, and in drawing on posthuman relational insights, I argue that relying solely on chemical descriptions of substances is only a limited approach, one that, if taken in an isolated way, potentially masks political, ethical and ecological dimensions of the human-substance relationships involved.

So, in order to return to the theme of this volume, is mercury subsistence-related, then? Is it necessary for survival? For chemists and biologists, the substance is ‘non-essential’ with ‘no biochemical or nutritional function to bioorganisms’ (Karunasagar et al. 2006, 153). We should keep in mind, that it is not only toxic or therapeutic categories that are contingent on a particular complex. We should return to our starting point that ‘basic needs’ is a variable concept. This is also central to understanding the relationship between subsistence preferences and other types of human activities involving animals, plants and substances.

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Margarita Sánchez Romero

## The Archaeology of Care, the Archaeology of Children

### As Close as Essential

Keywords: care, maintenance activities, motherhood, prehistory, gender archaeology

#### Summary

In this chapter I am going to deal with the concept of care in past societies. First of all, I will consider the conceptual and methodological aspects of care, then I will observe the material culture of care: objects and bodies, and how they reflect the practice of care; finally, I will pay special attention to motherhood and the practices related to the feeding of infants through the archaeological recognition of lactation and weaning in order to understand the biological, technological and social challenges they entailed.

#### Assessing Care: The Concept of Maintenance Activities

Caring for others and seeking the wellbeing of the group are basic human practices that, despite being essential activities, have not been evaluated when it comes to analysing historical processes. In fact, research has paid so little attention to them that until very recently no analytical category even existed for their study (Picazo 1999; Montón/Sánchez Romero 2008).

For some years now archaeologists with a feminist and gender perspective have been working on the concept of maintenance activities, defined as the practices related to the care and sustainment of life in human groups. They include food

preparation and consumption, healthcare, healing, hygiene and the gestation, raising and socialisation of children. These activities are part of daily life and seek the sustainment and wellbeing of the members of the social group from birth to the final moments of life. Broadly speaking, we identify them today as domestic tasks and they are the most basic, essential and obvious in any social group (González Marcén/Picazo 2005; González Marcén et al. 2008).

Historical research has always considered these practices to be unchanging, static and independent of other social and economic processes traditionally considered as key to understanding the societies of the past. The contemporary analysis of work in mercantile terms has influenced the negative consideration of these production and maintenance processes. It is well known that, as a whole, they are tasks that consume time, are not measured in economic terms, are not remunerated and no price is placed on them, thus making them largely invisible. Maintenance activities are not considered to require any type of technology, experience or specialised knowledge. As a consequence, whereas in the study of past societies it is common to come across the concept of technological innovation in diverse artisanal activities, it is more difficult to find it linked to food production or care activities (Hernando 2008).

All this has had specific consequences for women and how they have been considered in popular view. The distorted view of these activities from the contemporary world and the projection of this scale of values on the past – with a biased view of the social, cultural and economic

importance of the activities undertaken by women – has meant that they have not been considered as agents of the cultural changes that have shaped the future of human societies (González Marcén/Picazo 2005; González Marcén et al. 2008).

Despite this, maintenance activities are beginning to find their place in historical discourses. Their study is conceived with a triple objective. The first is to recognise the structural function of maintenance activities in a given society and place them at the forefront of historical research; they are the only tasks that all human groups, regardless of their historical period and geographical location, need to undertake in order to survive. The second objective is to eliminate the essentialist nature that leads such activities to be associated solely with women. The ethnographic observation of different human groups reveals the variability of behaviours in the distribution of tasks by gender and, although it is true that there is irrefutably a closer association of women with maintenance tasks, it is also unquestionable that there are some communities in which they are carried out mainly or even exclusively by men (Murdock/Provost 1973). Therefore, we are not looking at a direct biological attribution but rather at a social, economic and political strategy in each society. The third aim is to vindicate the ability of maintenance activities to develop technologically and to innovate, to acquire the knowledge necessary for them to develop and their repercussion in other social spheres. These objectives allow us to understand the potential of the study of maintenance activities for obtaining a comprehensive knowledge of past societies. And in parallel, they have important consequences for the historical appreciation of those who have been (and today continue to be) mainly in charge of them: women (Sánchez Romero 2023).

Research into these practices can tell us not only about the social and economic conditions that cause moments of crisis but also, and above all, about the conditions, resources and type of social organisation that make them possible and characterise their occurrence. The treatment of illness or the practice of care cannot only be considered from a biological perspective, but should also be seen as a social problem. Any symptom of illness, any need for protection brings into play knowledge, a series of tasks, strategies and experiences

as well as the use of instruments and technologies. Seeing how these basic human welfare needs were met, either in day-to-day life or in exceptional circumstances, provides a good idea of the political, social, ideological and economic conditions of a society.

If we do not pay attention to them, we miss information on universal human ways of working. For example, no consideration has been paid to the fact that maintenance activities involve the creation of social networks, above all among those who give care and those who receive it, generating forms of communication and connection in the social life that are fundamental for the development of cohesion, empathy or solidarity strategies (González Marcén/Picazo 2005).

The development of this concept in recent years has allowed us to add considerably to our knowledge of women in the prehistoric and proto-historic periods, although, conceptually and methodologically, it can be applied to any historical period. Its definition and theoretical framework have been the subject of reflection from diverse perspectives that have led, for example, to significant criticism of concepts such as ‘domestic’, ‘day-to-day’ and ‘technology’. Enormous effort has been put into characterising each of the actions involved in undertaking these activities and recognising the archaeological evidence that allows us to identify them.

### **Recognising Care: The Material Culture of Maternal Practices**

When speaking of care, we have to understand the diversity of aspects surrounding an activity that, in principle, could seem homogenous. These range from the diversity of care recipients – children, the elderly or the disabled (Murphy/Le Roy 2016) – to the decisions of each society as to why, how and where to give care and the ability of those societies to procure care.

Care involves an embodied experience (*fig. 1*). This could seem obvious, given that any care implicitly involves the body. We also have to take into account that caring does not only involve biological factors, simply treating the injury, illness or disability; we also have to evaluate the cultural





Fig. 1. Taking care. Copper Age (drawing: Andrés Marin, <[www.pastwomen.net](http://www.pastwomen.net)>).

and social aspects, none of which can be understood without the others, given that the very fact of caring implies a political decision. In this respect, the body should not be understood as a simple object, but as an expression of the culture itself. It is precisely because of the importance of the study of the body that the bioarchaeology of care in recent years has worked on the creation of concepts, methodologies and case studies. From that perspective, it studies the provision of health-related care from a theoretical basis that combines, on the one hand, elements taken from a range of archaeological subdisciplines and schools of thought (including post-processualist, social, cognitive and mortuary archaeologies as well as palaeopathology) and, on the other hand, additional elements taken from non-archaeological disciplines that are relevant to the consideration of the behaviours of care (such as nursing, clinical medicine, philosophy, sociology and psychology) and are adapted to the particularities of archaeology (Tilley 2017, 12).

Although the first publications did not appear until the first decades of this century (Buikstra/Beck 2006; Tilley/Oxenham 2011), in subsequent years special effort has been put into making advances in this perspective.

When we speak of care, we have to take into account that we are looking at two types of situations. The first has to do with the care that comes about as a result of an illness or injury that causes temporary or permanent disability in any member of the community. The second must take into account care that is carried out on members of the group that need attention due to a disability deriving from their age.

An important contribution to the first of the aforementioned casuistries is the Index of Care (Tilley/Cameron 2014), an online tool developed to help in adapting methodological instruments in the bioarchaeology of care. This index consists of four phases, the first of which consists of describing, diagnosing, documenting and providing the

context for the analysis by introducing the available osteological, palaeopathological and archaeological information on the individual as well as the funerary treatment and the cultural, social, economic and physical contexts in which the pathology occurs. The second phase determines whether the evidence of pathology gives us an idea of whether the subject suffered a disability (temporary or permanent) that would have required attention. The third phase determines what type of care was necessary as well as its probable duration, the changes in its practice over time and the resources available and used. Finally, in the fourth phase – interpretation – we corroborate the information that could reveal the care practices carried out in the human group, in other words, what type of decisions were taken between initial recognition of the need for care and the decision to end it. Studies from the bioarchaeology of care, from both the theoretical and methodological points of view as well as from the large number of case studies we are beginning to have at our disposal, show us that, although the evidence revealed by the analyses is bioanthropological, the full significance of the care cannot be revealed without continuous reference to the archaeological context, the material culture and the social, political and economic aspects of the societies (Tilley 2015; Tilley/Schrenk 2017).

As we indicated above, some of the care practices are highly specific and linked to the tasks implicit in the relationship between the adult world and children. As in the case of women, the role of children has been largely ignored by archaeological research. As a group, children have been rendered invisible for three reasons. The first is that, due to the concept of childhood in contemporary Western societies, children are not considered as actors in the economic and social dynamics of the communities. The second is the alleged difficulty of recognising children in the archaeological record, when this is actually due to a lack of specific research strategies for their recognition. The third cause of their invisibility is that the care, socialisation and learning practices related to the infant world have been included in the group of tasks attributed to women and have thus suffered from the scant consideration given to such practices when explaining the development of societies.

Under the protection of these contemporary considerations, children have been seen as passive members of societies, perceived only in relation to adults and their activities (Sánchez Romero 2004; 2007).

Despite this, many advances have been made since the archaeological presence of children and their influence on the formation of the archaeological record began to be taken into account (Bonnichsen 1973; Hammond/Hammond 1981), from the first time children were considered to be active subjects in societies (Lillehammer 1989) until the present day. Although the study of children and infancy in prehistoric societies is relatively recent, it is offering results that demonstrate the pertinence of paying attention to these social groups: from the very concept of what infancy means (Lillehammer 2010; 2015a; 2015b) to the study of their bodies from a bioarchaeological perspective (Lewis 2007; Mays et al. 2017; Halcrow/Tayles 2011; Halcrow/Ward 2017; Lewis 2017); the analysis of the areas they occupied (Sánchez Romero et al. 2015); learning, play and socialisation (Crawford 2009; Högberg/Gårdenfors 2015); and participation in the rituality of their communities (Bacvarov 2008; Murphy/Le Roy 2016; Sánchez Romero 2018b; *fig. 2*).

As in the case of care due to illness or injury, recognising the interaction between the adult world and children with regard to care during the first years of life offers us extensive information about the societies of the past. These activities, which we call maternal practices, are based not only on maintaining physical wellbeing, but also on the establishment of social practices that allow socialisation. The lack of interest in these maternal practices corresponds to the inability to recognise the explanatory importance of processes such as maternity, child rearing, learning and socialisation. This situation has clearly been influenced by the naturalisation of all these concepts and their essentialist link to the female sphere. In this respect, we must consider that there is a biological maternity and a social maternity and that they can be performed either by the same person or by different people. The fact that the reproductive mechanisms need women's bodies for the pregnancy and delivery is a universal phenomenon; what happens to the child once it has left the





**Fig. 2.** Building the community: socialisation. Upper Palaeolithic (drawing: Andrés Marín, <[www.pastwomen.net](http://www.pastwomen.net)>).

maternal uterus involves multiple possibilities. We understand it is highly likely that maternal practices in prehistoric societies were mainly carried out by women, due to the fundamental fact that they provided the nutritional needs of infants. We must not forget that maternity, precisely because it is a cultural and social construct charged with social, economic, cultural, political, psychological and personal significance, depended on the organisational needs and strategies of each of the societies under study (Sánchez Romero 2006).

In recent years archaeology has made a particularly important contribution to the conceptual change in the construction of maternity. The works of Kathleen M. Bolen (1992), Elisabeth Beausang (2000; 2005), Laurie Wilkie (2003), Emer O'Donnell (2004) and Katharina Rebay-Salisbury (2017) or publications such as 'Motherhood and Infancies in the Mediterranean in Antiquity' (Sánchez Romero/Cid 2018) and 'Motherhood in Antiquity' (Cooper/Phelan 2017) have contributed to placing maternity at the heart of the debate on the societies of the past. Observing infant individuals as recipients of care and socialisation practices, seeing them as actors in the productive processes and the generation of the archaeological record or as protagonists in social hierarchisation strategies offers us new perspectives and opportunities that

had remained unexplored until now. More than anything, they pose new challenges and questions in areas such as the ability of infant individuals to act; children who learn, care and interact, in short, who participate in the taking of decisions and who transform areas and objects (Sánchez Romero et al. 2015).

The archaeological recognition of those care practices also involves, on the one hand, the anthropological analysis of the remains of infant individuals, which is becoming one of the most innovative and informative aspects regarding this age group (Lewis 2006; Mays et al. 2017), even developing specific perspectives such as the bioarchaeology of the foetus (Halcrow et al. 2017). On the other hand, the evidence of care for children is manifested in a multitude of objects and structures that were specially designed for their nourishment, transportation, learning, socialisation or dress.

As part of the maternal practices we can recognise diverse processes and experiences ranging from the birth, lactation and weaning methods to healthcare and the uses corresponding to socialisation and learning that culminate in competent members of societies. For example, the Bronze Age archaeological record on the southeastern Iberian Peninsula shows us such important events as

childbirth at, for example, El Cerro de las Viñas (Malgosa et al. 2004), or other examples of premature foetuses buried in settlements such as Cabezo Redondo (Villena, Alicante, Spain) or Mas del Corral (Alcoi, Alicante) (De Miguel 2010, 145).

Processes such as socialisation and learning were organised by means of rules and actions that were observed and repeated daily. Children were initiated into adult activities through play. Among the diverse forms of entertainment and play, those dedicated to imitating the actions of adults represented a form of learning linked to the discovery of self-identity, socialisation and the learning of different technologies (Sánchez Romero 2017). In the case of both learning and socialisation, understanding of the material culture is neither univocal nor obvious and requires effort and methodological innovation. The advances in this respect are unquestionable (Crawford 2009; Ember/Cunnar 2015; Högberg/Gårdenfors 2015; Sánchez Romero 2018a; 2018b).

In this text, we pay special attention to the practices related to the feeding of infants, in other words, to the archaeological recognition of lactation and weaning, taking into account the biological, technological and social challenges they entailed.

The scant attention paid to infant feeding strategies in past societies is influenced basically by two factors. On the one hand, lactation and weaning have been considered as natural, immutable, universal and with a marked essentialist nature linked to women. There has been very little consideration of the amount of work they involved, the different technologies applied when replacing breast milk with other foodstuffs or the social strategies established to successfully carry out that process. Different communities all had different ways of implementing those processes (Sánchez Romero 2019).

Analyses of the bone remains of infant individuals in the majority of prehistoric societies show that children died due to two sets of factors: endogenous causes influenced by the conditions before or during birth and exogenous causes originating from the quality of the postnatal environment. Among the exogenous causes, the most critical moment for infants was the end of lactation;

the step that children take from the security of the mother's milk to another type of nourishment is a process fraught with risk due, above all, to the deficient hygienic and sanitary conditions of those populations. In certain societies with inadequate hygiene conditions, the early withdrawal of breast milk can lead to diarrhoea and allergies, as the child's digestive and immunological systems are not fully formed. Faced with this situation, the people establish strategies that not only respond to biological criteria but are also influenced by cultural factors (Sánchez Romero 2007; 2019).

The first alternative is that they are fed by another lactating mother from their immediate circle or by wet nurses with whom some type of contract is established. If that is not possible, the closest substitute to mother's milk is that from animals such as goats, sheep, cows or horses (Dunne et al. 2019). The use of substitute nourishment involves a highly specific type of material culture; children can be fed with animal milk by using spoons, cups and feeding bottles. In the known European prehistoric funerary record that allows us to associate this type of utensil with infant individuals, spoons are practically non-existent; a rare exception is Tomb 64 in the Bronze Age necropolis of Pitten (Turkey) that contained a spoon associated with the inhumation of an infant of four to five years old. Since Clemens Eibner's (1973) studies of Bronze Age feeding bottles, abundant evidence has been found to support the relationship between these small cups and the feeding of infants. Some scholars believe the feeding bottles were transitional elements (and not always substitutive) between breast feeding and weaning (Pomadere 2007). Feeding bottles, as cups with a small spout through which the liquid poured, are more common in prehistoric funerary contexts. We have examples such as those from the German Neolithic necropolises of Steigra and Aiterhofen found in infant tombs or inside an urn with the cremated remains of a child aged between zero and six in the necropolis of Franzhausen-Kokoron (Austria) (Rebay-Salisbury 2017). Other possible feeding cups are from the Neolithic necropolis of Jebel Moya in Nubia, where two vessels of that type were found next to the tomb of twins (Bécares 2019) or those documented in various Bronze Age

necropolises in the Aegean (Pomadere 2007). In all those cases the vessels were designed with specific functional and formal characteristics that, without doubt, supposed a technological innovation.

The second option for feeding babies that did not have access to mother's milk was gruel made with cereals and mixed with milk, water or some kind of broth. In this respect, various studies have hypothesised that one of the reasons pottery technology made a quantitative leap was the need for vessels that allowed this replacement food to be made more digestible for infants in the first phases of adult nutrition, as it needed longer cooking times at temperatures of above 100°C (Skibo/Blinman 1999, 173; Crown 2000, 253). The technological changes and material culture associated with infant nutrition became increasingly complex once those populations adopted sedentary lifestyles, as the increase in the number of births also meant a longer weaning period but with an earlier start than in the mobile populations (Skibo/Blinman 1999, 173; Crown 2000, 253). We also find this type of material culture in other finds such as bovine horns used as feeding bottles almost without any modification or desiccated bovine udders fitted with a suction device.

## Conclusion

Infant feeding practices ensured the sustainment of life for children and involved technology, innovation, strategies of solidarity between women and specific social and emotional relations, all with the single purpose to guarantee the survival and wellbeing of the infant members of the community. This behaviour could have been present from our beginnings as a human species through the extension of the model of maternal behaviour to the rest of the members of the group for the primate context of the first hominids and we have been seeing this for some time now in the archaeological record of the earliest human groups (Querol 2005). Studying these essential practices in depth will undoubtedly help us explain the populations of the past much more efficiently.

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### BEYOND SUBSISTENCE

Different perspectives aiming to understand the complex relationship of humans and resources were the main focus of the international workshop 'Beyond Subsistence: Human-Nature Interactions', which took place within the initiatives of the Collaborative Research Centre SFB 1070 ResourceCultures at the University of Tübingen. Cultural anthropologists and archaeologists came together to reflect on the meanings and values of different socio-cultural practices surrounding the interactions between humans and nature, which go beyond the pure subsistence needs. From the exploration of modern rice cultivation in India to the personal ornaments of Ice Age Germany, the case studies examined here provide insights on multiple aspects of the existence of humans, animals, plants and substances. By reflecting on behaviours and practices from modern and archaeological contexts, this edited volume offers a detailed report of the interdisciplinary discussions that occurred during the workshop and ultimately allow us to reflect on how we understand the multi-layered interactions among all types of social actors.



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