



# Regional Responses to Global Climate Change: Exploring Anthropomorphic Depictions in Rock and Mobiliary Art Expressions from the Kimberley and Europe During the Late and Terminal Pleistocene

Peter Veth, Sam Harper, and Martin Porr

## Abstract

Northern Australia and particularly the Kimberley and Arnhem Land regions are well known for the intensive production of figurative anthropomorphs as a dominant theme by the terminal Pleistocene. Ongoing analysis and dating places the archaeological efflorescence of individual human figures and grouped scenes, often with extraordinary detail in the depictions of accoutrements, weaponry, and personal ornamentation, subsequent to the LGM (MIS 2) and across the Pleistocene-Holocene transition. In this chapter, we argue that the intensive production of human figures – in contrast to preceding millennia of predominantly figurative animal motifs – was a cultural response to ongoing loss of territory with sea level rise (and especially on the shallow continental shelves of the north), greater identity marking and emerging regionalism in northern Australia starting between 18–12 ka. While the impacts and climate details of MIS 3 and 2 were clearly different in the northern hemisphere, we believe there are complementary trajectories in Western Eurasian art bodies, which equally display regional and interregional patterns during approximately the same time period in both parietal and mobiliary art. We explore whether global drivers associated with glacio-eustatic trends, the loss of land through inundation and the emergence and subsequent relaxation of glacial refugia, might be implicated in the enhancement of anthropomorphic assemblages located on opposite sides of the world.

## Keywords

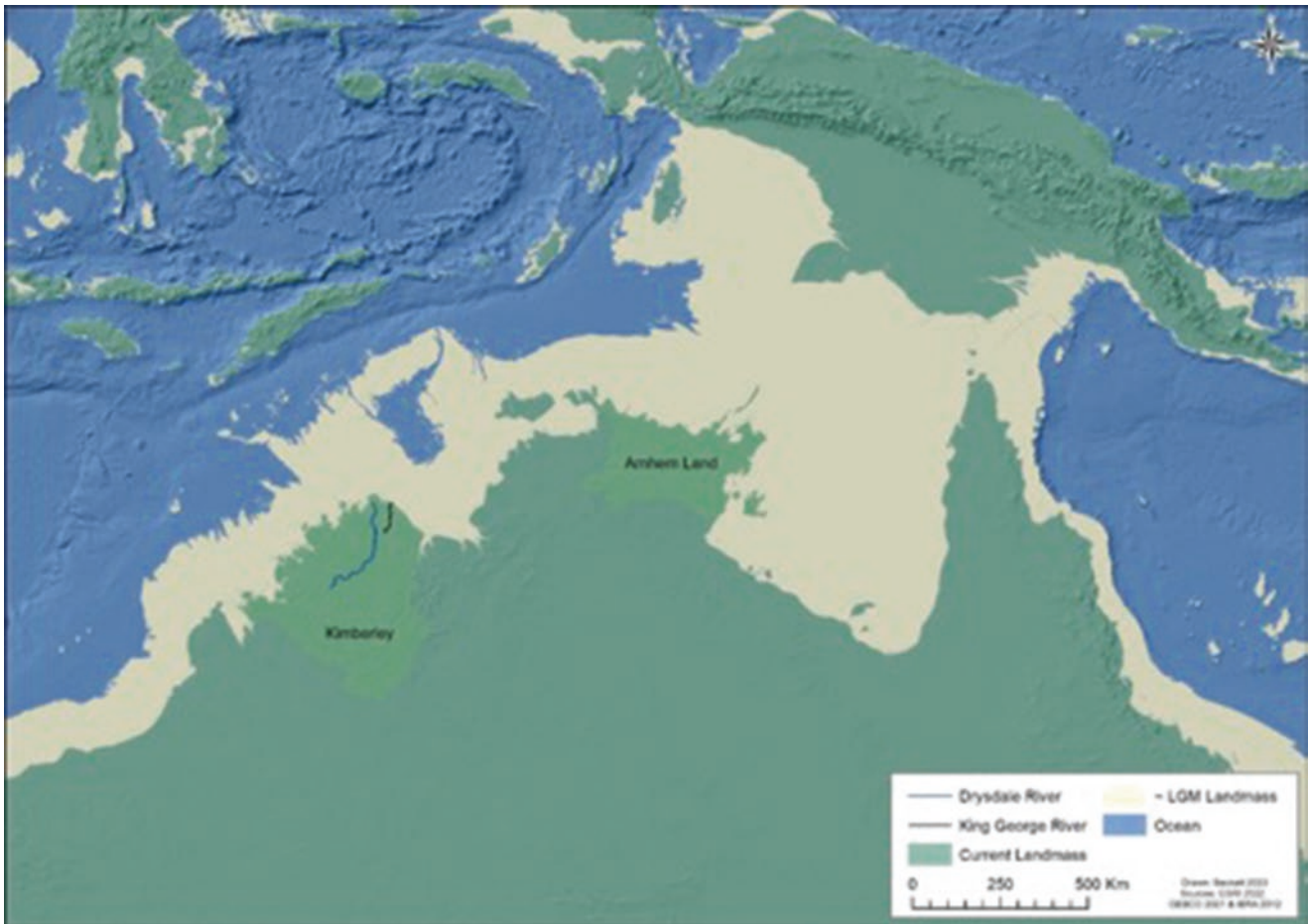
Anthropomorphs · Climate change · Regionalism · Identity · Animals · Last Glacial Maximum (LGM) · Networks

## 5.1 Introduction

In this paper we explore the regionalisation of rock art styles in the terminal Pleistocene of Northern Australia (c. 18–12 ka) and the Late Pleistocene of Europe (c. 45–12 ka) to elucidate examples of human network building at different temporal and spatial scales (Johnston et al. 2017; Ouzman et al. 2017) (Fig. 5.1). The early development of regional rock art styles provides one important stream of evidence for how people have negotiated change and cross-cultural interaction, utilising rock and mobiliary art within social networks and for information exchange. In Northern Australia, human-focused rock art provides a rich repository of human sociality with a focus on body ornaments and perishable accoutrements not normally recovered from excavation contexts. Of particular interest in this respect is the *Gwion Gwion* (or *Gwion Gwion*) art style in the Kimberley (Northwest Australia). This sits at an important juncture of social and demographic reconfigurations, dated to the terminal Pleistocene/early Holocene transition (~12 ka) as outlined in several foundational papers characterising time brackets for earlier figurative animal art from 17 ka – 13 ka and for human *Gwion Gwion* art at c. 12 ka (Finch et al. 2020, 2021). We will discuss these findings in the light of rock art from the European Upper Palaeolithic and the transformative environmental changes that occurred during and after the Last Glacial Maximum (LGM). We explore a range of interpretations between the two hemispheres. For Northern Australia, we build upon recent and emerging research across the wider

P. Veth (✉) · S. Harper  
The University of Western Australia, Perth, WA, Australia  
e-mail: [peter.veth@uwa.edu.au](mailto:peter.veth@uwa.edu.au); [sam.harper@uwa.edu.au](mailto:sam.harper@uwa.edu.au)

M. Porr  
The University of Western Australia, Perth, WA, Australia  
Hilton, WA, Australia



**Fig. 5.1** Map of the Kimberley region and Arnhem Land showing extent of the coastal plain towards the Timor Sea at peak LGM c. 20 ka. (Map: Emma Beckett).

region that includes the suggestion of the existence of a tropical Pleistocene era culture bloc with possible regional cultural exchanges (Florin et al. 2020; Veth et al. 2021). In the context of European Palaeolithic art, we consider the intersection of past social and cultural meanings at different scales. For both the northern and southern hemispheres, we contextualize the respective phenomena in relation to recent archaeological evidence, new radiometric dates, emerging palaeoclimatic frameworks, and modelled changes in social organization. Through our analysis, we want to explore late and terminal Pleistocene networks through rock art and mobiliary figurative expressions. Our explorations will draw attention to the existence and persistence of past regional relationships that emerged at opposite ends of the world and perhaps in response to similar global glacio-eustatic drivers (see discussion in Aubert et al. 2018). While these networks should not be regarded as historical precursors to the age of globalization that characterises the modern world, they allow insights into the sometimes vast, spatial dimensions of human flexibility, adaptability, and fundamental sociality through deep time. We aim to explore the tensions between

global narratives – here profiling the expanding and contracting worlds and human responses due to glacio-eustatic and climatic changes – and local cultural expressions that see forager-gatherer-hunters engage in intensive production of anthropomorphic form(s) in both the southern and northern hemispheres, yet unquestionably as unique local expressions with clear emblematic differences.

## 5.2 Art, Regionalisation, Globalization, and Networks

One of the most persistent topics in the study of past hunter-gatherer societies is the attempt to understand and model their spatial behaviours. Before the widespread adoption of farming and animal husbandry practices after ca. 10 ka ago, virtually all human populations relied on different forms of mobility and territorial marking to fulfil their social and economic needs. Both within hunter-gatherer studies and in relation to the need to develop a systematic basis for archaeological inferences, studies into mobility patterns and related

causalities have increased rapidly over the last several decades (Kelly 1992; Perreault and Jeffrey Brantingham 2011; Whallon 2006). From the 1960s onwards, an era which can be described as the modern phase of hunter-gatherer studies, the crucial role of the environment was thoroughly recognised and explored in increasingly sophisticated ways. Probably the most influential early paper in this respect was Binford's (1980) *Willow smoke and dogs' tails*, in which he proposed a basic distinction between a forager and a collector mobility pattern. This distinction is fundamentally connected to the spatial and temporal distribution of resources in an environment and the respective human responses to these challenges. From these insights, a range of conclusions can be drawn about a wide range of human behaviours at different temporal scales and with reference to the impact on different material cultural expressions ranging from the pattern of sites across landscapes, the structure of camp sites and down to preferred hunting equipment (see e.g., Bleed 1986). However, while such a human behavioural ecology approach has its clear merits, human societies and behaviours do not exist in isolation and thus issues of demography, the creation and maintenance of social networks, and the mechanisms for the exchange of information within and between populations need to be equally considered. In this paper, we aim to explore some of these wider themes in relation to the possible roles of rock art and mobiliary art objects (after Conkey 1989).

Explicit attempts have been made in Australia to theoretically engage rock art styles with archaeology and palaeoenvironmental studies and many of the polarities inherent in previous approaches (for example, informed versus formal; symbolic versus functional; ritual versus mundane; gendered versus ungendered) are now being unpacked in more nuanced ways (chapters in McDonald and Veth 2012; Veth et al. 2016, 2021). The fact that rock art can signal information at many levels and has agency between culture groups and across time and space as well as inter-generationally is a recurrent theme as is its organising role in ideational, sensory, social organizational, religious, hierarchical, territorial, and economic domains. The information content of rock art, when viewed within its larger archaeological and environmental contexts, can inform on multiple facets of past behavioural systems (Porr and Veth 2017). And as such, we can use different theoretical approaches for different scales of analysis.

At a broad scale, an evolutionary approach has the significant advantage in that it does not assume (or require) 'uniform' human intentionality for the continuities and changes in the styles used. Put another way, proliferation events in successive rock art style phases and gradual changes between these (Travers 2015) can be viewed as patterned symbolic behaviours that are the human evolutionary outcomes of new ecological states. The same pressures will influence other non-symbolic social and economic behaviours (such as

group mobility and stone artefact technological systems) and, therefore, these archaeological records are coupled with changing art production modes. An example would be the greater degree of homogeneity in rock art styles across arid regions due to the low density and high mobility of groups, and with a high degree of language/dialect permeability (McDonald and Veth 2013a, b). Innovation, learning and adoption of rock art operate as humanly mediated outcomes. However, the success of its transmission through space and time will be influenced by the direction and intensity of environmental, climatic, and hydrological changes.

In evaluating rock art style phases covering many millennia, we argue that the temptation to use single prime movers to explain change (such as climate, demography, or artistic convention) should be avoided. Changes are likely to be multi-factorial and coupled rather than deterministic, with longer-term processes favoured. We suggest that these explanatory frameworks can encompass evolutionary social biology approaches and Group Boundary Formation (GBF) theory (Foley and Lahr 2011); climate drivers and biome changes as these influence hunter-gatherer mobility patterns (Kuhn et al. 2016); and changing information-exchange networks (McDonald and Veth 2013a). Additionally, the repeated and recursive use of places and existing art (McDonald and Veth 2013b) and cladal, non-progressive models, for changing art styles (Johnston et al. 2017; Travers 2015; Veth et al. 2016; Welch 2016) should also be incorporated as these are well-documented human behaviours over time. Settlement and aggregation behaviours can be understood according to GBF and Information Exchange Theory (IET; and see Veth et al. 2021). Using GBF and IET, different settlement and mobility patterns are modelled to be in *phase* with – and not determined by – different environmental settings (Veth et al. 2000; Whallon 2006). That social groups would have experienced various stressors with these environmental, territorial and consequent demographic changes is not in question. We argue that changes in a group's boundary maintenance and information exchange behaviours are often expressed and managed most visibly via rock art styles, a theme developed in detail by Conkey (1978, 1980 and 1984, also see Wobst 1977). Style phases are a specific coding of a group's self-image and subsistence as groups engage with environmental and cultural drivers. In the Australian case studies discussed below, during higher precipitation regimes, more 'closed' information systems tend to occur with greater emblematic group-identifying behaviours and higher stylistic heterogeneity. In contrast, arid phases generally tend to result in more 'open' information systems where more stylistically homogeneous schemes occur across permeable group boundaries and over larger landscapes (McDonald and Veth 2013a). While some of these latter aspects can also be discerned in European Palaeolithic art, it also needs to be recognised that the dimensions discussed so

far generally do not explain all aspects of figurative imagery. Material culture is always polysemic and meaning is established relationally (e.g., Motta and Veth 2021). This applies both to past meanings and those created through modern research questions and analyses (Porr 2018). Material culture items can generally be related to different causalities and different rhythms that operate at different temporal scales. At smaller scales, social meanings and particular contexts of use and consumption can often be discerned while at larger scales regional and interregional social networks become relevant as they relate to particular environmental conditions.

### 5.3 Europe

Europe comprises the western portion of the Eurasian subcontinent which is the largest land mass on the planet (Fig. 5.2), stretching from the Atlantic Coast to the Eastern shores of Siberia. This enormous region has a human history that covers at least two million years as evidenced by early hominin sites in Georgia and China (Muttoni et al. 2018). However, here, we will focus on a much later period and

‘constrained’ area, the Upper Palaeolithic of Europe, which is broadly dated to between ca. 45 and 12 ka ago. During this time, Neanderthals were replaced by *Homo sapiens* populations and from ca. 40 ka ago, Europe was exclusively inhabited by the latter (Higham et al. 2014). The ability to create regional or interregional networks might have significantly contributed to the survival rates and expansion of *Homo sapiens* populations during times of environmental stress. As French (2021) has argued, the Neanderthal-to-*Homo sapiens* transition marks an important threshold in the demographic history of Eurasia. It is the time that saw a crucial expansion of social lives and an increase in the connectedness of human societies on increasingly larger scales. Populations, “while still small, were no longer ‘small-scale’” (French 2021, 173).

#### 5.3.1 Environment and Palaeo-Climature

The time period that is relevant for the European Upper Palaeolithic falls within Marine Isotope Stages (MIS) 3 and 2. Most importantly, it encompasses the Last Glacial Maximum (LGM), which is currently dated to between ca.



**Fig. 5.2** Map of the Eurasian subcontinent showing key regions discussed in this paper. (Map: Emma Beckett)

27 and 20 ka. While significant climatic fluctuations still occurred, the LGM was characterised by generally very cold conditions and a considerable extension of Alpine and Scandinavian glaciers, which made occupation of the northern latitudes of the continent challenging for human populations. It is clear that large parts of the current temperate zone of Europe were unoccupied during the LGM (Maier and Zimmermann 2017). The climatic downturn was followed by a complex but generally rapid phase of amelioration. The retreat of the glaciers was followed by the establishment of open steppe and tundra habitats, which were superseded by both open and increasingly closed coniferous and deciduous forest types. The first modern humans entering Eurasia sometime between 50 and 40 ka would have encountered deciduous woodlands in the southern parts of the region, for example, around the current Mediterranean and Black Sea, and coniferous forests that stretched across the whole northern sections of the continent. Overall, during MIS 3, habitats exhibited much variability, offering a range of adaptive opportunities, including mountainous and coastal environments. With the cascading down of temperatures, these opportunities partly narrowed but others were enhanced or emerged. The period between ca. 27 and 20 ka saw the expansion of boreal and tundra conditions further towards the south, impacting the productivity of plant and animal resources. However, during this time, Europe also became part of one of the most significant and rich glacial environments connected to one of the most iconic Ice Age animals. The concept of the so-called ‘mammoth steppe’ was first proposed by Guthrie (1990), who argued for the existence of this specifically Middle and Late Pleistocene habitat that does not have a clear current ecological equivalent. This steppe was the product of a unique combination of relatively low temperatures and marked aridity during the Pleistocene, which both created conditions for a rich soil and abundant growth of grasses. This environment supported an extraordinarily rich biomass of grazing animals (mammoths, bison, horses, woolly rhinoceros, reindeer etc.) together with communities of large predators (lions, leopards, wolves, and hyenas) (Gamble 2013, 232–236). When climatic conditions deteriorated further around the LGM, however, human populations retreated towards refugia in the south of the continent, for example in Southwestern Europe. Accordingly, the amelioration of climate after ca. 18 ka allowed populations to expand again northwards and resettle regions that were either previously covered by glaciers or had endured arctic conditions during the LGM.

### 5.3.2 Archaeology

The climatic and environmental changes described above equally presented challenges and opportunities for human

occupation. After the initial occupation of Europe by *Homo sapiens* groups, these populations followed complex patterns of expansion and contraction interacting with geographical, environmental, and climatic variables. The first fully established Upper Palaeolithic technocomplex is the so-called Aurignacian (ca. 45 to 28 ka). It is generally accepted that the Aurignacian was exclusively associated with *Homo sapiens*. Compared to the preceding Middle Palaeolithic, it is characterised by a much higher standardisation in lithic and organic technologies, which are recognisable from the Iberian Peninsula to the Caucasus. These similarities seem to reflect more integrated and stable social transmission mechanisms that operated over vast distances and for several 1000 years (White et al. 2015). The Aurignacian is also the time during which personal ornaments become much more common in the archaeological record. They were made from a range of organic materials and were often highly standardised in their shapes and decorations. It has been argued that the distribution of these implements across Europe reflects the existence of ethno-linguistic groupings during the Aurignacian (Vanhaeren and d’Errico 2006). At a smaller scale, it appears that differences in ornamentation’ allowed for the differentiation of local social groups inhabiting neighbouring valleys (Dutkiewicz et al. 2018). Despite these undeniable complexities, the settlement patterns across Eurasia were rather diffuse and population densities were probably quite low (Schmidt and Zimmermann 2019). At a local level, however, differentiations between habitation sites and locales for other and probably restricted purposes can be observed, for example, for some cave sites in the Swabian Jura, Southwest Germany (Porr 2015).

During the subsequent Gravettian phase (ca. 28 to 20 ka), the increasingly cooler and dryer conditions allowed human populations to make use of the opportunities presented by the mammoth steppe environment (Bicho et al. 2017). While the Aurignacian was mostly restricted to Europe and parts of Anatolia, the Gravettian became a true Eurasian technocomplex and typical tool types from this period can be found over vast distances across Europe and the Eurasian Plain. The presence of large and predictable herds of herbivores allowed the development of much more focused settlement patterns and demographic expansion. Large numbers of mammoths and other grazing herbivores were not only utilised for food. Their bones were also used to construct massive open-air habitation structures that were possibly occupied on a semi-permanent basis enabled by food storage practices. Most of these mega-sites occur along the Desna/Dnieper river system and are integrated into large settlements of up to 10,000 square metres (Soffer et al. 2000). From this period, there are also a number of complex multiple burial sites containing rich grave goods that point towards the emergence of social stratification (Pettitt 2011).

These complex social and economic structures were disrupted during the height of the LGM, which severed lifeways and communication pathways operating across the Eurasian plain (Maier and Zimmermann 2017). During the coldest periods of the LGM, large parts of Central and Eastern Europe were uninhabited. Subsequently, Europe was resettled from Southern European refugia while Eastern Europe was recolonised from refugia along the Caucasus and other Central Asian Mountain ranges. In Western Europe, the main post-LGM technocomplex was the Magdalenian that can be found as far as present-day Poland. In Eastern Europe, so-called Epi-Gravettian technocomplexes show more continuity with pre-LGM traditions but in both cases, the trajectories were leading towards various Late Palaeolithic technocomplexes of highly mobile foragers in a world of increasingly forested environments (Wygall and Heidenreich 2014; Gavrillov 2021; Miller 2012; Lengyel et al. 2021).

### 5.3.3 Rock Art and Mobiliary Art

It has long been noted that the emergence of Upper Palaeolithic technocomplexes across Eurasia appear to be connected with the regular occurrences of unequivocal figurative imagery in the archaeological record (Lorblanchet and Bahn 2017). While different archaeological artefact categories do not map neatly onto art/stylistic categories in the European record, already during the Aurignacian the imagery shows a high level of diversity and occurs both in the form of rock art and mobiliary objects. The latter include the famous Grotte Chauvet and the ivory statuettes of the Swabian Jura Mountains (Floss 2015; Clottes 2003). During this early period, figurative representations, which overwhelmingly depict animals, are not as standardised as organic or lithic tools. The spatial patterning seems rather to follow the evidence of personal ornaments, outlined above, with broadly shared conventions and regional variations. The sample size for figurative representations is, however, very small and thus no quantitative analyses are possible. A qualitative comparison between the Grotte Chauvet and the mobiliary art of the Swabian Jura caves shows a broad similarity in the choice of motifs (with a preference for lions) and some stylistic conventions but also a lot of variability (a trend first observed by Clottes 1995 and elsewhere). Cave art appears to be absent from Central and Eastern Europe, instead being restricted to Southwest Europe. Overall, the available evidence appears to mirror the structure of Aurignacian demography with relatively low population densities and a high degree of social and cultural variability. The tension between shared conventions and expressions of individuality can also be seen in some of the collections of

figurative art themselves. In the Swabian Jura statuettes, the depictions of mammoths and lions show coherent references to animal behaviours (along a carnivore/herbivore opposition) but little stylistic standardisation (Porr 2010a). Figurative imagery also exhibits a complex dialectic between change and continuity through time, which is evidenced by the initial occurrence of a female statuette at Hohle Fels cave (Germany) and a comparable depiction at Chauvet Cave (France) during the Aurignacian, long before the proliferation of this motif during the Gravettian period (Porr 2010b). Figurative imagery does not simply change with environmental conditions and adaptive strategies; it also follows its own rhythms.

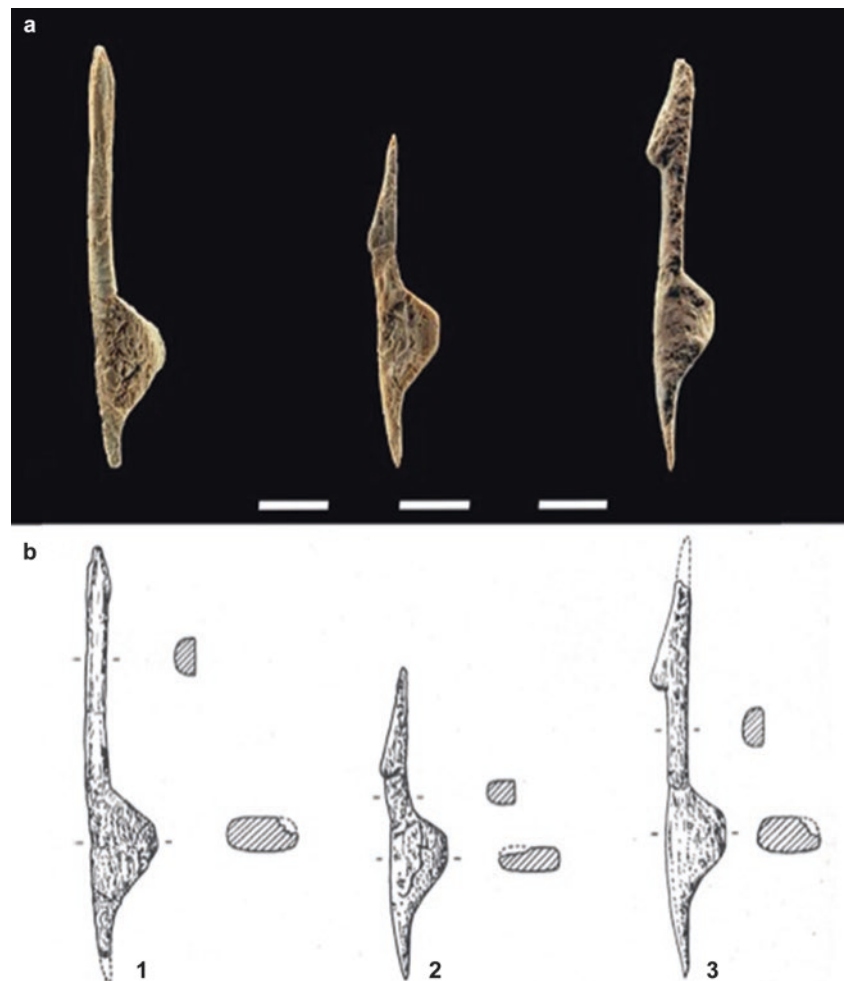
Some of the most well-known figurative forms from the European Palaeolithic are the female statuettes from the Gravettian period. The most famous of these statuettes is the so-called Venus of Willendorf. These representations occur mostly as mobiliary or portable items, however other expressions are also known such as the famous engraving at Laussel, France (Gaudzinski-Windheuser and Jöris 2015). One particularly striking feature of these female statuettes is their enormous geographical range. They occur from Iberia to the Baikal region of Siberia. Across this enormous area and despite some significant variations, the statuettes share several common features: they are usually carved in stone or ivory, they often depict unclothed and, less commonly, clothed women. In Western Eurasia, they seem often to depict mature women with sometimes exaggerated sexual attributes. Contextually, the statuettes almost always occur in habitation sites, and they appear, therefore, to be connected to a domestic and public sphere. They are a regular feature in the extensive habitation structures mentioned above. In a seminal paper, Gamble (1982) argued that the statuettes reflect extensive networks of interactions and alliances which operated to mitigate risk during the harsh climatic conditions of the LGM. The statuettes were consequently interpreted as “visual mechanisms of information exchange designed to establish and maintain alliance networks between groups living up to thousands of kilometres apart” (French 2021, 242). The Willendorf-style motifs are, therefore, interpreted as evidence for the existence of open social systems, which is consistent with the ecological structure of the mammoth steppe, as outlined above (e.g., Conkey et al. 1997; Soffer et al. 2000). This inference is further supported by demographic reconstructions that seem to suggest that Gravettian interaction networks allowed for the survival of viable populations, linked as nodes, during the LGM despite local extinction events (Maier and Zimmermann 2017).

The role of rock art and mobiliary art during the European Upper Palaeolithic has also been explored for post-LGM societies. The proliferation of mobiliary art objects and

painted cave sites in the Franco-Cantabrian region in Southwest Europe after ca. 18 ka has been explained as a reflection of demographic refugia effects and the necessity to negotiate increased population densities (Conkey 1987; Rivero and Sauvet 2014; Gravel-Miguel 2016; Fuentes et al. 2019). In terms of the interrelatedness between figurative imagery and social networks, the re-colonisation of Central and North-western Europe was also accompanied by the emergence of new and widely distributed motifs (Maier 2012). During the Late Magdalenian period between ca. 16 and 13 ka, the so-called Gönnersdorf-style female figurines emerge (Bosinski 1987). They are characterised by highly abstract and standardised depictions of the female body. Most famous in this context are the numerous engravings on slate plaques at the site of Gönnersdorf, Germany. Here, they are arranged in groups and seemingly engaged in communal activities or rituals (Bosinski et al. 2001). They also occur as mobiliary objects and were apparently personal items. These objects were, for example, found at the Magdalenian sites of Oelknitz and Nebra (Fig. 5.3) (see

Braun 2018 for an overview). Finally, in some exceptional cases, they were also manufactured from lithic materials as evidenced by some extraordinary findings in Poland (Fiedorczuk et al. 2007). It has been argued that these representations are connected with the rapid (re)colonisation of post-LGM habitats (Maier 2015, 2017). They possibly reflect the establishment of networks between pioneering groups with their level of abstraction acting to suppress individual expression. Gaudzinski-Windheuser and Jöris (2015, 312) have argued that the respective long-distance communication networks “focused on the mandatory functioning of individuals within a group to ensure survival. Thus, the individual sphere must have been subordinate for the group and was presumably reflected in the absence of depictions of individuals”. While the details of this interpretation need to be addressed in future contextual analyses, during the Late Palaeolithic period, mobiliary art clearly played a crucial role in the establishment and maintenance of large-scale cultural entities and reflects open systems of social interaction.

**Fig. 5.3** So-called Gönnersdorf-style female figurines characterised by highly abstract and standardised depictions of the female body from the Magdalenian site of Nebra, Germany. (Landesamt für Denkmalpflege und Archäologie Sachsen-Anhalt; photo: Juraj Lipták)



## 5.4 Northern Australia and Sahul

### 5.4.1 Environment and Paleoclimate

Our modelling for northern Australia considers changes in the intensity of the Australian–Indonesian summer monsoon, rainfall, temperature, and sea levels. Sea level modelling shows that between 14 and 12 ka vast areas of the coastal plain (~200 km of coastline of the Bonaparte shelf), representing significant estates for NW Kimberley peoples, was drowned due to sometimes rapidly rising sea levels (Ishiwa et al. 2016; Williams et al. 2018), and especially between Meltwater Phase 1A and 1B (Finch et al. 2021). This is precisely the time which sees a switch between large naturalistic animal depictions dating to times of lower sea level (and possibly to the peak of the Last Glacial Maximum at 19 ka) towards the efflorescence of anthropomorphic images reflecting the demographic packing of populations slowly relocating to interior estates. In the case of the Kimberley region (some 424,000 km<sup>2</sup>), the effects of the possible loss of the Indo-Australian Monsoon before the Last Glacial Maximum (LGM); the drowning of the Bonaparte Basin after the LGM; ENSO intensification from 4 ka and then relaxation of ENSO during the last 1.5 millennia, resulted in significant changes in precipitation, available territory, and seasonality (Veth et al. 2016). While the LGM reconfigurations of northern Australia did not act to isolate groups in glacial refugia as occurred in Eurasia, parts of some bioregions may have been used less frequently or intensively (Law et al. 2021; Veth et al. 2022). During the LGM a coextensive land bridge emerged between the Kimberley and Arnhem Land to the east, accompanied by the emergence of style regions in each culture bloc, between which there could have been some degree of information exchange, as expected in an open and permeable exchange mode Lewis 1988). Major falls in sea level up to -130 m at the peak of the LGM (c. 19 ka), created contiguous cultural landscapes over the broad and shallow continental shelves of the north, which were then subsequently drowned and lost entirely by 6 ka.

### 5.4.2 Archaeology

The Kimberley was a vast and continuously occupied hunter-gatherer landscape as deduced from both the archaeological record (Vannieuwenhuysen et al. 2017; Veth et al. 2019, 2021) and recent genomic studies (Bird et al. 2018; Malaspina et al. 2016). The known occupational history of the Kimberley extends back to at least 50 ka (Norman et al. 2022; Veth et al. 2019; Wood et al. 2016), with strong evidence that it has likely acted as a large-scale refugium in the larger Australian context through all of this time (Veth 1993;

Williams et al. 2013; Wood et al. 2016). Because the region extends from the interior to the sea including plateau, riverine and plains hosting desert, riparian, woodland and (sub) tropical vegetation we might expect very different human adaptive strategies through time. And that is precisely the patterning emerging (Fig. 5.1), with detailed site-catchment archaeologies being described from the edge of the Great Sandy Desert (Balme et al. 2019; Veth et al. 2009), along the Devonian reef and sandstone plateau (O'Connor and Fankhauser 2001; O'Connor et al. 2014; Veth et al. 2019) and from the western and northern maritime zones and sub-coastal riverine catchments (Dortch 1977; O'Connor 1999).

There are marked introductions of technologies and practices through time, such as the edge-ground axe and ground bone points at 46 ka, application of ochreous pigments by 40 ka, and a sequence of very different rock art styles dated from at least c. 20 ka. There is also the long-distance transport of shells for ornaments and implements at 30 ka, and bifacial and backed point production by 5 ka (Hiscock et al. 2016; Langley et al. 2021; Maloney et al. 2014). Through the lenses of Information Exchange and Group Boundary Formation Theory, different scenarios of cultural/economic and symbolic sharing can be expected across the Kimberley depending on (a) sea level and position on the continental shelf, (b) latitude, (c) catchment types and (d) resource patchiness in addition to predominantly social trajectories (Motta et al. 2020; see summary in Veth et al. 2021). Distinct regional material cultures are in place by the terminal Pleistocene and unquestionably by the mid-Holocene. Against the backdrop of changes in sea levels, monsoonal intensity, and vegetation structure, is the emergence of the material signatures of distinct polities, likely also of related language and dialects, which show both persistence and flexibility in long-term residence patterns across the Kimberley. The case for continuity is overwhelming as is the complexity of technological and symbolic practices associated with these non-Pama-Nyungan speakers. The central role of the Kimberley region in the settling of Australia (Bird et al. 2018), emergence of complex symbolic practices (Veth et al. 2021), and regionally distinct land-use and resource extractive practices (Hiscock et al. 2016; Ouzman 2021) makes it the ideal landscape to examine issues of regionalism and long-distance exchange and connection. Unsurprisingly, in many respects it shares some of the long-term occupational patterns and regional symbolic variabilities seen in Arnhem Land to the east (Lewis 1988).

### 5.4.3 Rock Art

Across northern Australia, advances in scientific dating techniques are confirming terminal Pleistocene ages for human



**Fig. 5.4** Panel of early Irregular Infill Animals, here three life-size kangaroos in red ochre with, selective battering of anatomical features, King George River. (KV\_BAC\_KGR\_020: BAC/UWA, and Ambrose Chalarimeri)



figures in rock art; specifically, age constraints of 12 ka for *Gwion Gwion* figures and an earlier date and brackets for Irregular Infill Animal Art of 17–13 ka (Finch et al. 2020, 2021; Jones et al. 2017, 2020). This research provides opportunities to develop a more robust chronology and to explore how we understand the role of style, and how linear the progressions may be, in these regions. Superimposition sequences in both areas are indicative of early figurative traditions that change in significant ways through time (Chaloupka 1993; Walsh 1994; Welch 2016). In both the Kimberley and Arnhem Land, two of the richest bodies of figurative rock art globally, earliest art styles are dominated by naturalistic animals which currently have absolute age brackets from AMS as early as 17 ka (Finch et al. 2021; Jones et al. 2020) with very few figurative human depictions (Fig. 5.4). Humans are more obviously present via hand-prints and stencils. However, by around 12,000 years ago, a significant shift happens in northern Australia to focus on humans, in scenes rich with dress and material culture displays (Fig. 5.5). This is happening at a time of significant territorial loss with sea level rise and inferred social responses, which include the proliferation of *Gwion* and *Dynamic* figures. That this pattern is observed in both regions suggests dynamic cultural exchanges are being reflected in shared rock art traditions (Lewis 1988; May et al. 2018; Taçon et al. 1999; Veth et al. 2011).

What concerns us here is why two contiguous areas of the northern Australia, the Kimberley and Arnhem Land (Fig. 5.1), should have both witnessed a proliferation of rock art focusing on grouped (read socialized) humans. Both regions show prolific details in headdress, hair belts, necklaces and bangles, dilly bags and pubic aprons, as well as wooden artefacts including spears, digging sticks and ceremonial ‘staves’. While the schemata are not identical, with



**Fig. 5.5** Large *Gwion* figures with details of headdress, shoulder arm and wrist ornamentations, tassel waist band and carrying dilly bags, King George River. (KV\_BAC\_KGR\_003: BAC/UWA, and Ambrose Chalarimeri)

**Fig. 5.6** Transitional Elegant Action Figures showing animated and juxtaposed humans, kangaroos and therianthrope on shelter roof, King George River. (KV\_BAC\_KGR\_028A: BAC/UWA, and Ambrose Chalarimeri)



Kimberley Gwion figures generally shown in more erect and formal stances (in contrast to subsequent dynamic Elegant Action Figures – Walsh 2000), in comparison to the Dynamic Figures of Arnhem Land, there are many common attributes which allows us to think about these as ‘cousin-styles’.

The most recent phase or substyle amongst Gwion art is the shift to dynamic figures (Fig. 5.6), labelled ‘Elegant Action Figures’ by Walsh (1994, 2000). This shift sees a move away from the codified, large Gwion scenes of parallel, richly garbed humans suggestive of ceremony, to scenes of life, such as hunting, sex, and camping. With this shift, there are increasingly gendered figures which are smaller, with a simplification of form and reduction in dress, and the inclusion of animals, largely macropods, appearing as key figures within scenes. Additionally, the highly visible placement of earlier Gwion is no longer dominant, and in contrast, discrete panels that engage with the less obvious features of the rock (e.g., an erosion stain; a rippled under-ceiling surface) are incorporated into placement choice.

## 5.5 Discussion

Both study areas from the northern and southern hemispheres have experienced significant environmental changes during the Late Pleistocene. The impacts of climatic fluctuations around the LGM on Eurasia and Northern Australia (Kimberley and Arnhem Land) have been substantial with significant impacts on the mobility of human populations. In each example, we can track human adaptive and social responses. Although these are not seen as simple reactions to changing environmental conditions and resource distributions, we can discern coherent patterns emerging in both regions in both mobility configurations and forms of visual

communication. Across the Kimberley and Arnhem Land, there are comparable visual repertoires between approximately 17 ka and after 12 ka (see Jones et al. 2017, 2020), which follow a largely similar trajectory over time. In both regions, and dating from the tail end of the LGM, the earliest phase of figurative rock art is dominated by naturalistic depictions of large animals. This imagery appears to have a mostly public character for the following criteria (a) the motifs are generally on single panels most of which have wide viewscapes, (b) animal types are aggregated in related scenes (c) they are portrayed as life-size motifs with peripheral infilling, and (d) they exhibit communal and complex relational ontologies (see Motta and Veth 2021). This latter characteristic is shared with the following phase of art where it switches to a range of elaborately decorated human figures, the *Gwion Gwion* style phase, often engaged in communal and seemingly ritual activities (Fig. 5.5). This phase is followed by a diversification of the art, which becomes more stylistically encoded and restricted, whilst less elaborate (Fig. 5.6). Finally, during the early Holocene and from the mid-Holocene onwards, publicly displayed art forms begin to dominate again, and these seem to articulate with a stronger local focus and the formation of estates within larger interconnected cultural blocs. Across Europe, the changes in the art over time seem to relate to an initial settlement of the continent by modern human groups, who were connected with each other but still displaying a considerable degree of variability, and especially in their figurative visual repertoires. This phase was followed by a long phase of vast open networks between hunter-gatherer populations, who sometimes followed strategies of reduced mobility accompanied by an increase in social complexity. These open networks continued throughout and after the LGM in different forms and at different scales. Only with the onset of the Post-

Pleistocene reforestation, did populations increasingly form locally focused social and economic strategies.

Art forms reflect and mediate these changes in complex ways. Across Europe, mobile art and rock art seem to reflect the nature and reach of communication networks that articulate with broad environmental changes and the availability of resources. Only in Southwest Europe and under demographic refugia conditions, do local focus areas appear, being created around communal and highly elaborate rock art sites. These are now some of the best-known Palaeolithic painted caves. They reflect a highly structured and complex social landscape, which most likely relates to social group formations and respective restrictions, rules, and interconnections. In terms of motif choices, no dramatic switches in the overall repertoire can be discerned. Human and animal depictions are continuously created in parallel. However, animal imagery continues to dominate throughout, and human depictions remain under-represented (Rivero and Ruiz 2019, 6). This is a slightly different pattern than the mobiliary art of the Gravettian and Epigravettian, which shows a greater proliferation of human depictions in the form of female statuettes. However, these findings need to be considered with regard to taphonomic processes, which negatively impact parietal art in caves more than rock art. Throughout, animal and human depictions are highly contextual and the female statuettes may have had a role in negotiating social identities across domestic and ritual spheres. While they reflect large-scale patterns, they probably played more active roles in the negotiations of social life than in the establishment of communication networks themselves.

Across the two Northern Australian regions we argue that rock art has played a crucial role in the negotiation of social formations, places, and boundaries. We believe two key drivers for change over time were the loss of significant habitable land areas and the associated changes in available resources. Consequently, the dynamics of GBF (Veth et al. 2021) are reflected in the appearance of stylistic heterogeneity and boundary marking and differentiation; whilst the paired transition across these regions with inferred encoding of information readable across the northwest, indicates continued exchange of visual strategies, as understood through IET. The initial period of naturalistic depictions of animals, the 'external gaze', appears to reflect a focus that is arguably similar to some European Palaeolithic art. As recent research in Indonesia has established, this focus also has a similar antiquity in Borneo and Sulawesi (Aubert et al. 2019; Brumm et al. 2021). In Southeast Asia and Northern Australia, they do not appear to have been spatially focused to the same degree. They seem to reflect a more flexible spatial and social organisation of interconnected hunter-gatherer groups. During the subsequent period of rapid inundation of the coastal plain (c. 12–8 ka), visual systems in the Kimberley and Arnhem Land begin to exhibit a less diffuse spatial pat-

tern. Emergent regionalism occurs from the terminal Pleistocene with loss of territory and the reconfiguration of smaller and bounded groups. Interestingly these two adjacent regions fall within the northerly and more ancient non-Pama Nyungan language family, independent of the Pama-Nyungan family spreading across the rest of the continent during the Holocene (Bouckaert et al. 2018).

The visual repertoire from c. 12 ka onwards shows a high degree of standardisation together with a strong focus on human depictions, as outlined above. The land becomes marked with representations of ritual activities, with people invested in rituals themselves. It is difficult to avoid the impression that the art played a role in negotiating or renegotiating the relationships between human groups in often expressive and publicly visible forms. The general switch from a focus on animal to human depictions represents the greatest difference between the Northern Australian and the European art repertoires examined in this paper.

In Southeast Asia, a similar switch has been recently described from rock art imagery in Borneo. The so-called *datu saman* figures exhibit a close similarity with some *Gwion* art in the Kimberley (after Aubert et al. 2018). Interestingly they are dated to only 1.6 ka earlier at 13.6 ka than *Gwion*. It would be tempting to infer the existence of a system of interrelated cultural areas between Northern Australia and Southeast Asia during the Late Pleistocene in the form of a 'trans-Wallacean tropical cultural interaction shere'. The current radiometric dates seem to suggest that the situation cannot easily be resolved, and it rather appears that we are dealing with parallel developments of the negotiation of social identities through visual expressions of ritual activities. Nevertheless, these may be rooted in similar deep cultural and ideological foundations and perhaps shared common drivers associated with the LGM.

During the latest stages of the Pleistocene and in the Holocene, rock art becomes less and less central across Europe for the establishment of social relationships. The reforestation across the temperate zone of the continent pushed communities towards less large-scale mobility and economic patterns. Visual systems of communication become more difficult to discern with more material expressions made from perishable materials (see Rivero and Ruiz 2019 for an overview). In contrast, across the Kimberley and Arnhem Land, hunting and gathering groups started to organise themselves in local estates and created a complex social and cultural landscape. This configuration articulates well with the recent Monsoonal weather pattern and the respective environments and resource availability patterns.

Based on ethnographic records, these estates were connected to spiritual ancestors such as the famous Wandjina of the Kimberley. These areas were, nevertheless, connected with each other and it remains an open question if human groups and individuals actually stayed within these estates or

expanded their ceremonial ranges, as recorded ethnographically (e.g., the Kunapippi ceremony). Within this system emerges the *Wunan* network, a Kimberley-wide social network and trade system with reciprocal obligations, that sees the movement of valuable objects, such as pearl shell from the coast into the arid zone (Akerman and Stanton 1994; McCarthy 1939). These trade routes, driven by individuals responsible for links within the chain, endure into the recent past (Bradshaw et al. 2021). Archaeological and ethnographic evidence supports the deep interconnectedness of people at different scales. Exchange networks not only encompassed the Kimberley or Arnhem Land, but also adjacent desert groups. In both case studies, the available evidence from the rock art, mobiliary art, archaeological and environmental contextual information allows us to gain important insights into the development of local, regional, and interregional patterns of connections that sometimes reach almost global dimensions over many thousands of kilometres.

## 5.6 Conclusion

Our comparison of largely figurative art rock art schema between Europe and northern Australia uncovered some parallel developments in art repertoires, with a common foundation of dominant figurative animal iconographies followed by subsequent shifts in style and theme due to environmental challenges associated with the Last Glacial Maximum. These environmental vectors included glacial refugia in the north and sea level changes in the south. In tracking such global responses, this paper speaks to global drivers with local responses. While the post-LGM response in northern Australia, and possibly in the broader trans-Wallacean region, was a distinctive switch to predominantly socialised human figures, European rock art shows a more complex pattern, although human representations do also become more common in some regions. Whilst we argue for open information exchange systems in both regions, interactions in Europe were facilitated through different media with a distinct focus on mobiliary art such as the Willendorf-style and Gönnersdorf-style figurines. While environmental drivers associated with the LGM create globally shared phenomena, specific cultural responses are localised and regionally constituted, as evidenced in the unique inter-regional patterns demonstrated in this paper.

## References

- Akerman, Kim, and John Stanton. 1994. *Riji and Jakoli: Kimberley Pearlshell in Aboriginal Australia*. Darwin: Northern Territory Museum of Arts and Sciences.
- Aubert, Maxime, P. Setiawan, Adhi Agus Oktaviana, Adam Brumm, P.H. Sulistyarto, E.W. Saptomo, B. Istiawan, et al. 2018. Palaeolithic cave art in Borneo. *Nature* 564 (7735): 254–257. <https://doi.org/10.1038/s41586-018-0679-9>.
- Aubert, Maxime, Rustan Lebe, Adhi Agus Oktaviana, Muhammad Tang, Basran Burhan, Andi Jusdi Hamrullah, et al. 2019. Earliest hunting scene in prehistoric art. *Nature* 576 (7787): 442–445. <https://doi.org/10.1038/s41586-019-1806-y>.
- Balme, Jane, Sue O'Connor, Tim Maloney, Dorcas Vannieuwenhuys, Kim Aplin, and India Dilkes-Hall. 2019. Long-term occupation on the edge of the desert: Riwi Cave in the southern Kimberley, Western Australia. *Archaeology in Oceania* 54 (1): 35–52. <https://doi.org/10.1002/arco.5166>.
- Bicho, Nuno, Joãoascalheira, and Célia Gonçalves. 2017. Early Upper Paleolithic colonization across Europe: Time and mode of the Gravettian diffusion. *PLoS One* 12 (5): e0178506. <https://doi.org/10.1371/journal.pone.0178506>.
- Binford, Lewis R. 1980. Willow smoke and dogs' tails: Hunter-gatherer settlement systems and archaeological site formation. *American Antiquity* 45: 4–20. 279653.
- Bird, Michael, Robin Beaman, Scott Condie, Alan Cooper, Sean Ulm, and Peter Veth. 2018. Palaeogeography and voyage modeling indicates early human colonization of Australia was likely from Timor-Roti. *Quaternary Science Reviews* 191: 431–439. <https://doi.org/10.1016/j.quascirev.2018.04.027>.
- Bleed, Peter. 1986. The optimal design of hunting weapons: Maintainability or reliability. *American Antiquity* 51 (4): 737–747. <https://doi.org/10.2307/280862>.
- Bosinski, Gerhard. 1987. „Die große Zeit der Eiszeitjäger. Europa zwischen 40.000 und 10.000 v. Chr.“ *Jahrbuch des Römisch-Germanischen Zentralmuseums* 34: 3–139. <https://doi.org/10.11588/jrgzm.1987.1.83138>.
- Bosinski, Gerhard, Francesco d'Errico, and Petra Schiller. 2001. *Die gravierten Frauendarstellungen von Gönnersdorf*. Der Magdalénien-Fundplatz Gönnersdorf. Vol. 8. Stuttgart: Franz Steiner Verlag.
- Bouckaert, Remco, Claire Bowern, and Quentin Atkinson. 2018. The origin and expansion of Pama-Nyungan languages across Australia. *Nature: Ecology and Evolution* 2: 741–749. <https://doi.org/10.1038/s41559-018-0489-3>.
- Bradshaw, C.J.A., K. Norman, S.G. Ulm, A.N. Williams, C. Clarkson, J. Chadoeuf, S.C. Lin, Z. Jacobs, R.G. Roberts, M.I. Bird, L.S. Weyrich, S.G. Haberle, S. O'Connor, B. Llamas, T.J. Cohen, T. Friedrich, P. Veth, M. Leavesley, and F. Saltré. 2021. Stochastic models support rapid early peopling of late Pleistocene Sahul. *Nature Communications* 12 (1): 2440.
- Braun, Ingmar M. 2018. Upper Palaeolithic portable art objects in Central Germany and supra-regional parallels. *Paleo. Revue d'Archéologie Préhistoire* 29: 55–74. <https://doi.org/10.4000/paleo.3756>.
- Brumm, Adam, Adhi Agus Oktaviana, Basran Burhan, Budianto Hakim, Rustan Lebe, Jian-xin Zhao, Priyatno Sulistyarto, et al. 2021. Oldest cave art found in Sulawesi. *Science Advances* 7 (3): eabd4648. <https://doi.org/10.1126/sciadv.abd4648>.
- Chaloupka, George. 1993. *Journey in time: The World's longest continuing art tradition*. Chatswood: Reed.
- Clottes, Jean. 1995. Changement thématique dans l'art du Paléolithique Supérieur. *Bulletin de la Société de l'Ariège Pyrénées* 50: 13–34.
- , ed. 2003. *Return to Chauvet cave: Excavating the birthplace of art*. London: Thames & Hudson.
- Conkey, Margaret W. 1978. Style and information in cultural evolution: Toward a predictive model for the Paleolithic. In *Social archaeology: Beyond subsistence and dating*, ed. Charles L. Redman, Mary Jane Berman, Edward V. Curtin, William T. Langhorne, Nina M. Versaggi, and Jeffrey C. Wanser, 61–85. New York: Academic.

- . 1980. Context, structure and efficacy in Paleolithic art and design. In *Symbol as sense. New approaches to the analysis of meaning*, ed. Mary LeCron Foster and Stanley E. Brandes, 225–248. New York: Academic Press.
- . 1984. To find ourselves: Art and social geography of prehistoric hunter gatherers. In *Past and present in hunter gatherer studies*, ed. Carmel Schrire, 253–276. Orlando: Academic Press.
- . 1987. New approaches in a search for meaning? A review of research in ‘Paleolithic art’. *Journal of Field Archaeology* 14: 413–430. 530230.
- . 1989. Ceramics and territory: Review of C. Garth Sampson, stylistic boundaries among mobile hunter foragers. *Science* 244 (4911): 1500. <https://doi.org/10.1126/science.244.4911.1500.a>.
- Conkey, Margaret W., Olga Soffer, Deborah Stratmann, and Nina G. Jablonski, eds. 1997. *Beyond art: Pleistocene image and symbol*. San Francisco: California Academy of Sciences.
- Dortch, Charlie. 1977. Early and late stone industrial phases in Western Australia. In *Stone tools as cultural markers: Change in evolution and complexity*, ed. Richard Wright, 104–132. Canberra: Australian Institute of Aboriginal Studies.
- Dutkiewicz, E., S. Wolf, and N.J. Conard. 2018. Early symbolism in the ach and lone valleys of southwestern Germany. *Quaternary International* 491: 30–45.
- Fiedorczuk, Jan, Bodil Bratlund, Else Kolstrup, and Romuald Schild. 2007. Late Magdalenian feminine flint plaquettes from Poland. *Antiquity* 81 (311): 97–105. <https://doi.org/10.1017/S0003598X00094862>.
- Finch, Damien, Andrew Gleadow, Janet Hergt, Vladimir A. Levchenko, Pauline Heaney, Peter Veth, Sam Harper, et al. 2020. 12,000-Year-old Aboriginal rock art from the Kimberley region, Western Australia. *Science Advances* 6 (6): eaay3922. <https://doi.org/10.1126/sciadv.aay3922>.
- Finch, Damien, Andy Gleadow, Janet Hergt, Pauline Heaney, Helen Green, Cecilia Myers, Peter Veth, et al. 2021. Ages for Australia’s oldest rock paintings. *Nature Human Behaviour* 5 (3): 310–318. <https://doi.org/10.1038/s41562-020-01041-0>.
- Florin, S. Anna, Andrew S. Fairbairn, May Nango, Djaykuk Djandjomerr, Ben Marwick, Richard Fullagar, Mike Smith, et al. 2020. The first Australian plant foods at Madjedbebe, 65,000–53,000 years ago. *Nature Communications* 11 (1): 924.
- Floss, Harald. 2015. The oldest portable art: The Aurignacian ivory figurines from the Swabian Jura (Southwest Germany). In *Aurignacian genius: Art, technology and society of the first modern humans in Europe*, ed. Randall White and Raphaëlle Bourrillon, 315–329. New York: New York University.
- Foley, Robert, and Marta Mirazón Lahr. 2011. The evolution of the diversity of cultures. *Philosophical Transactions: Biological Sciences* 366 (1567): 1080–1089. <https://doi.org/10.1098/rstb.2010.0370>.
- French, Jennifer. 2021. *Palaeolithic Europe: A Demographic and social prehistory*. Cambridge: Cambridge University Press.
- Fuentes, Oscar, Claire Lucas, and E. Eric Robert. 2019. An approach to Palaeolithic networks: The question of symbolic territories and their interpretation through Magdalenian art. *Quaternary International* 503: 233–247. <https://doi.org/10.1016/j.quaint.2017.12.017>.
- Gamble, Clive. 1982. Interaction and alliance in Palaeolithic society. *Man (N.S.)* 17 (1): 92–107. 2802103.
- . 2013. *Settling the Earth. The archaeology of deep human history*. Cambridge: Cambridge University Press.
- Gaudzinski-Windheuser, Sabine, and Olaf Jöris. 2015. Contextualising the female image – Symbols for common ideas and communal identity in Upper Palaeolithic societies. In *Settlement, society and cognition in human evolution. Landscapes in mind*, ed. Fiona Coward, Robert Hosfield, Matt Pope, and Francis Wenban-Smith, 288–314. Cambridge: Cambridge University Press.
- Gavrilov, Konstantin N. 2021. The Epigravettian of Central Russian Plain. *Quaternary International* 587–588: 326–343. <https://doi.org/10.1016/j.quaint.2020.10.016>.
- Gravel-Miguel, C. 2016. Using species distribution modelling to contextualize Lower Magdalenian social networks visible through portable art stylistic similarities in the Cantabrian region (Spain). *Quaternary International* 412: 112–123. <https://doi.org/10.1016/j.quaint.2015.08.029>.
- Guthrie, R. Dale. 1990. *Frozen Fauna of the Mammoth Steppe*. Chicago: University of Chicago Press.
- Higham, Tom, Katerina Douka, Rachel Wood, Christopher Bronk Ramsey, Fiona Brock, Laura Basell, Marta Camps, et al. 2014. The timing and spatiotemporal patterning of Neanderthal disappearance. *Nature* 512 (7514): 306–309. <https://doi.org/10.1038/nature13621>.
- Hiscock, Peter, Sue O’Connor, Jane Balme, and Tim Maloney. 2016. World’s earliest ground-edge axe production coincides with human colonisation of Australia. *Australian Archaeology* 82 (1): 2–11. <https://doi.org/10.1080/03122417.2016.1164379>.
- Ishiwa, Takeshiga, Yusuke Yokoyama, Yosuke Miyairi, Stephen Obrochta, Takenori Sasaki, Akihisa Kitamura, Atsushi Suzuki, Minoru Ikehara, Ken Ikehara, Katsunori Kimoto, et al. 2016. Reappraisal of sea-level lowstand during the Last Glacial Maximum observed in the Bonaparte Gulf sediments, northwestern Australia. *Quaternary International* 397: 373–379. <https://doi.org/10.1016/j.quaint.2015.03.032>.
- Johnston, Ian G., Joakim Goldhahn, and Sally K. May. 2017. Dynamic Figures of Mirarr Country: Chaloupka’s four-phase theory and the question of variability within a rock art style. In *The archaeology of rock art in Western Arnhem Land, Australia (Terra Australis 47)*, ed. Bruno David, Paul S.C. Taçon, Jean-Jacques Delannoy, and Jean-Michel Geneste, 109–127. Canberra: ANU Press.
- Jones, Tristen, Vladimir Levchenko, Penelope King, Ulrike Troitzsch, Daryl Wesley, Alan Williams, and Alfred Nayingull. 2017. Radiocarbon age constraints for a Pleistocene–Holocene transition rock art style: The Northern Running Figures of the East Alligator River region, western Arnhem Land, Australia. *Journal of Archaeological Science: Reports* 11: 80–89. <https://doi.org/10.1016/j.jasrep.2016.11.016>.
- Jones, Tristen, Daryl Wesley, Sally K. May, Ian Johnston, Clare McFadden, and Paul S.C. Taçon. 2020. Rethinking the age and unity of large naturalistic animal forms in early Western Arnhem Land Rock Art, Australia. *Australian Archaeology* 86 (3): 238–252. <https://doi.org/10.1080/03122417.2020.1826080>.
- Kelly, Robert. 1992. Mobility/sedentism: concepts, archaeological measures, and effects. *Annual Review of Anthropology* 21 (1): 43–66. <https://doi.org/10.1146/annurev.an.21.100192.000355>.
- Kuhn, Steven, David Raichlen, and Amy Clark. 2016. What moves us? How mobility and movement are at the center of human evolution. *Evolutionary Anthropology* 25 (3): 86–97. <https://doi.org/10.1002/evan.21480>.
- Langley, Michelle, Jane Balme, and Sue O’Connor. 2021. Bone artifacts from Riwi Cave, south-central Kimberley: Reappraisal of the timing and role of osseous artifacts in northern Australia. *International Journal of Osteoarchaeology* 31 (5): 673–682. <https://doi.org/10.1002/oa.2981>.
- Law, W. Boone, Peter Hiscock, Bertram Ostendorf, and Megan Lewis. 2021. Using satellite imagery to evaluate precontact Aboriginal foraging habitats in the Australian Western Desert. *Science Reports* 11: 10755. <https://doi.org/10.1038/s41598-021-89642-1>.
- Lengyel, György, Annamária Bárány, Sándor Béres, Ferenc Cserpák, Mihály Gasparik, István Major, Mihály Molnár, et al. 2021. The Epigravettian chronology and the human population of eastern Central Europe during MIS2. *Quaternary Science Reviews* 271: 107187. <https://doi.org/10.1016/j.quascirev.2021.107187>.

- Lewis, Darrell. 1988. *The Rock Paintings of Arnhem Land, Australia*, BAR International Series 415. Oxford: British Archaeological Reports.
- Lorblanchet, Michel, and Paul Bahn. 2017. *The first artists. In search of the world's oldest art*. London: Thames & Hudson.
- Maier, Andreas. 2012. Regional groups and social interaction during the Central European Magdalenian. *Notae Praehistoricae* 32: 121–132.
- . 2015. *The Central European Magdalenian. Regional diversity and variability*. Dordrecht: Springer.
- . 2017. Population and settlement dynamics from the Gravettian to the Magdalenian. *Mitteilungen der Gesellschaft für Urgeschichte* 26: 83–101.
- Maier, Andreas, and Andreas Zimmermann. 2017. Populations headed south? The Gravettian from a palaeodemographic point of view. *Antiquity* 91 (357): 573–588. <https://doi.org/10.15184/aqy.2017.37>.
- Malaspinas, Anna Sapfo, Michael Westaway, Carig Muller, Vitor Sousa, Oscar Lao, Isabel Alves, Anders Bergström, Georgios Athanasiadis, Jade Cheng, Jacob Crawford, and Tim Heupink. 2016. A genomic history of Aboriginal Australia. *Nature* 538 (7624): 207–214. <https://doi.org/10.1038/nature18299>.
- Maloney, Tim, Sue O'Connor, and Jand Balme. 2014. New dates for point technology in the Kimberley. *Archaeology in Oceania* 49 (3): 137–147.
- May, Sally K., Ian Johnston, Paul S.C. Taçon, Ines D. Sanz, and Joakim Goldhahn. 2018. Early Australian Anthropomorphs: Jabiluka's Dynamic Figure Rock Paintings. *Cambridge Archaeological Journal* 28 (1): 67–83. <https://doi.org/10.1017/S095977431700052X>.
- McCarthy, Frederick D. 1939. "Trade" in Aboriginal Australia, and "Trade" relationships with Torres Strait, New Guinea and Malaya. *Oceania* 9 (4): 405–438. <https://doi.org/10.1002/j.1834-4461.1939.tb00275.x>.
- McDonald, Jo, and Peter Veth, eds. 2012. *Companion to rock art*. Oxford: Wiley-Blackwell.
- . 2013a. Rock art in arid landscapes: Pilbara and Western Desert petroglyphs. *Australian Archaeology* 77: 66–81. <https://doi.org/10.1080/03122417.2013.11681980>.
- . 2013b. The Archaeology of Memory: The recursive relationship of Martu rock art and place. *Anthropological Forum* 23 (4): 1–19. <https://doi.org/10.1080/00664677.2013.843444>.
- Miller, Rebecca. 2012. Mapping the expansion of the Northwest Magdalenian. *Quaternary International* 272–273: 209–230. <https://doi.org/10.1016/j.quaint.2012.05.034>.
- Motta, Ana Paula, and Peter Veth. 2021. Relational ontologies and performance: Identifying humans and nonhuman animals in the rock art from north-eastern Kimberley, Australia. *Journal of Anthropological Archaeology* 63: 101333. <https://doi.org/10.1016/j.jaa.2021.101333>.
- Motta, Ana Paula, Martin Porr, and Peter Veth. 2020. Recursivity in Kimberley rock art production, Western Australia. In *Places of memories: Spatialised practices of remembrance from Prehistory to today*, ed. Christian Horn, Gustav Wollentz, Gianpiero di Maida, and Annette Haug, 137–149. Oxford: Archaeopress.
- Muttoni, Giovanni, Giancarlo Scardia, and Dennis Kent. 2018. Early hominins in Europe: The Galerian migration hypothesis. *Quaternary Science Reviews* 180: 1–29. <https://doi.org/10.1016/j.quascirev.2017.10.031>.
- Norman, Kasih, Chris Clarkson, Sue O'Connor, Jane Balme, Peter Veth, and Ceri Shipton. 2022. Australia's First People: Oldest sites and early culture. In *Oxford handbook of the archaeology of indigenous Australia and New Guinea*, ed. Ian McNiven and Bruno David. Oxford: Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780190095611.013.9>.
- O'Connor, Sue. 1999. *30,000 Years of Aboriginal Occupation: Kimberley, North-West Australia*, Terra Australis 14. Canberra: Australian National University.
- O'Connor, Sue, and Barry Fankhauser. 2001. Art at 40,000 BP? One step closer: An ochre covered rock from Carpenter's Gap Shelter 1, Kimberley region, Western Australia. In *Histories of old ages: Essays in honour of Rhys Jones*, ed. Atholl Anderson, Ian Lilley, and Sue O'Connor, 287–300. Canberra: Australian National University.
- O'Connor, Sue, Tim Maloney, Dorcas Vannieuwenhuysse, Jane Balme, and Rachel Wood. 2014. Occupation at Carpenter's Gap 3, Windjana Gorge, Kimberley, Western Australia. *Australian Archaeology* 78: 10–23. <https://doi.org/10.1080/03122417.2014.11681994>.
- Ouzman, Sven. 2021. Archaeologies of Austral: Australian identities from the Pleistocene to the Anthropocene. *Journal of Australian Studies* 45 (2): 152–164. <https://doi.org/10.1080/14443058.2021.1910857>.
- Ouzman, Sven, Peter Veth, Kevin Kenneally, Pauline Heaney, and Cecilia Myers. 2017. Plants before animals? Aboriginal rock art as evidence of ecoscaping in Australia's Kimberley. In *The Oxford handbook of the archaeology and anthropology of rock art*, ed. Bruno David and Ian McNiven. Oxford: Oxford Handbooks Online. <https://doi.org/10.1093/oxfordhb/9780190607357.013.31>.
- Perreault, Charles, and P. Jeffrey Brantingham. 2011. Mobility-driven cultural transmission along the forager–collector continuum. *Journal of Anthropological Archaeology* 30 (1): 62–68. <https://doi.org/10.1016/j.jaa.2010.10.003>.
- Pettitt, Paul. 2011. *The Palaeolithic origins of human burial*. London: Routledge.
- Porr, Martin. 2010a. Palaeolithic art as cultural memory. A case study of the Aurignacian art of Southwest Germany. *Cambridge Archaeological Journal* 20 (1): 87–108. <https://doi.org/10.1017/S0959774310000065>.
- . 2010b. The Hohle Fels 'Venus': Some remarks on animals, humans and metaphorical relationships in Early Upper Palaeolithic art. *Rock Art Research* 27 (2): 147–159. <https://doi.org/10.3316/informit.487439509728532>.
- . 2015. Beyond animality and humanity. Landscape, metaphor and identity in the Early Upper Palaeolithic of Central Europe. In *Settlement, sociality and cognition in human evolution: Landscapes in mind*, ed. Fiona Coward, Robert Horsfield, Matt Pope, and Francis Wenban-Smith, 54–74. Cambridge: Cambridge University Press.
- Porr, M. 2018. Country and relational ontology in the Kimberley, Northwest Australia: Implications for understanding and representing archaeological evidence. *Cambridge Archaeological Journal* 28 (3): 395–409. <https://doi.org/10.1017/S0959774318000185>.
- Porr, Martin, and Peter Veth. 2017. Zeiten – Träume – Realitäten. *Archäologie in Deutschland* 1 (2017): 14–19. <https://www.jstor.org/stable/26323386>.
- Rivero, Olivia, and Juan F. Ruiz. 2019. The rock art of Sub-Scandinavian Europe. In *The Oxford handbook of the archaeology and anthropology of rock art*, ed. Bruno David and Ian McNiven. Oxford: Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780190607357.013.21>.
- Rivero, Olivia, and Georges Sauvet. 2014. Defining Magdalenian cultural groups in Franco-Cantabria by the formal analysis of portable artworks. *Antiquity* 88 (339): 64–80. <https://doi.org/10.1017/S0003598X00050225>.
- Schmidt, Isabell, and Andreas Zimmermann. 2019. Population dynamics and socio-spatial organization of the Aurignacian: Scalable quantitative demographic data for western and central Europe. *PLoS One* 14 (2): e0211562. <https://doi.org/10.1371/journal.pone.0211562>.

- Soffer, Olga, James M. Adovasio, and David C. Hyland. 2000. The 'Venus' Figurines: Textiles, basketry, gender, and status in the Upper Paleolithic. *Current Anthropology* 41 (4): 511–537. <https://doi.org/10.1086/317381>.
- Taçon, Paul S.C., Ken Mulvaney, Richard Fullagar, and Lesley Head. 1999. Bradshaws' – an eastern province? *Rock Art Research* 16 (2): 127–128.
- Travers, Meg. 2015. *Continuity and Change: Exploring Stylistic Transitions in the Anthropomorphic Figures of the Northwest Kimberley Rock Art Assemblage and the Varying Contexts of Rock Art Production* (Unpublished PhD dissertation). University of New England, Armidale.
- Vanhaeren, Marian, and Francesco d'Errico. 2006. Aurignacian ethno-linguistic geography of Europe revealed by personal ornaments. *Journal of Archaeological Science* 33: 1105–1128. <https://doi.org/10.1016/j.jas.2005.11.017>.
- Vannieuwenhuysse, Dorcas, Sue O'Connor, and Jane Balme. 2017. Settling in Sahul: Investigating environmental and human history interactions through micromorphological analyses in tropical semi-arid north-west Australia. *Journal of Archaeological Science* 77: 172–193. <https://doi.org/10.1016/j.jas.2016.01.017>.
- Veth, Peter. 1993. *Islands in the Interior: The Dynamics of prehistoric adaptations within the Arid Zone of Australia*, International Monographs in Prehistory. Archaeological Series 3. Ann Arbor: Michigan.
- Veth, Peter, Sue O'Connor, and Lynley Wallis. 2000. Perspectives on ecological approaches in Australian archaeology. *Australian Archaeology* 50: 54–66. <https://doi.org/10.1080/03122417.2000.11681666>.
- Veth, Peter, Mike Smith, Jim Bowler, Kathryn Fitzsimmons, Alan Williams, and Peter Hiscock. 2009. Excavations at Parnkupirti, Lake Gregory, great sandy desert: OSL ages for occupation before the Last Glacial maximum. *Australian Archaeology* 69: 1–10. <https://doi.org/10.1080/03122417.2009.11681896>.
- Veth, Peter, Nicola Stern, Jo McDonald, Jane Balme, and Ian Davidson. 2011. The role of information exchange in the colonisation of Sahul. In *Information and its role in hunter-gatherer bands*, ed. Robert Whallon, E. William Lovis, and Robert Hitchcock, 203–220. Los Angeles: The Cotsen Institute of Archaeology Press of UCLA.
- Veth, Peter, Cecilia Myers, Pauline Heaney, and Sven Ouzman. 2016. Plants before farming: The deep history of plant-use and representation in the rock art of Australia's Kimberley region. *Quaternary International* 489: 26–45. <https://doi.org/10.1016/j.quaint.2016.08.036>.
- Veth, Peter, Kane Ditchfield, Mark Bateman, Sven Ouzman, Marine Benoit, Ana Paula Motta, Darrell Lewis, and Sam Harper. 2019. Minjiwarra: archaeological evidence of human occupation of Australia's northern Kimberley by 50,000 BP. *Australian Archaeology* 85 (2): 115–125. <https://doi.org/10.1080/03122417.2019.1650479>.
- Veth, Peter, Sam Harper, and Kane Ditchfield. 2021. The case for continuity in the Kimberley occupation and rock art. In *The Routledge companion to indigenous global history*, ed. Anne McGrath and Lynette Russell, 194–220. New York: Routledge. <https://doi.org/10.4324/9781315181929-10>.
- Veth, Peter, Jo McDonald, and Peter Hiscock. 2022. Beyond the Barriers: a new model for the settlement of Australian Deserts. In *The Oxford handbook of the archaeology of indigenous Australia and New Guinea*, ed. Ian McNiven and Bruno David. Oxford: Oxford University Press. <https://doi.org/10.1093/oxford/dhb/9780190095611.013.32>.
- Walsh, Grahame. 1994. *Bradshaws: Ancient rock paintings of North-west Australia*. Geneva: Limiteé.
- . 2000. *Bradshaw art of the Kimberley*. Brisbane: Takarakka Nowan Kas Publications.
- Welch, David. 2016. *From Bradshaw to Wandjina: Aboriginal paintings of the Kimberley region, Western Australia*. Coolalinga: Australian Aboriginal Cultural Series 12.
- Whallon, Robert. 2006. Social networks and information: non-“utilitarian” mobility among hunter-gatherers. *Journal of Anthropological Archaeology* 25 (2): 259–270. <https://doi.org/10.1016/j.jaa.2005.11.004>.
- White, Randall, Raphaëlle Bourrillon, and François Bon, eds. 2015. *Aurignacian genius: Art, technology and society of the First Modern Humans in Europe*. New York: New York University.
- Williams, Alan, Sean Ulm, Andrew Cook, Michelle Langley, and Mark Collard. 2013. Human refugia in Australia during the last glacial maximum and terminal Pleistocene: a geospatial analysis of the 25-12 ka Australian archaeological record. *Journal of Archaeological Science* 40 (12): 4612–4625. <https://doi.org/10.1016/j.jas.2013.06.015>.
- Williams, Alan, Sean Ulm, Tom Sapienza, Stephen Lewis, and Chris Turney. 2018. Sea-level change and demography during the last glacial termination and early Holocene across the Australian continent. *Quaternary Science Reviews* 182: 144–154. <https://doi.org/10.1016/j.quascirev.2017.11.030>.
- Wobst, H. Martin. 1977. Stylistic behavior and information exchange. In *For the director: Research essays in Honor of James B. Griffin*, ed. Charles E. Cleland, 317–342. Ann Arbor: University of Michigan.
- Wood, Rachel, Zenobia Jacobs, Dorcas Vannieuwenhuysse, Jane Balme, Sue O'Connor, and Rose Whitau. 2016. Towards an accurate and precise chronology for the colonization of Australia: The example of Riwi, Kimberley, Western Australia. *PLoS One* 11 (9): e0160123. <https://doi.org/10.1371/journal.pone.0160123>.
- Wygal, Bran, and Stephan Heidenreich. 2014. Deglaciation and human colonization of Northern Europe. *Journal of World Prehistory* 27: 111–144. <https://doi.org/10.1007/s10963-014-9075-z>.

**Peter Veth** trained in archaeology and anthropology at UWA completing his PhD on the Martu of the Western Desert in 1990. The resulting 1993 monograph *Islands in the Interior* was the first Australian doctoral project to be published internationally. He has carried out ARC-funded research on archaeology and heritage projects across Australia, working with many Aboriginal and Torres Strait Islander communities. He has been an expert witness for native title cases in the federal court, covering claims in Western Australia, South Australia, and New South Wales. He was made a Fellow of the Australian Academy of Humanities in 2005 and awarded the Rhys Jones Medal for outstanding contributions to Australian Archaeology in 2014. He was the inaugural Kimberley Rock Art Chair (2012–2018) and an ARC Discovery Outstanding Research Fellow (2013–2015). He currently holds an ARC Laureate Chair leading the Desert People project and is a Chief Investigator on the Centre of Excellence for Indigenous and Environmental Histories and Futures (2024–2030). He lives in Fremantle port city, enjoys bush walking and diving, and would like to spend more time playing music.

**Sam Harper** is an archaeologist and rock art specialist, who completed her PhD in engraved rock art from Marapikurrinya (Port Hedland), on the coastal Pilbara, NW Australia, in 2018. She has worked in cultural heritage management and academic roles, working as a project manager and research fellow on successive Australian Research Council Linkage Projects across the northwest: Kimberley Visions, Dating Murujuga's Rock Art, and From the Desert to the Sea. She has worked with communities in these roles to focus on two-way research programs with knowledge, heritage management, and capacity building outcomes. Sam has research interests around rock art and identity, style, material culture, and cross-cultural interactions with arid-zone marking systems, from the coastal Pilbara and northern Kimberley, into the desert.

**Martin Porr** is an associate professor of Archaeology and a member of the Centre for Rock Art Research + Management at the University of Western Australia (UWA). He is an associate investigator of the Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage, Monash University (Monash Indigenous Studies Centre) and an associate researcher at the Frobenius Institute for Research in Cultural Anthropology, *Goethe-Universität Frankfurt am Main*, Germany. He has published widely on Palaeolithic art and

archaeology as well as general theoretical aspects of archaeological and rock art research. His research has so far focussed on aspects related to the Palaeolithic art of Europe, Australian rock art, and postcolonial/decolonial critiques of human evolution. He has conducted fieldwork in Germany, Thailand, Australia, India, and the Philippines. Between August 2015 and October 2017, he was based at the *Institut für Ur- und Frühgeschichte at the Universität Tübingen* (Germany) as a Senior Alexander von Humboldt Research Fellow.

**Open Access** This chapter is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

