



Editorial

Beringia and beyond: Papers celebrating the scientific career of Andrei Vladimirovich Sher, 1939–2008



This issue has been compiled as a tribute to the career of Andrei Sher (1939–2008). All of the papers include among their authorship colleagues who collaborated closely with Andrei, and in many cases also enjoyed personal friendship with him.

The issue begins with a scientific biography of Andrei and is followed by a consideration of his role in developing scientific collaboration between East and West during the Cold War.

A set of papers dealing with past environments of Western Beringia reflects a major research theme pursued by Andrei throughout his career. A major advance in chronostratigraphic studies in Western Beringia is presented in Minyuk and Ivanov's paper that traces the magnetic reversal of the Brunhes–Matuyama boundary (ca. 780,000 yr BP) in early Middle Pleistocene deposits from Central and Northern Yakutia, the Magadan region, and Chukotka.

The article by Kienast et al. reports on organic sediments from the last interglacial (MIS 5e) preserved in permafrost along the coast of Oyogos Yar at the Dmitry Laptev Strait in north-east Siberia. This multiproxy study included paleobotany, beetles, midges, cladocerans, ostracods and molluscs. The fossil assemblages indicate that the tree line was at least 270 km north of its current position during MIS 5e, and mean summer temperatures must have been at least 6 °C higher than they are today.

Anderson and Lozhkin retrieved continuous lacustrine records in the Okhotsk and Upper Kolyma regions that extend back into MIS 3 and beyond, allowing a fuller assessment of the Karginsk environment. Perhaps not surprisingly, the record is complex, with evidence of fluctuations between cool and warm intervals

evident in the southern part of the region, but a more stable, single warm interval further north, which was advocated by Sher and others. In the lower Kolyma, Zazina et al. provide an excellent update on the Duvanny Yar section. Andrei and colleagues worked for decades on the exposures of the lower Kolyma, gradually refining methodological approaches and dating. Zazina et al. provide detailed evidence from ground squirrel nests about local environments (see also Zazula et al. for a parallel study in the Yukon) and data from palaeosols that suggest that Kind's (1974) warm–cold fluctuations are recorded at Duvanny Yar.

The paper by Kuzmina et al. (on which Andrei is a co-author) documents paleoenvironments in easternmost Siberia: on the Main River in the Chukotka Peninsula. Here, sediments exposed in an ice-bluff yielded insect fossils dating to the transition from MIS 3 to MIS 2. Unlike the classic steppe-tundra insect faunas from all regions west of Chukotka, the Main River fauna indicates more moist conditions, supporting the hypothesis that a cool moist Bering Land Bridge served as a biotic filter for more dry-adapted flora and fauna. This view is supported by the paper of Berman et al., who studied the modern relict steppe beetle faunas of the Eastern and Western Beringia regions. They note that the dominant beetle species found today in relict steppe patches on either side of Bering Strait are substantially different from each other.

The paper by Andreev et al. provides an overview of the Laptev Sea project for which Andrei was a colleague and advisor in its early stages. The well-preserved fossil record extends back to about 200 ka BP, and shows fluctuations between extremely harsh

conditions and relatively developed shrub tundra. Data from this northern region suggest the Karginsk was expressed here as a single warm interval. A preliminary assessment of simulations by an intermediate-complexity earth-system model suggests that model and data agree well, particularly for the warm intervals.

Three papers address aspects of the past environments of NW North America (Eastern Beringia) and the associated chronological challenges. Studies in Eastern Beringia benefit from the numerous tephra that occur in deposits throughout the region and assist in dating and correlation of sections. Preece et al. return to the Old Crow tephra (OCt), the iconic marker for Eastern Beringia that defines the end of stage 6 and the onset of the last interglaciation (LIG). Andrei saw parallels between the gradual ageing of the OCt, as better methodologies were applied to date it, and the ageing of the base of Duvanny Yar, which dates to the LIG, as it was realized that 'old' ^{14}C dates were actually infinite. He was fond of referring to the "Old Crow, the Older Crow, and the Oldest Crow". Preece et al. confirm that it is indeed the "Oldest Crow" and provide new evidence about the possible source of this impressive eruption.

Two papers from the Yukon address strikingly different aspects of past environments. Zazula et al. use fossil ground squirrel nests to reconstruct the local details of Eastern Beringian vegetation during MIS 4—with tephra being an important age control and correlation tool. MIS 4 environments were similar but not identical to those of MIS 2 and indicate "steppe-tundra" environments. Zazula et al. suggest that the squirrels themselves are widespread during cold, dry conditions that favour steppe-tundra, and that their populations experience disjunctions during warmer intervals. In contrast, the paper by Schweger et al. brings evidence from multiple sites in the Yukon recording interglaciations, plus records from the latest Pliocene, to re-examine forest history. They highlight the anomalous forest composition of the Holocene, compared with the many interglaciations that preceded it, and put forward a hypothesis that presents an interesting challenge to palaeoecologists: was human-set fire in the late Holocene responsible for the development of today's pine-dominated forests, which have not occurred in the Yukon since the late Pliocene?

Sher was a dedicated mammalian palaeontologist, and made important contributions to understanding the evolution, ecology and extinction of the Quaternary megafauna. A paper by Boeskorov et al., to which Andrei himself was a contributor, describes a very rare example of the mummified remains of a woolly rhinoceros – a female, from deposits dating about 39,000 yr BP. As is so often the case, the mummy was uncovered because of gold mining. Spore and pollen analyses of the stomach contents indicate that grasses and sagebrushes formed the main part of its diet in MIS 3.

The paper by Van Geel et al. offers tantalizing evidence about the behaviour of woolly mammoths in Eastern Beringia. A sample of mammoth dung, recovered from permafrost sediments in Alaska, yielded clear evidence about the animal's diet (mainly sedges and grasses), but it also contained the fruiting bodies of *Podospora conica*, a fungus associated with coprophagy in mammals. The habit of dung-eating allows grazers with low-efficiency digestion to extract additional nutrients from the vegetation.

The analysis of ancient DNA from permafrost-preserved fossils deeply interested Andrei. The paper by Workman et al. (including Andrei himself and his collaborators Ian Barnes and Beth Shapiro) exemplifies the exciting possibilities of this field by sequencing a hair-colour gene in 47 mammoth individuals and finding only one 'light' mutant allele, so that 'blond' mammoths, if they occurred at all, were very rare.

In a seminal contribution to the megafaunal extinction debate, Andrei demonstrated successive northward range contraction of mammoth in tandem with environmental change at the Pleistocene/Holocene transition. In a contribution by his former student,

Pavel Nikolskiy, and colleagues, time-series of radiocarbon dates from northern Siberia are analysed across 50 kyr and demonstrate synchrony of mammoth numbers with climate fluctuations. Importantly, the authors test for an alternative, taphonomic interpretation by comparing local with regional signals, but conclude that density of dates genuinely reflects mammoth abundance.

Stuart and Lister offer an overview of the extinction of another member of the Pleistocene megafauna: the cave lion (*Panthera spelaea*). By obtaining 111 radiocarbon dates from cave lion remains, Stuart and Lister were able to document range contractions about 40–35 cal ka BP in Siberia (MIS 3) and during the LGM (ca. 25–20 cal ka BP) in Europe. The species' ultimate extinction took place across Eurasia about 14–14.5 cal ka BP, and in Eastern Beringia a few centuries later.

A paper by Harington, pioneer of Quaternary mammal research in the Yukon, provides a valuable summary of key localities in that territory and the development of its mammalian faunas through Quaternary time. It also addresses the contentious issue of pre-Clovis human occupation of Eastern Beringia.

Andrei's interests in fossil mammals were not limited to those of the far north. The mammoths from southern European Russia played a key role in his thinking about the evolution of the group, and in a contribution by Mashchenko et al., a new skeleton of ancestral mammoth, which they term *Archidiskodon meridionalis*, is described from the Stavropol region. The authors disagree with Sher, Lister and others, who place the species in *Mammuthus*, and who recognise a critical co-existence of the species with its descendent *M. trogontherii* in the Taimanian fauna of the region.

In many visits to Weimar, Andrei studied Early to Middle Pleistocene faunas from key Thuringian localities including Süssenborn, Voigtstedt and Untermassfeld. In contribution by Kahlke and Kaiser, remains of the early Middle Pleistocene rhinoceros *Stephanorhinus hundsheimensis* from these localities are demonstrated, through a study of dental wear, to have had a remarkably varied diet until it was outcompeted by the arrival of two more specialised species.

At the time of his death, Andrei had completed an article, with Gennady Baryshnikov and colleagues, on their remarkable discovery of cave bear fossils in north-east Siberia. The two finds are a mandible from the Olyorian of the Cherskiy region, and a Late Pleistocene astragalus (foot bone) from the Adycha River, the latter having also yielded DNA characteristic of cave bear. Their occurrence in the far north-east forces a re-evaluation of both the evolutionary biogeography of this lineage (originally thought to have been restricted to Europe), and its adaptive range.

The variety of Quaternary themes among the contributions to this issue is a direct reflection of the remarkable diversity of Andrei Sher's interests and achievements over 40 years of active research. We trust it will act as a fitting tribute to the scientist and the man.

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