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## NATURALISTIC ANIMALS AND HAND STENCILS IN THE ROCK ART OF XINJIANG UYGHUR AUTONOMOUS REGION, NORTHWEST CHINA

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**Abstract.** Rare rock paintings and hand stencils from northwest China's northern Xinjiang Uyghur Autonomous Region, thought to possibly date to the Pleistocene, are described and analysed in terms of subject matter, possible age, relationship to other forms of rock art and location. We highlight three sites in particular that have a range of naturalistic animal and some human-like depictions, near the city of Altay (also known as Aletai, Altai). What have been interpreted as the earliest depictions of people on skis focus discussion, along with the potential age of the rock art. Direct dating was not possible but it is concluded from indirect methods that the naturalistic-looking animal and human paintings, and the stencils, were most likely made between 4000 to 5250 years ago. The contemporary significance of the rock art imagery and sites is reviewed along with aspects of conservation and management. It is concluded that there are many reasons some of the imagery appears to us to resemble naturalistic depictions at sites in Europe, other areas of China, the larger Altay region and Southeast Asia. These include aspects of hunter-gatherer lifestyle that depends on animals for survival, a shared human visual brain and our own forms of seeing and interpreting. Thus we caution that what to us appears as a 'naturalistic style' should not be used as evidence of a particular age or direct relatedness between dispersed cultural groups.

### Introduction

The rock art of China has been observed and recorded to various degrees for over 1500 years. The earliest literal record of rock art is the historic book entitled *Shui Jing Zhu*, which was written by Li Daoyuan (470–527 CE) in the 5th century. He recorded petroglyphs in Inner Mongolia at that time (Tang 2014) but it was not until the 1980s and early 1990s that widespread discoveries were made across China and rock art was considered important to document scientifically. During this period of the later 20th century it was found that China has thousands of sites throughout the country. Rock art sites were no longer studied in isolation and style regions began to be defined. One of the results of this intensified research was that it was found that pictograms and petroglyphs have very different distributions, the latter more often located in the north and east and the former most frequently in the south and west of the country (see distribution map in Zhang 2014b: 88). It was also discovered that hand stencils are rare compared to Australia and western Europe but they have been found at a few locations.

Rock art research began to accelerate in the late 1990s and early 2000s with many significant books and journal publications by Chinese scholars. Since 2008

rock art has been intensively researched by teams of Chinese and international scholars (Zhang 2014b: 87; Tang et al. 2014, in press; Taçon and Yang in press). This is resulting in further discoveries as well as sites being revisited for intensive recording, dating, significance assessment and conservation (Taçon et al. 2012; Taçon and Yang in press).

In this paper we profile little-known pictogram sites in the far north of China's Xinjiang Uyghur Autonomous Region, near the Mongolian, Russian and Kazakhstan borders (Fig. 1). Field research was undertaken in June 2015 (see Bednarik 2015a). The purpose of the trip was to record ten little known rock painting sites in the north of Xinjiang, to assess the sites for rock art dating and to provide advice on conservation and management. Paintings proposed to be reminiscent of Franco-Cantabrian rock paintings of Western Europe were a focus and the possibility they could be of similar age tested. Although it was concluded that the oldest surviving north Xinjiang pictograms are less than 5250 years of age they are nevertheless a very important source of information about past landscape use, the contemporary significance of rock art sites, rock art conservation and debates about the use of stylistic analysis and neuroscience for interpretation in rock



**Figure 1.** Map of northern Xinjiang with Altay (Aletai) and rock art site complexes indicated.

art research.

This paper is one of the first detailed studies of pictograms in the Chinese Altai region and will be of use to Russian, European and American research teams working in Mongolia, Kazakhstan and Russia at both pictogram and petroglyph sites. It is beyond the scope of this paper to undertake detailed stylistic, subject matter and landscape context comparisons with the rock art of these neighbouring countries, the subject of future research. However, there are important similarities to mention, some of which are noted below. There also is a vast and growing literature on the rock art of the Altai region outside China and readers are directed especially to two lavishly illustrated recent volumes that provide comprehensive overviews of important aspects of Altai rock art in Russia (see Devlet and Jang 2014) and Mongolia (see Jacobson-Tepfer 2015).

### Xinjiang pictogram sites

The Altay mountain system runs through Kazakhstan, Russia, China and Mongolia and is well known for petroglyph sites in all four countries. The Chinese Altai runs about 800 km from Xinjiang's northern border with Russia and Kazakhstan to Mongolia, with a width of

80–150 km and an average altitude of about 3000 metres (Wang 2005: 16), and is connected to the Altay belt in Mongolia by what is known as the southern Altiid orogen (Xiao et al. 2004: 339). The Chinese Altai and the southern Altiid orogen are 'mainly composed of variably deformed and metamorphosed sedimentary rocks, volcanic rocks and granitic intrusions' (Cai et al. 2011: 1620). The mountain geography supports seasonal shifts for grazing, with a range of pasture zones. Rock painting sites are usually located in small shelters of granitic landscapes but occasionally in gneiss and schists as evidenced by inspection and geological distribution maps (e.g. Xiao et al. 2004: 340).

The archaeology and history of the region indicates that the Altay mountain system and adjacent parts of Xinjiang have long been a crossroads with much cultural interaction for thousands of years (e.g. see Baumer 2012; Gladney 2005; Jia and Betts 2010; Mei and Shell 1999: 571). Rock art was first rediscovered in Xinjiang in the 1920s. Xinjiang is considered 'the most complicated region in China as far as rock art is concerned, since the ages and ethnic affiliations of the art are difficult to determine' (Chen 2001: 764). Most of the sites are open-air petroglyphs (Zhao 1987) with some similar in style and subject matter to petroglyphs in Siberia (e.g. Devlet and Jang 2014; Plets et al. 2012), Mongolia (e.g. see Jacobson-Tepfer 2012, 2013, 2015; Kubarev 2007) and even central Asia (Rozwadowski and Lymer 2012).

In northern Xinjiang, there are two main concentrations of pictogram sites with naturalistic depictions of animals, both near the city of Altay. At these locations there are a few small granitic rockshelters adorned with paintings and sometimes stencils. Dundebulake, one of the most impressive sites with two main phases of painting, about 50 km southeast of Altay, is a surprisingly small shelter with a low ceiling. Several dozen paintings lie on an inner wall and part of the ceiling. There are a couple of small sites a few kilometres south. The other concentration, the Duogart site complex, is northwest of Altay in Habahe (Kaba) County, where seven small rockshelters cluster in a creek-lined lush valley between low hills. Two other clusters of pictogram sites are found in northern Xinjiang but they mostly have geometric designs (Wang 2005). One of these, Tanblatas (also known as Tangbaletas), was also visited for comparative purposes. Besides geometric designs, there are also a few red stick figures in the smaller of the two rockshelters with paintings. All sites were recorded with 2D digital cameras and some 3D recording (by PT) also took place at the main sites discussed below.

### Dundebulake (also known as Dundebulak, Dundebulaq)

#### Main shelter

Discovered by Wang Bo in January 2006, this site is located about 50 km southeast of Altay but it takes about 90 minutes to reach it, mostly on gravel roads. The name 'Dundebulake' means 'Middle Spring'. Until now it had not been fully analysed or published, with only

very brief description and a couple of images in a regional archaeology paper (Hu 2012) or interpretations of select figures in occasional Chinese articles (e.g. Wang 2009). The site is considered important by local archaeologists for a number of reasons but especially because of depictions of human figures on what have been interpreted as skis (Wang 2009; Zhaojian and Wang 2011; see discussion below).

The shelter (Fig. 2) is 5.49 m long, 1.6 m deep and 1.28 m high. There is a panel of paintings 2.98 m long by 1 metre high. The shelter's opening and most of the painted panel faces south, at 185°. There were at least two main phases of painting at Dunde Bulake as is indicated by both superimposition and preservation. The earliest consists of paintings of animals and humans in a naturalistic manner. They generally have a light purple colour. The pigment was not sampled for analysis but appears to be an ochre and likely haematite-based. It is thin and survives as a stain on the rock surface.

There are 35 purple paintings, 13 human-like and 22 animal forms. All are silhouettes. The human-like figures are all in profile with a row of 10 human figures at the top of the wall panel standing on what look like skis (Fig. 3). Two appear to carry a pole and all have hunched backs as if carrying a backpack. All face right. They range in height from 6–13 cm and 2–5 cm in width. Near the left side of the panel there is a group of three human-like figures with hunched backs. The first two are depicted as if standing on a ski or sled (Fig. 4). The third, in front of the other two, holds a large bow-like object. All are about 12 cm in height and 2 cm in width.

All the animals also are in profile facing right (Fig. 5). Many have species-specific anatomical features, such as distinctive tails, head shapes, and so forth that help with species identification. Most appear to be depictions of wild yaks (9) but there also are 2 'moose/elk', a 'horse', 2 'bulls' and 8 quadrupeds that could not be classified. One of the 'yaks' (22 cm wide by 28 cm high; Fig. 6) has prominent curved horns and a typical bushy and roughly triangular tail. The largest 'moose' (Fig. 7) has a very prominent moose-like snout and is 22 cm wide by



**Figure 2.** Dunde Bulake rockshelter with protected entrance and recently placed white scarves and Tibetan flags across the front and over the top.



**Figure 3.** Near the top of the Dunde Bulake painted panel there is a row of ten human figures that appear to be on skis. Some hold a single 'pole' and most look as if carrying backpacks.



**Figure 4.** The left side of Dunde Bulake has three human figures (centre), two of which are standing on a ski or sled-like object. The third carries a 'bow'. In the upper right a painting of an 'aurochs' with long horns can be seen.



Figure 5. The main concentration of Dundee Bulake animals with 'leaping yak' at the far right.



Figure 6. Dundee Bulake central 'yak' with triangular bushy tail and curved horns.



Figure 7. One of two 'moose/elk' depictions at Dundee Bulake.

21 cm high. The largest animal, at the far left of the painted panel, is a 'bull' with two long forward pointing horns (Fig. 4). It measures 64 cm wide by 35 cm high. The next largest is what looks like a leaping yak that is 42 cm wide and 31 cm high. The 'horse' (Fig. 8) is one of the smallest animal paintings at 17 cm wide by 12 cm high.

Xinjiang fauna distribution studies indicate the yaks are most likely depictions of *Bos mutus* (Gao et al. 2011; see Leslie and Schaller 2009: Fig. 1 and compare to Fig. 6 here), the horse is *P. przewalski* (Gao et al. 2011; Huang et al. 2007), the moose is *Alces alces* (Huang et al. 2007) and the bull is either *Bos primigenius* (aurochs) (Pushkina 2007 indicates the Altay region as a key spot for aurochs in the Pleistocene and Holocene; also see below) or a very early domesticate.

There is a certain amount of dynamism about the animal paintings, with most having a front leg and foot that faces backward rather than forward, suggestive of 'galloping'. Yaks are depicted both leaping and running and the impression one gets from the panel in its entirety is a scene of wild animals moving across the nearby steppe with hunters behind and to one side.

Some Dundee Bulake animal paintings have the remains of a dark, broad outline with body infill lighter in colour. Many of the Dundee Bulake purple animal paintings look as if their colour has changed on the edges or in the middle of the paintings over time. This is because some have partially pink-red ears (e.g. the largest 'moose', Fig. 7), feet and so forth. This could be due to weathering/taphonomy, the paint recipe and/or the way the paint was applied. However, in the Kimberley region of northern Australia purple (or mulberry) paintings were found to have not resulted from taphonomic change but rather from the use of two naturally occurring pigments, jarosite or haematite (Huntley et al. 2013). Close examination of the Dundee Bulake paintings reveals that what most likely occurred is that some animals originally were outlined and partially painted in pink-red and later were fleshed out with purple, while other animals were added to the panel

solely in purple. For instance, the hind quarters of the 'horse' and its 'mane' clearly were first made with pink-red and then purple was applied (see Fig. 8). This is important because it illustrates the panel of animals was made in a well thought out manner, not only in terms of placement of particular images but also technique, with some initial painting in pink-red before purple was applied.

The most recent phase of rock painting at Dunde Bulake consists of at least 60 red geometric designs: dots, crosses, 'x's, ovals, parallel lines. There also is a red stick figure portrayed facing the viewer with its right hand on its hip and the left outstretched and pointing left. It was placed as if standing on the back of an older purple yak painting. All of these designs have a sporadic appearance and lines look as if they were made quickly, the pigment not fully applied so that it sits on the rock surface rather than penetrating it (unlike the purple paintings described above). This could be due to the physical properties of the paint rather than application, but either way it suggests these paintings are younger than the purple ones. Furthermore, these designs consistently overlie the purple animal and human paintings in every instance of superimposition. None of the paintings of this phase show colour change or repainting as with the naturalistic images but some red lines were painted over some of the upper human figures of the earlier phase.

#### *Shelter with bovid and cervid pierced with 'arrows'*

About 5 km southwest of Dunde Bulake is a small oval shelter with at least 5 basic red human-like stick figures, a partial outline cow-like animal, 2 barred ovals and a few other faint geometric designs. Although faded, the art resembles recent paintings at Dunde Bulake and Tangbaletas (see Wang 2005) and is part of a recent phase of painting across the region.

A few hundred metres away there is another small painted shelter, 4.66 m long, 3.06 m deep and 1.14 m high. This site has two overlapping outline animal paintings in profile on a side wall, with the panel facing NNE at 21°. Both animals are finely executed images in



Figure 8. The painting of a 'horse' at Dunde Bulake resembles a *P. przewalski* horse.



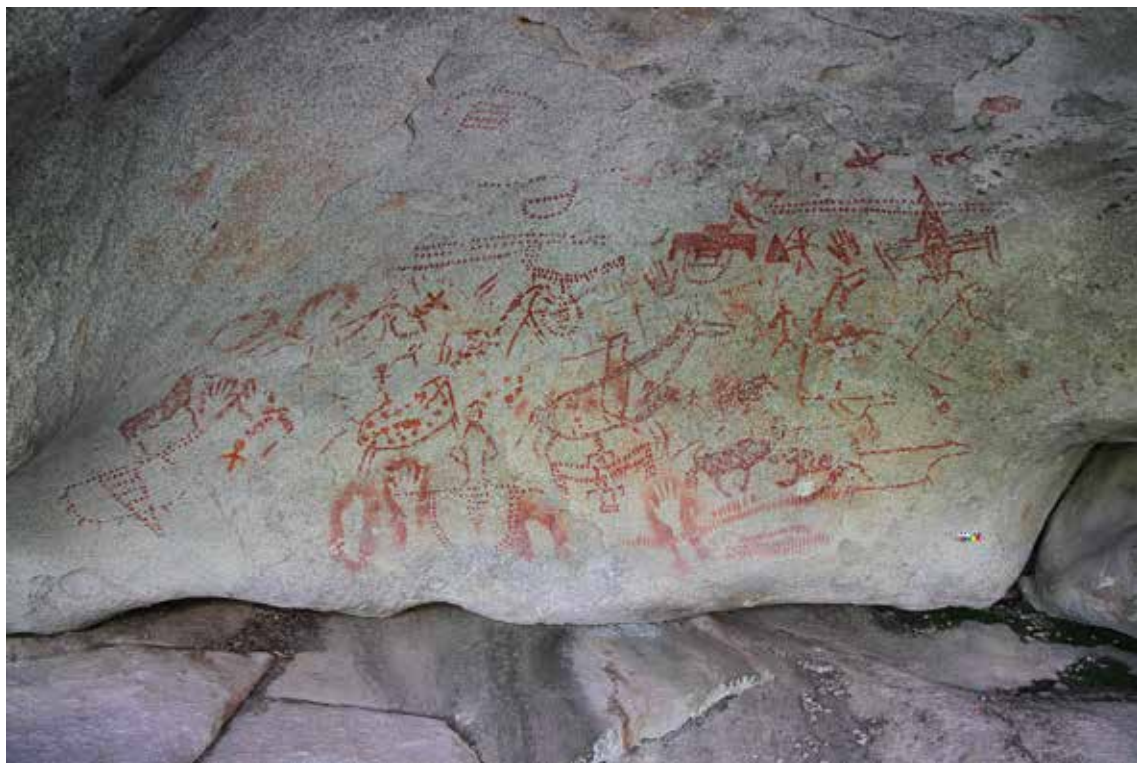
Figure 9. A painting of a bovid and a cervid with 'arrows' protruding from their bodies at a small site near Dunde Bulake.

red and very naturalistic in appearance (Fig. 9). There is a bovid and a cervid, both with 'spears' protruding from their bodies. Red lines were painted on either side of the animals, framing the composition. The painted panel measures 79 cm wide by 27 cm high. The bovid is 33 cm wide by 22 cm high, including the spear. It is most likely a depiction of *Bos primigenius* (aurochs) or early domesticate (see above), possibly an early *Bos taurus* (but see below). The cervid is 29 cm wide by 21 cm high. It most likely is a depiction of *Cervus elaphus* (red deer), the only large cervid of the region and the only one with such extensive antlers (Gao et al. 2011; Huang et al. 2007).

The painted panel is very well protected from the elements. These images look more like Franco-Cantabrian rock paintings than any others in northern Xinjiang but, importantly, they also are similar to some of the red outline paintings in Khoit Tsenkher cave, Mongolia (as in Mongolian Ministry of Enlightenment



*Figure 10. The largest Duogart painted rockshelter with entrance protected by locked gate and metal fence and grill.*



*Figure 11. The Duogart main panel with several phases and episodes of painting.*

& UNSECO1996: 16–17; Okladnikov 1972), Aral Tolgoi petroglyphs (e.g. see Kubarev 2007) and Jinsha River rock paintings of northwest Yunnan Province, China (e.g. see Deng 2004; Taçon et al. 2010b, 2012).

#### **Duogart (also known as Duogarte and Dugat)**

The site complex is located northeast of the city of

Kaba, about 10 km south of the Kazakhstan border. Discovered in 1965 by Wang Binghua (Wang 2005: 16), the site complex consists of seven rockshelters with paintings and stencils. As the Duogart complex has been summarised by Wang (2005: 18–19) we focus on a new analysis of the main shelter.

The largest shelter (Fig. 10) is half way up a small

granite scree slope and faces northeast at 37°. The main part of the shelter is 5.9 m wide by 2.53 m high by 3.9 m deep. The entire shelter is 8.6 m wide and there is another 1.98 m to the northwest where a small painted panel (46 cm wide × 20 cm high) is located, facing southeast at 146°. A large painted panel (Fig. 11) measures 3.9 m wide by 1.53 m high to the domed ceiling and then runs another 2.37 m across the ceiling to near the dripline and entrance. Part of the left wall near the ceiling also has some paintings and stencils.

On-site superimposition analysis revealed this shelter has at least 5 phases of painting. From earliest to most recent they are (1) stencils, (2) solid animals, (3) outline animals, (4) rows of short vertical red lines and (5) dot and other geometric designs plus stick figures, 2 painted hands (not prints) etc. (1–3 internal painting events). A dark red 'boat' in the small panel may have resulted from a separate painting event. We focus primarily on the first two phases in this paper because of their older appearance and stylistic similarity between the second phase and the purple paintings of Dundee Bulake.

Seventeen stencils are found on the right side of the main painted panel, in the middle and across the bottom (Fig. 11). At the top right hand side there are 5 very faint open hand stencils (3 right, 1 left, 1 partial). Below them are 4 open hand stencils in pairs (2 right, right and left) that are darker in colour and more visible. In the middle of the panel there are 2 very faint hand stencils (1 right, 1 partial) partly superimposed by various more recent paintings and two partial small open hand stencils near the right end of the panel. Those two are of child size. Along the bottom of the panel there are two open hand-and-arm stencils (both right), two clenched fist stencils, one of which appears to have been made palm-down and the other with the back of the hand against the wall (Fig.



Figure 12. Three of the Duogart lower stencils including clenched fist stencils.



Figure 13. Duogart 'yak' and 'tiger'. The 'yak' is portrayed in the same manner as Dundee Bulake, with triangular bushy tail and front foot curved back. The tiger-like animal appears to be confronting the 'yak'.

12). There may once have been more hand stencils as evidenced by small patches of sprayed ochre paint. And a solitary open hand stencil was placed in the middle of a small shelter on the scree slope about 10 m below the main shelter.

There are 3 solid dark red animals similar in style to those of Dundee Bulake. These consist of a yak with triangular tail and front leg curved back facing right, a tiger-like image facing left as if 'confronting' the yak (Fig. 13) and a possible yak above the first one, facing right. One of the hand-and-arm stencils is partially under the first yak (Fig. 14).



Figure 14. One of the Duogart hand-and-arm stencils is partly under the 'yak' and other paintings.

### The age of north Xinjiang rock paintings and stencils

Since the first discovery of rock paintings in northern Xinjiang it has been argued that much of this art is Palaeolithic in origin and over 10 000 years of age (Hu 2012; Wang 2005; Wang 2009; Zhaojian and Wang 2011). This is a proposition we wished to test. However, no mineral crusts were observed over the Xinjiang pictograms that could be sampled for radiocarbon, Uranium-series or other forms of dating. But at Dundee Bulake and nearby sites a yellowish crust with amorphous silica and oxalates underlies all of the rock paintings and appears up to 10 mm thick on the floor immediately below the painted panel. The identification of the mineral skins is based on our observations and experiences and not on chemical or physical analysis (see also Bednarik 2015a, 2015b).

Although their processes of formation are not fully understood (Aubert 2012) it is generally believed that oxalate crusts in rockshelters usually form under moist and dusty conditions (Watchman 1990a: 48). As Watchman et al. (2004: 370) note:

In damp, shaded micro-environments oxalic acid is produced from the oxaloacetate cycle of algae, bacteria, and fungi, and from lichen during metabolic processes, and this reacts with gypsum in dust to form oxalate salts. These carbon-bearing minerals build up over time in laminated crusts where overhanging ledges protect the stable surfaces from direct sunlight and rain.

Amorphous silica skins also form under aqueous solutions whereby the silica is derived from the natural aqueous weathering of siliceous minerals and amorphous silica cement in rocks above seepage areas (Watchman 1990b). As Watchman (1990c: 30) concludes,

'Water is fundamental to the development of silica skins. The thickest silica skins form where water containing low concentration of silica, flows regularly and perhaps continuously, and where exfoliation and micro-erosion of the skin do not occur.'

The Dundee Bulake shelter's painted panel and floor are well shaded and the shelter is an ideal site for oxalate crust and amorphous silica skin production during wet climatic periods. A dry climate dominates the Altay region of Xinjiang today. The oxalate crust and amorphous silica skin would have formed

during the last wet period. As all of the rock paintings are over the crust and skin, they must be younger than the end of the most recent wet climate phase.

Climatic records for northern Xinjiang have been reconstructed from environmental proxy data in lake sediments and instrumental records (Long et al. 2011) as well as from ostracod species assemblages and stable isotopes (Jiang et al. 2008). Lake sediments showed that in northern Xinjiang 'the climate was dry in the early Holocene, warm and wet in early Mid-Holocene and dry in the late' (Long et al. 2011: 6). However, Long et al. (2011) also conclude that climatic fluctuation during the Holocene varied across Xinjiang. At Ulungur Lake, the closest large lake near Dundee Bulake (about 90 km southwest), an analysis of ostracod species assemblages and stable isotopes gave more precise results for the Altay region. Three palaeoclimatic and paleoenvironmental phases were identified, the wettest between 9985 – 5250 years cal BP. The period of 5250 – 1255 cal BP was found to be the driest phase. Since about 1255 years ago the climate has undergone a medium phase (Jiang et al. 2008: 38).

We suggest that the oxalate crust and amorphous silica skins at Dundee Bulake formed during the wet phase that ended about 5250 years ago. This is the *terminus post quem* for the paintings; in other words, they are less than this age. This maximum age precludes the rock paintings being contemporaries of Pleistocene Franco-Cantabrian rock art and means the possible depictions of human figures on skins are much younger than previously thought (see discussion below). Bednarik (2015a, 2015b: 58) suggests they may even younger, no more than 3000 years of age.

The geometric and stick figure phase of painting, as seen at Tangbelatas, Dundee Bulake and a nearby



small shelter, as well as Duogart, is most typical of Bronze Age peoples, as well as other agriculturalists elsewhere in China and beyond. Importantly, the designs also are consistent with geometric red ochre paintings that line stone coffins dated to about 4000 years ago at Tuoganba (Fig. 15; see Zhang 2005), in Burqin County, a half hour drive northeast of Kaba. Numerous excavations of cemeteries have shown that the Bronze Age began in the Altay region and other parts of Xinjiang about 4000 years ago (Jia and Betts 2010). In and around Altay it was associated with

Qiemu'erqieke (Ke'ermuqi) culture (Baumer 2012: 212; Jia and Betts 2010; Mei and Shell 1999: 571). We thus conclude the geometric body of rock art is no more than 4000 years of age; some of it is probably very recent, less than 100 years old given preservation and subject matter that includes things that look like a boat and aircraft (see Bednarik 2015a: 59 and his Fig. 5).

All of the animals depicted are extant in the larger region except for the aurochs, if that is what was depicted. The aurochs was once plentiful in the greater Altay region and nearby Russia and Kazakhstan (Puskin 2007: 233–235). The first domestic cattle (*Bos taurus*) were introduced to northern Xinjiang about 4000 years ago (Cai et al. 2014; Yuan et al. 2008; Yue et al. 2014). Thus, following on from our argument above, we conclude it more likely that *Bos primigenius* (aurochs) was depicted at Dundu Bulake and the small site nearby rather than *Bos taurus* but that at Duogart the outline paintings of cattle that overlie the first two art phases of stencils and solid infill naturalistic animals (Figs 11 and 13) are *Bos taurus*.

Based on all of the above, we suggest that the naturalistic animal and human paintings at Dundu Bulake and the small site nearby, as well as three naturalistic animal paintings and hand stencils at Duogart, probably date to between about 5250 and 4000 years ago, the crusts/skins at sites providing a maximum age and the Bronze Age transformation of the region about 4000 years ago providing a reasonable minimum. Petroglyphs in Mongolia close to Altay that resemble some of the Dundu Bulake paintings, as well as the deer and bovid in the nearby small shelter, are argued to be pre-Bronze Age using various criteria by Jacobson-Tepfer (2013; see also Kubarev 2007; Novgorodova



Figure 15. Geometric red ochre paintings lining stone coffin dated to about 4000 years ago at Tuoganba, in Burqin County, northeast of Kaba.

1984), supporting our argument. Furthermore, the petroglyphs of 'Kalgutinsky Rudnik' in Russia just to the north of the Chinese Altai also resemble some Dundu Bulake animal paintings but, although in profile, they are static rather than dynamic like the Chinese paintings. The petroglyphs are also very large. Russian scholars argue the 'Kalgutinsky Rudnik' petroglyphs are late Palaeolithic but there are no depictions of extinct animals (see Devlet and Jang 2014: 19–22). Of course, rock art dating is one of the biggest challenges in rock art research, especially when there is nothing to sample for radiocarbon or uranium-series dating, but when a number of different lines of evidence can be 'cabled together', a strong hypothesis of probable age like this one can be developed (Chippindale and Taçon 1998).

### Contemporary significance

Dundu Bulake is a great source of national pride for many people in Xinjiang and elsewhere in China because it is believed the paintings of human figures on what appear to be skis support the contention that the Altay region of China is the origin of skiing (Wang 2009; Zhaojian and Wang 2011). For others, the animal paintings are important because of a resemblance to early European rock art. The shelter itself is sacred to people who practice a form of Tibetan Buddhism, as evidenced by the recent placement of white scarves and Tibetan flags across the front and over the top of the protective metal cage that prevents unauthorised access inside the rockshelter (Fig. 2). And in 2014 a new stone plaque was placed in front of the shelter by the local government, reaffirming its importance as a national archaeological site.

The Dundu Bulake representations are rare and

important because they are the only early rock paintings of what appear to be human figures on skis. Petroglyph sites with depictions of human figures on what are believed to be skis are more common and are found in Norway (Alta and Rødøy), Sweden (Böksta), Russia (Zalavruga and Kola Peninsula), Mongolia (Baga Oigor Gol and Sogoo Gol) and Xinjiang, China (Taher Tubek in Buerjin County) (for a review see Helskog 2013). Attempts to date these sites have relied on the relationship of the petroglyphs to nearby and covering archaeological deposits dated with radiocarbon and correlation of the engraved rock's elevation with sea-level fluctuation records that indicate when engraved rock near coastlines that now has petroglyphs was accessible for image-making. This suggests the Zalavruga petroglyphs of several figures on skis with poles, ski tracks and pole marks may be the oldest known from anywhere, at least 5000 years of age (Janik et al. 2007). Until now it was argued the Dundee Bulake skiers were the oldest in the world and that this proved the origin of skiing lies in the Altay region (Wang 2009; Zhaojian and Wang 2011). This is a contemporary source of great pride for many people in China, especially in northern Xinjiang. However, our analysis suggests it is more likely that the Dundee Bulake images are about the same age as Russian and Scandinavian petroglyphs showing skiing or a bit younger. Thus the debate about the origin of skiing cannot be resolved and it may well be that the practice spread quickly across a region encompassing northern Scandinavia, Russia, northern Xinjiang and Mongolia about 5000 years ago. It also is possible that the practice was invented independently in northern Scandinavia/northeast Russia and northern Xinjiang/western Mongolia about the same time. Significantly, the Dundee Bulake painted human figures closely resemble petroglyphs of human figures in profile of the Russian Altai. One Russian petroglyph from Kalbak-Tash even appears to show a human figure on skis, holding a pole and wearing a bag on its back like many of the human figures at Dundee Bulake (see Devlet and Jang 2014: 102, Fig. 151; human figure 3 in row 4; Kubarev 2007: 114, Fig. 6-34).

Another rare and important image at Dundee Bulake is the probable painting of a *P. przewalski* horse. Although wild horses are common in early European rock art (e.g. a recent study analysed over 900, see Pigeaud 2007) they are rare in China, with only a few in the Jinsha River area where naturalistic animal paintings are also found. There are also some clear examples in the Tsagaan Salaa/Baga Oigor complex of the Mongolian Altay (Jacobson 2000) and at Aral Tolgoi (Kubarev 2007: 121, Fig. 21) but they are petroglyphs. The only other examples of horse-like paintings in northern Xinjiang are three paintings in the Duogart complex but they do not look like a *P. przewalski* horse, instead resembling larger domestic horses. As the *P. przewalski* horse is today rare, and those that remain form one of the last remaining wild species of horse, the Dundee Bulake horse painting is a poignant reminder

of an East Asian ancestral link to what were once large herds of wild horses.

As with wild species of animals, today rock art globally is threatened by an increasing range of human and environmental destructive forces (Agnew et al. 2015; Darvill and Fernandes 2014). Only recently have threats to China's rock art (Zhang 2014a) and that of the Siberian Altay region received much attention (Plets et al. 2012). Fortunately, northern Xinjiang rock painting sites are currently well looked after with guardians from local communities hired by government to protect sites from unwanted visitation and government signage in various languages at some sites detailing their importance as heritage places.

The largest and most important sites have had their entrances fenced off with lockable gates. Smaller sites are not afforded this sort of protection but fortunately graffiti is minimal and nearby local communities currently both respect and monitor their rock art heritage. However, regular monitoring by archaeologists and rock art experts would also be desirable, especially to see if climate fluctuation, weathering, development and previous conservation measures are impacting on the rock paintings in new and damaging ways. For instance, both natural and artificial driplines can change with time in rockshelters, diverting water over rock art in new ways that can quickly damage paintings and stencils. Water damage and fading can also occur when water is thrown over pictograms to enhance the images for photography. This practice, once common in many parts of the world, needs to be eradicated through education so that it ceases in Xinjiang and elsewhere.

Furthermore, conservation interventions should only be undertaken as a last resort and by conservation scientists. Not only is special training needed for rock art conservation but also strict adherence to conservation ethics and fundamental principles such as pre-intervention conservation studies (see for example Agnew et al. 2015). In this regard, no sites were sampled for pigment and crust analysis by us and if this is done in future then it should be supervised by a specialist rock art conservator. The nature of our visit to the sites also did not allow for detailed 3D, near-ultraviolet and near-infrared recording, or XRD or FTIR identifications, but this is something that would be useful for more detailed documentation and analysis in the future.

### Naturalistic animals, hand stencils and style

As Taçon et al. (2014) have noted, what appear to us to be stylistically naturalistic rock paintings of animals were made at different times by a wide range of related and unrelated peoples, as were hand stencils. Although Aubert et al. (2014) have demonstrated that in Sulawesi some naturalistic animal paintings and hand stencils are among the earliest surviving pictograms from anywhere in the world (over 40 000 years of age), and Europe has much Pleistocene rock art including naturalistic animals and hand stencils alongside non-

iconic forms, we should not assume all such depictions are Pleistocene or that there are direct connections between geographically and temporally distant peoples who made them (see also Bednarik 1995; Taçon et al. 2010a, 2010b). The north Xinjiang paintings are another good example of this as our analysis suggests they are less than 5250 years of age.

For instance, the naturalistic animal and human rock paintings of Dundee Bulake, the small site nearby and Duogart are reminiscent of some Franco-Cantabrian rock art as well as naturalistic iconic rock paintings in the Jinsha River region of northwest Yunnan Province in southwest China. In the Jinsha River both outline and silhouette animal paintings are found, some associated with small human figures in profile as at Dundee Bulake. Many of the Jinsha River animal paintings resemble Franco-Cantabrian rock paintings but although maximum ages have not yet been obtained it was concluded there was no direct connection between Jinsha River artists and those of Pleistocene Europe and that much Jinsha River rock art is Holocene (Taçon et al. 2010b, 2012). As with northwest Yunnan Province, north Xinjiang rock painting sites are close to permanent water sources and we argue here that they also are Holocene. Whether there once was a connection between Jinsha River and north Xinjiang artists is unlikely but worthy of investigation once rock art has been more fully dated in each region.

But the Dundee Bulake paintings are most probably part of a local tradition. Future research should focus on their possible relationship to nearby Russian, Kazakhstan and Mongolian petroglyph sites that have early depictions of naturalistic animals. For instance, detailed comparisons between the Chinese Altay rock art, both pictograms and petroglyphs, and that found at Kalbak Tash to the north in Russia (see Devlet and Jang 2014: 38–58) as well as the rock art of various sites in Mongolia, such as Aral Tolgoi (e.g. see Kubarev 2007) and Khoit Tsenkir (e.g. see Okladnikov 1972) would be particularly worthwhile. This is because already it can be said that the bovid and cervid depicted at the Dundee Bulake small site are strikingly similar to what are argued to be the oldest rock art depictions of these creatures at these sites. For instance, the small shelter paintings and some of the petroglyphs at Aral Tolgoi both have infilled heads and necks but most of the rest of their bodies were not painted or engraved (compare Fig. 9 to Kubarev 2007: Figs 7–9). On the other hand, the main Dundee Bulake paintings have some unique features, such as the way animal legs are shown. They are also fully infilled and their style is different to that of the paintings in the small shelter and Altai region petroglyphs, with Bednarik (2015b: 57) concluding 'their style does not resemble a Franco-Cantabrian style'.

Some researchers have argued that aspects of neuroscience can help explain the common occurrence of naturalistic animal imagery in outline and silhouette form across time and space (e.g. Halverson 1992;

Hodgson 2012; Hodgson and Watson 2015; Watson 2009 etc.). For instance, a shared anatomically and behaviourally modern human visual brain will account for some of the image similarity, along with modern human eye-hand coordination. We argue that a hunter-gatherer lifestyle, reliant on keen observation of animals for survival, also accounts for some of the similarity we detect in old rock art of different regions (but, of course, in many parts of the world hunter-gatherers also made non-iconic rock art). Furthermore, our own forms of seeing and interpreting affect the way we view relationships between what to us appear apparently similar rock art 'styles'. Thus the naturalistic manner of depicting animals (i.e. silhouette and outline, proportionally correct, faithful renditions with species-specific anatomical features) and the making of hand stencils should not be considered a shared cultural tradition that links widely separated peoples in time and space but rather a practice that some people engaged in different parts of the world for probably a range of reasons. In this regard a perceived 'naturalistic style' by researchers should not be used as evidence of Pleistocene age or direct relatedness between dispersed cultural groups across the world (see also Taçon et al. 2014). The age of such rock art needs to be determined in other, more rigorous ways.

The rise of agriculture heralded major changes to rock art imagery in many parts of the world, with greater stylisation, abstraction, variation and simplification, as well as new subject matter (e.g. carts pulled by animals). This is because agriculture led to population increases as well as life-style changes which, in turn, led to new relationships with landscapes and new ways of, and motivations for, signalling within landscapes. But in some places naturalistic rock art continued to be made through the Holocene. In other words, what we call naturalistic animal images at rock art sites are not only found amongst the earliest surviving rock art of many regions, as with Sulawesi and some locations in western Europe, but also were made at varying times by a wide range of different peoples.

The naturalistic north Xinjiang rock paintings are excellent examples of this. Future research will better articulate their relationship both to Xinjiang petroglyphs of similar appearance and to the wider Altay rock art complex that lies across several countries. It may be that even within the Chinese Altay naturalistic portrayals of animals were made during various different periods of the past. Future rock art dating programs that do minimal damage to imagery may be able to assist with this, perhaps resolving the age of the Dundee Bulake paintings currently subject to three competing hypotheses: over 10000 years (e.g. Wang 2009; Zhaojian and Wang 2011), less than 3000 years (Bednarik 2015a, 2015b) and our own proposition of between 4000 to 5250 years ago.

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## REFERENCES

- AGNEW, N., J. DEACON, N. HALL, T. LITTLE, S. SULLIVAN and P. S. C. TAÇON 2015. *Rock art: a cultural treasure at risk*. Getty Conservation Institute, Los Angeles.
- AUBERT, M. 2012. A review of rock art dating in the Kimberley, Western Australia. *Journal of Archaeological Science* 39: 573–577.
- AUBERT, M., A. BRUMM, M. RAMLI, T. SUTKINA, E. W. SAPROMO, B. HAKIM, M. J. MORWOOD, G. D. VAN DEN BERG, L. KINSLEY and A. DOSSETO 2014. Pleistocene cave art from Sulawesi, Indonesia. *Nature* 514: 223–227; DOI: 10.1038/nature13422
- BAUMER, C. 2012. *The history of central Asia. Volume 1: The age of the steppe warriors*. I.B. Tauris, London.
- BEDNARIK, R. G. 1995. The Còa petroglyphs: an obituary to the stylistic dating of Palaeolithic rock art. *Antiquity* 69: 877–883.
- BEDNARIK, R. G. 2015a. The rock art expedition in Xinjiang Uygur Autonomous Region, China. *Purakala* 25: 55–66.
- BEDNARIK, R. G. 2015b. Dating rock art in Xinjiang Province, China. *AURA Newsletter* 32(1): 6–8.
- CAI D., SUN Y., TANG Z., HU S., LI W., ZHAO X., XIANG H. and ZHOU H. 2014. The origins of Chinese domestic cattle as revealed by ancient DNA analysis. *Journal of Archaeological Science* 41: 423–434.
- CAI K., SUN M., YUAN C., LONG X. and XIAO W. 2011. Geological framework and Paleozoic tectonic history of the Chinese Altai, NW China: a review. *Russian Geology and Geophysics* 52: 1619–1633.
- CHEN Z. F. 2001. Asia. In D. Whitley (ed.), *Handbook of rock art research*, pp. 760–785. Altamira Press, Walnut Creek.
- CHIPPINDALE, C. and P. S. C. TAÇON 2001. The many ways of dating Arnhem Land rock-art, north Australia. In C. Chippindale and P. S. C. Taçon (eds), *The archaeology of rock-art*, pp. 90–111. Cambridge University Press, Cambridge.
- DARVILL, T. and A. P. B. FERNANDES (eds). 2014. *Open-air rock art conservation and management: state of the art and future perspectives*. Routledge, London.
- DENG, Q. 2004. *Rock murals in Yunnan*. The complete works of Yunnan National Fine Arts series. Yunnan Publishing Group Corporation, Kunming.
- DEVLET, E. and JANG S.-H. 2014. *The stone chronicle of Altai*. Institute of Archaeology Russian Academy of Sciences Northeast Asian History Foundation, Moscow.
- GAO X., XU W., YANG W., BLANK D., QIAO J. and XU K. 2011. Status and distribution of ungulates in Xinjiang, China. *Journal of Arid Land* 3(1): 49–60.
- GLADNEY, D. 2005. Xinjiang: China's pre- and post-modern crossroad. *The Silk Road* 3(1): 3–8.
- HALVERSON, J. 1992. The first pictures: perceptual foundations of Paleolithic art. *Perception* 21: 389–404.
- HELKOG, K. 2013. Ski og truger I fennoskandisk bergkunst. *Ottar* 298(5): 13–21.
- HODGSON, D. 2012. Emanations of the mind: Upper Palaeolithic art as a visual phenomenon. *Time and Mind* 5(2): 185–194.
- HODGSON, D. and B. WATSON 2015. The visual brain and the early depiction of animals in Europe and Southeast Asia. *World Archaeology* 2015: 1–16; online DOI: 10.1080/00438243.2015.1074871.
- HU H. 2012. The studies conducted in 2010 within the scope of the project of 'Epigraphic and photogrammetric researches on the runic inscriptions in Turpan and neighboring regions'. *International Journal of Turkish Literature Culture Education* 1(1): 42–52.
- HUANG W., XIA L., FENG Z. and YANG Q. 2007. Distribution pattern and zoogeographical discussion of mammals in Xinjiang. *Acta Theriologica Sinica* 27(4): 325–337.
- HUNTLEY, J., M. AUBERT, J. ROSS, H. E. A. BRAND and M. J. MORWOOD 2013. One colour, (at least) two minerals: a study of mulberry rock art pigment and a mulberry 'quarry' from the Kimberley, northern Australia. *Archaeometry* 57(1): 77–99.
- JACOBSON, E. 2000. *The petroglyphic complex: Tsagaan Salaa/ Baga Oigor, northwestern Bayan Ölgii Aimag, Mongolia*. University of Oregon, Eugene.
- JACOBSON-TEPPER, E. 2012. Rock art research in Mongolia 2005–2009. In P. Bahn, N. Franklin and M. Strecker (eds), *Rock art news of the world* 4, pp. 164–195. Oxbow Books, Oxford.
- JACOBSON-TEPPER, E. 2013. Late Pleistocene and early Holocene rock art from the Mongolian Altai: the material and its cultural implications. *Arts* 2013(2): 151–181; DOI:10.3390/arts2030151
- JACOBSON-TEPPER, E. 2015. *The hunter, the stag and the mother of animals: image, monument and landscape in ancient north Asia*. Oxford University Press, Oxford.
- JANIK, L., C. ROUGHLEY and K. SZCZĘSNA 2007. Skiing on the rocks: the experiential art of fisher-gatherer-hunters in prehistoric northern Russia. *Cambridge Archaeological Journal* 17(3): 297–310.
- JIA, P. W. M. and A. V. G. BETTS 2010. A re-analysis of the Qiemu'erqieke (Shamirshak) cemeteries, Xinjiang, China. *The Journal of Indo-European Studies* 38(3&4): 275–317.
- JIANG Q., SHEN J., LIU X. and ZHANG E. 2008. Holocene climate reconstructions of Ulungur Lake (Xinjiang, China) inferred from ostracod species assemblages and stable isotopes. *Frontiers of Earth Science in China* 2(1): 31–40.
- KUBAREV, V. D. 2007. Aral Tolgoi — new rock art site in Mongolia. *Archaeology, Ethnology & Anthropology of Eurasia* 29(1): 111–126.
- LESLIE, D. M. JR. and G. B. SCHALLER 2009. *Bos grunniens* and *Bos mutus* (Artiodactyla: Bovidae). *Mammalian Species*

- 836: 1–17.
- LONG M. A., JINGLU W. and J. ABUDUWAILI 2011. The climatic and hydrological changes and environmental responses recorded in lake sediments of Xinjiang, China. *Journal of Arid Land* 3(1): 1–8.
- MEI J. and C. SHELL 1999. The existence of Andronovo cultural influence in Xinjiang during the 2nd millennium BC. *Antiquity* 73(281): 570–578.
- Mongolian Ministry of Enlightenment & UNESCO 1996. *Mongolia's tentative list cultural and natural heritage*. UNESCO Beijing Office, Beijing.
- OKLADNIKOV, A. P. 1972. *Tsentral'noasiatskii ochag pervobytnogo iskusstva (The central Asian hearth of earliest art)*. Nauka, Novosibirsk.
- NOVGORODOVA, E. A. 1984. *Mir petroglifov Mongolii (The world of Mongolian petroglyphs)*. Nauka, Moscow.
- PIGEAUD, R. 2007. Determining style in Palaeolithic cave art: a new method derived from horse images. *Antiquity* 81(312): 409–422.
- PLETS, G., G. VERHOEVEN, D. CHEREMISIN, R. PLETS, J. BOURGEOIS, B. STICHELBAUT, W. GHEYLE and J. DE REU 2012. The deteriorating preservation of the Altai rock art: assessing three-dimensional image-based modelling in rock art research and management. *Rock Art Research* 29(2): 139–156.
- PUSHKINA, D. 2007. The Pleistocene easternmost distribution in Eurasia of the species associated with the Eemian *Palaeoloxodon antiquus* assemblage. *Mammal Review* 37(3): 224–245.
- ROZWADOWSKI, A. and K. LYMER 2012. Rock art in central Asia: history, recent developments and new directions. In P. Bahn, N. Franklin and M. Strecker (eds), *Rock art news of the world 4*, pp. 149–163. Oxbow Books, Oxford.
- TAÇON, P. S. C., N. BOIVIN, J. HAMPSON, J. BLINKHORN, R. KORISSETAR and M. PETRAGLIA 2010a. New rock art discoveries in the Kurnool District, Andhra Pradesh, India. *Antiquity* 84(324): 335–350.
- TAÇON, P. S. C., LI G., YANG D., S. K. MAY, LIU H., M. AUBERT, JI X., D. CURNOE and A. I. R. HERRIES 2010b. Naturalism, nature and questions of style in Jinsha River rock art, northwest Yunnan, China. *Cambridge Archaeological Journal* 20(1): 67–86.
- TAÇON, P. S. C., M. AUBERT, LI G., YANG D., LIU H., S. K. MAY, S. FALLON, JI X., D. CURNOE and A. I. R. HERRIES 2012. Uranium-series age estimates for rock art in southwest China. *Journal of Archaeological Science* 39(2): 492–499; DOI:10.1016/j.jas.2011.10.004.
- TAÇON, P. S. C., N. H. TAN, S. O'CONNOR, JI X., LI G., D. CURNOE, D. BULBECK, B. HAKIM, I. SUMANTRI, H. THAN, I. SOKRITHY, CHIA S., K. KHUN-NEAY and S. KONG 2014. Global implications of early surviving rock art of greater Southeast Asia. *Antiquity* 88(342): 1050–1064.
- TAÇON, P. S. C. and Q. YANG in press. Recent rock art research in China. In P. Bahn, N. Franklin, M. Strecker and K. Devlet (eds), *Rock art news of the world 5*. Oxbow Books, Oxford.
- TANG H. 2014. A century review of China rock art research. In Ningxia Rock Art Research Institute (ed.), *Rock Art Research*, pp. 269–276. Ningxia People's Publishing House, Yinchuan.
- TANG H., G. KUMAR and R. G. BEDNARIK 2014. Preliminary report of the 2014 rock art expedition of China. *Purakala* 24: 63–75.
- TANG H., G. KUMAR, LIU W., XIAO B., YANG H., ZHANG J., LU X. H., YUE J., LI Y., GAO W. and R. G. BEDNARIK in press. The 2014 microerosion dating project in China. *Journal of Archaeological Science*.
- WANG, B. 2005. The polychrome rock paintings in the Altay mountains. *The Silk Road* 3(1): 16–23.
- WANG, B. 2009. Ski was first invented in Altay. In Hou Shixin (ed.), *Studies on history and culture of the western regions*. Urumqi (in Chinese).
- WATCHMAN, A. 1990a. A summary of oxalate-rich crusts in Australia. *Rock Art Research* 7(1): 44–50.
- WATCHMAN, A. 1990b. What are silica skins and how are they important in rock art conservation? *Australian Aboriginal Studies* 1990(1): 21–29.
- WATCHMAN, A. 1990c. The composition and formation of silica skins. Final report presented to the Australian Institute of Aboriginal and Torres Strait Islander Studies. June 1990. Australian National University, Canberra.
- WATCHMAN, A., S. O'CONNOR and R. JONES 2005. Dating oxalate minerals 20–45 ka. *Journal of Archaeological Science* 32: 369–374.
- WATSON, B. 2009. Universal visions: neuroscience and recurrent characteristics of world palaeoart. Unpubl. PhD thesis, The University of Melbourne, Melbourne.
- XIAO W., B. F. WINDLEY, G. BADARCH, SUN S., LI J., QIN K. and WANG Z. 2004. Palaeozoic accretionary and convergent tectonics of the southern Altai: implications for the growth of central Asia. *Journal of the Geological Society, London* 161: 339–342.
- YUAN J., JIANLIN H. and R. BLENCH 2008. Livestock in ancient China: an archaeozoological perspective. In A. Sanchez-Mazas, R. M. Blench, M. D. Ross, I. Peiros and Lin M. (eds), *Human migrations in continental east Asia and Taiwan. Matching archaeology, linguistics and genetics*, pp. 84–104. Routledge, London.
- YUE X., LI R., LIU L., ZHANG Y., HUANG J., CHANG Z., DANG R., LAN X., CHEN H. and LEI C. 2014. When and how did *Bos indicus* introgress into Mongolian cattle? *Gene* 537: 214–219.
- ZHANG Y. 2005. Burial with color paintings on the cist coffin found in Buerjin County. *Xinjiang Wenzu* 1: 124–125 (in Chinese).
- ZHANG Y. (ed.) 2014a. *A monograph of rock art research and protection*. Zhong Guo Zang Xue Chu Ban She/ China Tibetology Publishing House, Beijing.
- ZHANG Y. 2014b. Spirituality and Chinese rock art. In D. Gillette, B. Murray, M. Greer and M. Hayward (eds), *Rock art and sacred landscapes*, pp. 85–102. Springer, New York.
- ZHAOJIAN S. and WANG B. (eds) 2011. *The original place of skiing — Altay Prefecture of Xinjiang, China*. People's Sports Publishing House and Xinjiang People's Publishing House, Urumqi (in Chinese).
- ZHAO Y. 1987. *Altay Mountain rock paintings of China*. Shaanxi Publishing House of Fine Arts, Xi'an (in Chinese).