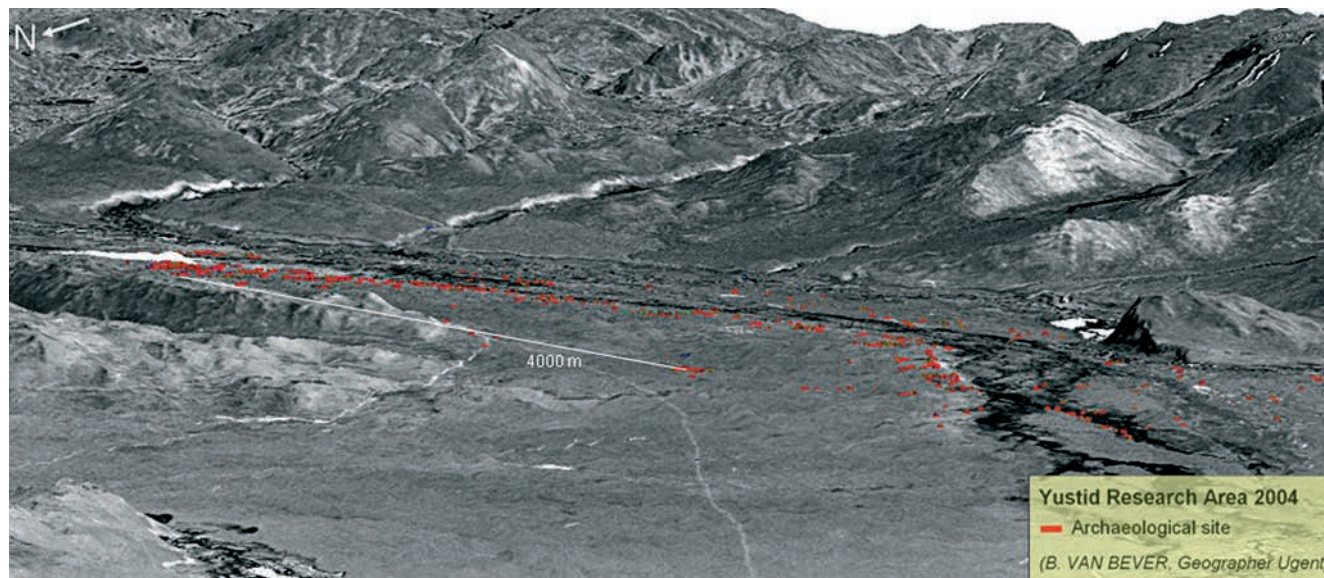
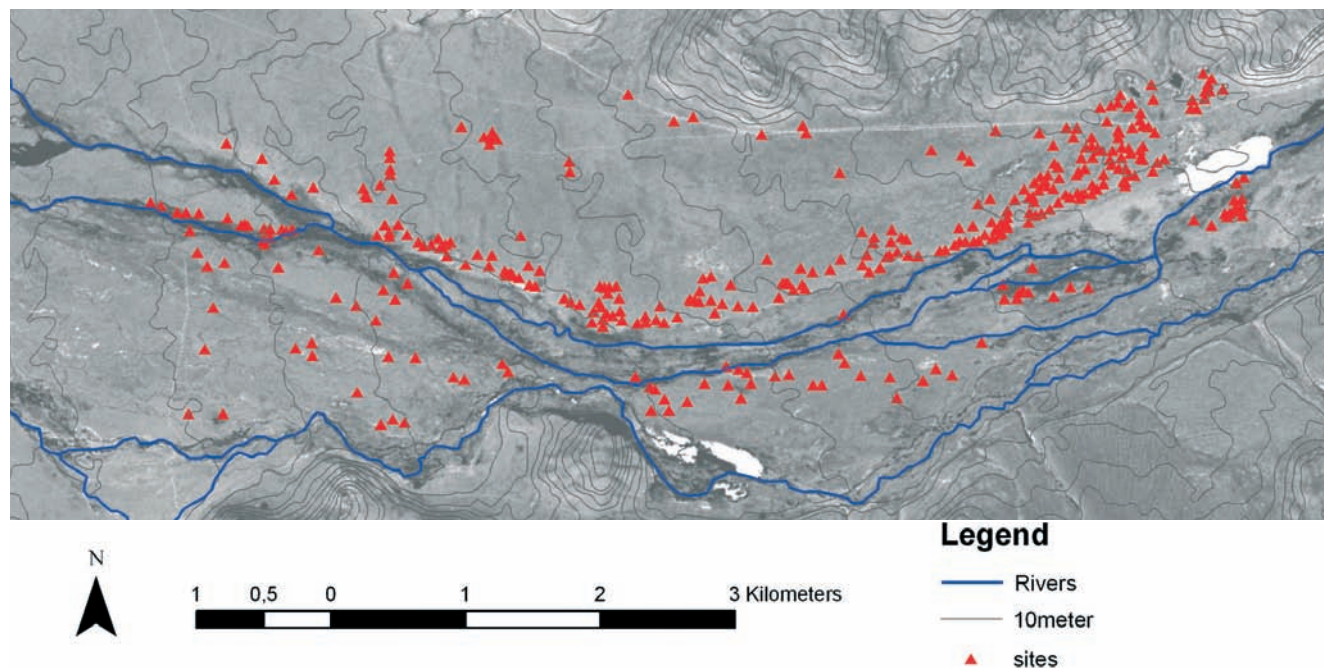


Impact of the Climate Change on the Frozen Tombs in the Altai Mountains



3-D view on the valley of Yustyd, based on the CORONA image, UNESCO Project (UNESCO Copyright)



A map of the middle part of the Yustyd valley, with archaeological sites and 10 m contour lines, based on the CORONA imagery, UNESCO Project (UNESCO Copyright)

The jagged, towering Altai Mountains stretch 2,000 km across China, Mongolia, Russia, and Kazakhstan. The Russian section of this mountain range was inscribed as a natural site on the World Heritage List in 1998. The area inscribed includes Altaisky Zapovednik and a buffer zone around Lake Teletskoye; Katunsky Zapovednik and a buffer zone around Mount Belukha; and the Ukok Quiet Zone on the Ukok Plateau. The region represents the most complete sequence of altitudinal vegetation zones in central Siberia, from steppe, forest-steppe, mixed forest, sub-alpine vegetation to alpine vegetation. The site is also an important habitat for endangered animal species such as the snow leopard. Although the Altai Mountains of Siberia were inscribed for their natural value on the World Heritage List, their cultural value should by no means be underestimated.

The Altai Mountains, indeed, bear unique testimonies to the Scythian civilization that inhabited the Eurasian Steppe during the first millennium BC. They developed a distinct nomadic way of life that was homogenous throughout the Eurasian Steppe, from the Black Sea area to the Mongolian Plain, and interacted with the neighbouring civilizations of China, India, Iran, Mesopotamia and Greece.

As Scythians have left little structural heritage and no written records, there are only two sources of information providing us with knowledge on this nomadic civilization. The first is historical records left by the Greek historian, Herodotus, who devoted the fourth book of his *Histories* to the Scythians. The second is archaeological sites, i.e. Scythian burial mounds, the so-called kurgans, and the artefacts contained in them.

Conserved in their original state, the kurgans in the Altai Mountains are of the utmost importance. The local climate, as well as the peculiar way the kurgans were constructed, created ideal conditions for their preservation; as rain seeped down into the tombs, it froze and never thawed. As such, all the buried material (metal, gold and pottery), even organic material (wood, leather, clothes, textiles and even mummified human bodies and horses' bodies) was kept intact over the millennia. To this day, the only frozen tombs discovered anywhere in the world are those that have been found in the Altai Mountains.

Many 19th-century scholars were prejudiced against Herodotus' record, in spite of numerous archaeological discoveries showing that as a witness he was conscientious and trustworthy.

Now, the organic material yielded by the frozen tombs of the Altai has confirmed Herodotus' accounts of Scythian culture. Occupation, dress, weapons, as well as customs such as the embalment of the corpses of chieftains, burial with a concubine, purifying after burial, and scalping of slain enemies are confirmed by study of the artefacts from the frozen tombs in the Altai Mountains. This information could not have been determined by the research made on the Scythian kurgans in the Black Sea region alone.

The material culture yielded by the excavation of the frozen tombs, in particular the organic material, sheds light, not only on the Scythian themselves, but on the other civilizations with which the Scythians were in contact: the Persian and Chinese textiles yielded from frozen tombs in the Pazyryk are older than any surviving examples in Persia or China.

Furthermore, the frozen tombs also revealed previously unknown connections between different regions during the second half of the first millennium BC. For example, the clothes discovered from the research project led by the Sino-French IPAX-CNRS team in the middle of the Taklamakan Desert (*Djouboulak-Koum*) show striking similarities to those yielded from the frozen tombs belonging to the Pazyryk culture (6th to 3rd century BC) of the high Altai Mountains, thus demonstrating a connection that already existed between East and West long before this route became known as the Silk Road.

The first discovery of a frozen tomb dates back to 1865 by the academician V.V. Radloff in Berel and Katanda, but scientific research started with S. Rudenko's excavations that took place from 1945 to 1949 in Pazyryk and Tuekta on a series of large burial mounds and several small ones. The discovery of frozen content in Pazyryk provided a good understanding of how ice formed within the tombs. In addition, frozen tombs yielded not only organic material such as carpets and wooden material, but also embalmed bodies that had been perfectly preserved. The research on these frozen funerary chambers considerably broadened scientific knowledge of the Scythian culture, and provided the name for the so-called 'Pazyryk Culture' (6th to 3rd century BC).

However, it was only in the 1990s that multidisciplinary scientific research using modern techniques began in this area. In 1993, the Institute of Archaeology and Ethnography of the Siberian Branch of the Russian Academy of Science (Polosmak, N. 1994), excavated a kurgan in the High Ukok Plateau; this was the first barrow found that contained solely a woman, a beautifully tattooed corpse later known as the "Ice Maiden." Her attire was one of the oldest pieces of female clothing ever found from a nomadic society. Her blouse was made of non-local silk from undomesticated silkworms, providing evidence of long-distance trade with India.

The French CNRS (Francfort, H-P. 2002) and the Margulan Institute of Kazakhstan (Z. Samashev), in collaboration with the Ligabue Research Centre of Venice, excavated from 1998 to 2000 a rich frozen burial ground known as Berel 11 (4th to 3rd century BC). The excavation of Berel 11 yielded two mummified bodies, though decomposed, along with thirteen sacrificed, fully harnessed horses,

thus providing rich material for anthropological and paleopathological research on mummies, as well as for DNA study. The examination of organic matter that had been ingested by the horses provided information about the flora history of the region, and even indicated in which season the tombs were constructed.

The most recent research was jointly conducted from 2004 to 2006 by the German Archaeological Institute (DAI) (H. Parzinger), in collaboration with the Institute of Archaeology and Ethnography of the Siberian Branch of the Russian Academy of Science (V. Molodin) and the Institute of Archaeology of the Mongolian Academy of Science (D. Zeveendorzh) in Bayan Olgy, the southern part of the Altai Mountains, northwest of Mongolia. Of particular value, kurgan Olon Kurin Gol 10 contained a completely intact burial chamber with a mummified blond warrior fully dressed and equipped with a full set of weapons. Through a dendro-chronological study carried out on the logs of the burial chamber, the findings of the excavation were identified as belonging to the Pazyryk culture (early 3rd Century BC). The research provided precious information regarding the extent of the Pazyryk culture in the Altai Mountains, found until today only in the northern part of the Altai. This will also contribute to considerably enlarge the current knowledge on the relations of the different nomadic peoples that existed at that time, between Southern Siberia and other regions in its vicinity.

Now, the permafrost layer of the Altai Mountains is endangered by climate change and as such frozen tombs are endangered. In particular, mountain permafrost is most sensitive to climate change; its average temperature remains usually within one or two degrees of freezing point. Temperature data from Mongolian mountain regions available for the last 30 years show a rise in permafrost temperatures by 0.1°C per decade in the Khentei and Khangai and 0.2°C per decade in Kovsgol mountain regions. Glacier research shows that the glaciers in the Altai Mountains have been melting for decades. Rough estimates showed that the glaciers have lost up to 27 % of their mass in the last 100 years. Average retreat rates are 9-20 m per year. Further degradation of glaciers is almost certain, and closely linked to the melting of the region's permafrost layer.

Consequently, significant reduction or disappearance of the permafrost is predicted for the middle of this century in the Altai Mountains. The most significant impact will be observed near the lower boundary of alpine permafrost, where the frozen grounds are very sensitive to climate change. Many frozen tombs in the Altai are situated within this area of sporadic and discontinuous permafrost, and are therefore extremely vulnerable, and will consequently thaw as a result. This will lead us to lose invaluable, undiscovered research material that sheds light on the important culture that flourished during the first millennium BC.

Taking into account the above-mentioned clear indication of the thawing of permafrost in the Altai Mountains that preserved the frozen condition of the Kurgans for millennia, archaeologists, in close co-operation with climatologists, geographers, and geocryologists, requested the attention of UNESCO and its assistance on this urgent issue. The result of this initiative was the UNESCO project, "Preservation of the Frozen Tombs in the Altai Mountains" (UNESCO/Flanders Funds-in-Trust), established in 2005.

The strategy proposed by the project was to first establish an accurate inventory of the remaining kurgans in the Altai Mountains, along with accurate maps produced through advanced satellite imagery technique. The second step would be to identify and locate frozen tombs, and this became possible now thanks to sophisticated geophysical survey techniques, and also specialized geocryological techniques, combined with satellite imagery that can produce a map of permafrost zone. The third step would be to monitor the permafrost



Olon Kurin Gol 10, burial chamber (Copyright: DAI)

layer to determine how quickly the frozen tombs are thawing. The UNESCO World Heritage Centre, under the above-mentioned project, has initiated a monitoring programme to see how quickly the permafrost zone is thawing in the Russian part of the Altai, and will publish its result in its final report end of 2007.

However, climate change is a global phenomenon, and it is obvious that our efforts to prevent frozen tombs from thawing would preserve only a limited number of frozen tombs, if any. Consequently, in order to save as much invaluable research material lying in the frozen tombs as possible, excavations should be considered. In such cases, excavations should be carried out by means that are fully respectful of the local population of the Altai Mountains.

The scope of the current UNESCO project is at present limited to the first step, along with the permafrost monitoring programme. Therefore international academic and scientific communities should be mobilized to ensure that the invaluable research material is at best preserved, or at least documented. For this purpose, co-operation at all levels between the countries concerned would be crucial in order to ensure harmonized procedures and obtain the best synergy. In addition, to manage the frozen tombs, the establishment of an archaeological park in the areas in which frozen kurgans are concentrated is highly to be recommended.

This will, first of all, serve as an open-air museum for educational purposes; secondly, contribute to the sustainable development of the communities concerned; and thirdly, through the systematic monitoring of the frozen tombs within the boundary, prevent the irreplaceable loss of the precious undocumented material.

Finally, it would be highly desirable that the four countries concerned — China, Kazakhstan, Mongolia and Russia — consider that the protection of the Altai Mountains encompassing these precious frozen tombs along with other archaeological heritage making up the unique landscape of the Altai Mountains, through nomination for inscription on the World Heritage List.

The World Heritage Committee, conscious that the World Heritage List should be properly balanced and truly representative of the heritage of humanity, adopted a Global Strategy in 1994 to address the issue of 'non-represented civilizations/culture' on the World Heritage list. In 2000 it requested that ICOMOS proceed with an analysis of the sites inscribed on the List, and elaborate a subsequent action plan to fill the gaps within the World Heritage List.

A deliberation on the significance of the Scythian culture and its outstanding universal value as well as its impact on other civilizations should be highly encouraged both at the levels of the concerned gov-

ernments as well as academic institutions, and would be in line with the above-mentioned Global Strategy; as the place that the Scythian culture occupies in the history of humanity remains a blank spot in the World Heritage List. Future trans-national co-operation between concerned countries for this purpose will be crucial for the appropriate protection of the Altai Mountains.

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References

- Francfort, Henri-Paul: Samashev, Zainulla, "Scythian Steeds", *Archaeology*, May/June, 2002.
- Heinken, Siebo: "Der Krieger vom Altai. Was eine Mumie aus der Skythenzeit über die Geschichte eines antiken Steppenvolkes erzählt", *National Geographic*, June 2007, pp. 116-129.
- Marchenko, Sergei S., Gorbunov, Aldar P., Ramanovsky, Vlad E.: "Changes in Climate and Permafrost and impact on Frozen Tombs in the Mountains of Central Asia", UNESCO International Workshop "The Frozen Tombs of the Altai Mountains: Strategies and Perspectives", Gorno-Altai, Altai Republic, Russian Federation.
- Polosmak, Natalia, Charles O' Rear: "A Mummy Unearthed from the Pastures of Heaven", *National Geographic*, October 1994, pp. 82-103.
- Rudenko, Sergei, I: "Frozen Tombs of Siberia-the Pazyryk Burials of Iron Age Horsemen" (translated by M.W. Thompson), University of California Press, Berkeley, Los Angeles 1970; first published "Kultura Naseleniya, Gornogo Altaya Skifoskoe Vremya", Academy of Science, U.S.S.R, Moscow/Leningrad, 1953.

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A Persian rug found in one of the Pazyryk Kurgans excavated by S. Rudenko, 5th-4th c. BC (State Hermitage Museum)

