The Deer Stone Project
Anthropological Studies in Mongolia 2002-2004

William Fitzhugh, Editor, Jamsranjav Bayarsaikhan and Peter K. Marsh, Assistant Editors
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The Smithsonian-Mongolian Deer Stone Project has conducted fieldwork in Mongolia since 2002 and has issued two previous field reports. This report is the third and most comprehensive, documenting results of work to-date in a set of symposium papers, workshop reports, and archaeological field reports of the 2004 field season. It is therefore an appropriate venue to note the contributions made by so many people and institutions.

The Deer Stone Project would never have taken place had Ed Nef of Inlingua School of Languages of Arlington, Virginia, not invited Steven Young and I to join his 2001 expedition to the little-studied Hovsgol/Darkhat region of northern Mongolia. Nef’s expedition and its visits to deer stone sites and its humanitarian mission to the Tsaatan (Dukha) reindeer herders provided the stimulus that launched the Deer Stone Project and brought together many of its scholarly team. Dooloonjin Orgilmaa and the Inlingua/Santis Foundation have also been instrumental in our work. We thank these organizers and friends, as well as our other research partners and the many students and assistants who accompanied our yearly projects. Their efforts are more specifically noted in the papers that follow.

Special thanks are due to a large number of institutions: National Museum of Mongolian History, Mongolian Academy of Science and its Archaeology and Botany Institutes, Embassy of Mongolia, Trust for Mutual Understanding, United States Embassy in Mongolia, U.S. Department of State’s Ambassador’s Fund, and the Smithsonian’s National Museum of Natural History and its Department of Anthropology and Arctic Studies Center, and the Smithsonian Center for Materials Research and Education. Private support has come from Ed Nef, Robert Bateman Arctic Fund, Robert Malott Foundation, and Alicia Campi. In Ulaanbaatar, we have had a strong partnership with the American Center for Mongolian Studies and the Mongolian National University.

Our fieldwork has been facilitated by the Governor L. Damdinsuren of Hovsgol Aimag and various sum and village administrations. Countless herders, store-keepers, and children offered unforgettable Mongolian hospitality wherever we went. The Tsaatan have been especially generous in welcoming us in their villages and in their tents, and providing us with food, horses, reindeer, guides, and knowledge about their lands, lives, and culture. Our vehicle drivers, cooks, and local scholars from Muren, Ulaan Uul, and other towns gave us safe passage, fine meals, and expert local knowledge. Adiyabold Namkhai has been singularly important as translator and coordinator since 2002.

Finally, this publication could not have been prepared without the editorial assistance of J. Bayarsaikhan and formatting and coordination work of Peter Marsh. Translation services were provided by Solongo Chuluunbaatar. Helena Sharp provided production management, technical editing, and design. Marcia Bakry and Sharp worked up field maps and diagrams from field sketches, and designed the cover. Elizabeth Eldredge generously contributed her deer stone illustration drawings. Photography is by the authors of the papers they appear in unless otherwise attributed.
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Preface

American scientists and researchers have been exploring Mongolia since the beginning of the 20th century. The famous Roy Chapman Andrews undertook field explorations in the Mongolian Gobi desert area beginning in 1910 and, made important discoveries of rare dinosaur fossils and archaeological artifacts dating to the Paleolithic and later periods. These scientific discoveries were new not only to Mongolia but also to world science.

Although joint scientific work between Mongolians and Americans began more than a century ago, the relationship grew more distant throughout much of the 20th century. However, beginning in the 1990s, Mongolia shifted to a democracy and adopted a market-oriented economy, and from that time on Mongolian and American political, economical, and cultural ties have again begun to develop. We note with pride that the scientific associations between our two countries have played an important role in re-developing these ties.

Since 2003, the National Museum of Natural History in the Smithsonian Institution and the National Museum of Mongolian History have jointly undertaken research work as part of the “Deer Stone Project.” This project has initiated a wide-ranging study of the environment and peoples of the Lake Hovsgol area of northern Mongolia. During the 2004 fieldwork season, team members excavated at the Soyo Tolgoi site in Ulaan Uul sum (county) in Hovsgol province. They also closely examined deer stones and their surrounding environments in the Ulaan Tolgoi area of Alag Erdene sum and the Tsatstain Hoshuu area of Renchinlhumbe sum. The archaeological data from these sites have been transferred to laboratories for further examination and dating. Studies are also continuing on the vegetation of the Lake Hovsgol area, including its diversity and environmental correlation with the lifestyles of the Tsaatan (reindeer herding) people of the province.

We believe that the results of these environmental and ecological studies of the Lake Hovsgol area will contribute to the study of history and culture of not only the Mongolians, but also of the Central Asian nomads. Although this project started only a few years ago, it has helped many young Mongolian researchers and museum workers improve their knowledge of modern scientific equipment, technology, and research methodologies. This has been one of the many invaluable benefits of our joint research.

We are presenting to you, our dear readers and researchers, in this first edition of the Deer Stone Project Field Reports, the results and new scientific tools that have been collected from the beginning of this joint project. This important book introduces new information and ideas to the study of the history, culture, and environment of Mongolia’s northernmost peoples.

Finally, we would like to express thanks to the following people and organizations for their many contributions to this field research project: the Smithsonian’s National Museum of Natural History and its administration; Dr. William W. Fitzhugh, Director of the Smithsonian’s Arctic Studies Center; and Peter Marsh and the staff of the American Center for Mongolian Studies. To all of them we express our deepest appreciation and best wishes.

Professor A. Ochir
Director, National Museum of Mongolian History
March 28, 2005
АНУ-ын эрдэмтэд Монгол орнын судлах ажлыг бүр ХХ зуунд эхээр анх эхэлсэн юм. Алдарт эрдэмлэн Р.Ч.Эндрюс нэртэй судалгааны баг 1910-аад оноос эхээн Монгол орны говь нутагт эрэний судаллын хайруул шинжлээлээ үйлдсэн, эрт газарны амьтнадын яс, чулуун зэвсгийг улдууд тэргээ нэн ховор чухал дурсгалуудыг анх нээн олж байз. Энэ нь эхэнх Монголын тодойгүй дэлхийн шинжээл улам гарсан шинэ олол болсон юм.

Монгол Америкний шинжлэх ухааны харилцаа холбоо хэдийгээр зүүгаад жилийн эмнэлээ оршин болохыг аялж хүргэсэн байдлын талаар. Харин 1990-аас Монгол улсын үндсэн оршлын хэрэглээ, эрдэнэ оршлын хэрэглээ, байгаль-энэргийн асуудлын зэрэг нэгийг зөвөөлсөн байдлаар, Монгол АНУ-нын улсын эрдэнэ сумын Улаан-Уул сумын Соёо толгойны өмнөд хэлэлцэн энэ чулуун хэрэглэл 2003 оноос эхээлж байна. Энэ төсвийг хэрээнг Хөвелэл нуурын орчны археологийн дурсгалууд, орнын сууранд, угсаатны бүрэлдэх уулын өмнөд хэлэлцэн энэ чулуун хэрэглэл, тэндийн соёлын зэрэгчийг төлөх ёстой байдлаар байна.

Энэ бол экология энд нутаг эрдэнэ сумын Улаан-Уул сумын Тошон, Чонын тоолны өмнөд хэлэлцэн энэ чулуун хэрэглэл 2003 оноос эхээлж байна. Энэ бол Монгол орнын харилцааны нутгийн дурсгалуудыг хэрэглэл, археологийн асуудлыг хэрэглэл, байгаль-энэргийн асуудлыг хэрэглэл, археологийн асуудлыг хэрэглэл, байгаль-энэргийн асуудлыг хэрэглэл, археологийн асуудлыг хэрэглэл, байгаль-энэргийн асуудлыг хэрэглэл, археологийн асуудлыг хэрэглэл.
Part 1

Conference Reports
Evening camp at Ulaan Tolgoi west of Erhel Lake, Hovsgol Aimag. (photo: Fitzhugh)
The Deer Stone Project:
Exploring Northern Mongolia and its Arctic Connections

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Geographically remote to Western scholars and without a pre-Soviet scientific tradition, Mongolia is one of the least-known archaeological regions of Central Asia. Multidisciplinary research coordinated by the Smithsonian's Arctic Studies Center at the National Museum of Natural History, in collaboration with National Museum of Mongolian History and the Mongolian Academy of Sciences, has begun to explore aspects of northern Mongolia's cultural and environmental history relating to Siberia, circumpolar, and northern Pacific culture history and artistic traditions. This paper outlines the research being investigated by the Deer Stone Project and presents preliminary results of field studies in northern Mongolia in 2001-2004 (Figure 1.1).

Project History and Geographic Setting

During June of 2001 and 2002 the Smithsonian-Mongolian team conducted reconnaissance projects in Hovsgol Aimag of northern Mongolia between Muron and the Darkhat Valley and in the mountains between the West Darkhat and the Russian (Tuva) border, and in 2003 and 2004 returned for several weeks of archaeological excavation. The project began through collaboration with a humanitarian effort organized by Ed Nef to provide educational, medical, and financial assistance for a small group of reindeer-herders living in the West Darkhat taiga between Lake Hovsgol and the Tuva border known in Mongolia as 'Tsaatan' and to anthropological circles as 'Dukha' (Vainstein 1980, Plumley and Battulag 2000). Our scientific goal was to explore the potential for archaeological, anthropological, and environmental studies, including threats to Tsaatan survival resulting from climate, environmental, and socio-economic change, and from cultural and linguistic isolation from their Tuva relatives resulting from closure of the Mongolia-Russian border after 1991 (Plumley and others in Cultural Survival Quarterly 2000; Milnius 2003).
The geographic setting of the Hovsgol-Darkhat region of northern Mongolia is central to the goals of the Deer Stone Project. Lying north of the 50 degree parallel that roughly defines the northern boundary of present-day Mongolia, the political unit known as Hovsgol Aimag, which is dominated by Lake Hovsgol, the Darkhat Valley, and the extension of Eastern Sayan mountains, is geographically transitional between the Mongolian steppe and the Siberian taiga. Its basin-and-range topography, its higher elevations, colder climate, greater rainfall and forest cover, and its Yenesei-bound drainage, give the Hovsgol-Darkhat region a more ‘Siberian’ cast than the lower, more open steppe south of the Selinge River (Figure 1.2). Separated from the steppe by a barrier of high hills and plateaus rising to 2500-3000m, the Darkhat region has retained an ethnic and historical character somewhat apart from the Mongolian mainstream (Hodges 2003) where Mongolian herders and Siberian hunters and reindeer-herders have coexisted and to some extent blended for hundreds if not thousands of years. This cultural divide was evident as early as the 13th century when Genghis Khan began his campaign to unify Mongolia, beginning with the Darkhat tribes.

Today the Darkhat lowlands (ca. 1500m) are occupied by Mongol sheep, goat, cattle, camel, and horse herders who supplement their diet with fish and wild game. The Dukha/Tsaatan, consisting of a West Tundra group (west of Lake Hovsgol) and an East Tundra group (north and east of Lake Hovsgol), each having about 500 people and a slightly larger number of reindeer, occupy the taiga and tundra fringes to the west and north of the Darkhat valley lying between 2000-3500m (Figure 1.12). North of the Russian (Tuva) border, elevations fall, making lichen-dominated reindeer habitat more susceptible to adverse impacts of warmer climatic regimes like those of today. These conditions make the mountains surrounding the Darkhat an outlier of reindeer habitat far south of its normal geographic range. As recently as a century ago Dukha reindeer-herders used to herd their reindeer even further south, in the highlands between Muren and the Darkhat.

Mongolia and the Circumpolar World

Before describing the Deer Stone Project, we need to specify why Mongolia, a landlocked nation 1300 km south of the Arctic Circle, is relevant to circumpolar archeology.
**Eskimo Origins**

Since about 2000 years ago in the North Pacific and Bering Sea region have suspected that key features of this complex – including shamanistic ritual, art, and religious concepts – originated in Asia (Jenness 1928; Collins 1937, 1951). In particular, bone and ivory implements of the Okvik, Old Bering Sea, and Ipiutak cultures dating ca. A.D. 0-500, carried elaborate decoration illustrating hunting magic and animal-human transformation art (Figures 1.3, 1.4). Okvik and early OBS engravings were carved with stone tools, but OBS II and III styles, Ipiutak, and Punuk (A.D. 500-1000) utilized metal engraving tools of Asian origin. While the sources of the art styles and motifs have not yet been traced outside the Bering Sea region, some artifacts found in OBS burials were inspired by Asian prototypes, including ivory chains and open-work carvings modeled after bronze castings (Figure 1.5; Arutiunov and Sergeev 1975; Arutiunov and Fitzhugh 1988: fig. 150). Asian contacts are even more explicit in finds from the Ipiutak site at Point Hope, Alaska, where Larsen and Rainey (1948) found ivory and bone objects of the same form as metal ornaments used by Siberian shamans to decorate and empower their ritual coats, and ivory composite death masks that compared closely to Chinese Chou masks of jade and nephrite (Collins 1971). The excavators attributed many of the exotic forms to the introduction of a Siberian shamanistic complex into Alaska and linked specific artifact types to the Permian Bronze and Iron Age of West Siberia. A few years later, Carl Schuster noted that these and other forms of early ancient Eskimo art were probably related to the Eurasian animal-style art complex (Schuster 1951; Schuster and Carpenter 1986:1(4):911-927). Lacking a broader base of archaeological materials, dated finds, and contextual information from Siberia and the Far East, these theories were impossible to evaluate and until recently remained an untested aspect of circumpolar culture theory (Fitzhugh 1998; 2002a).

**Iron Age ‘Eskimos’ in Yamal**

The opening of Russia to Western scientists provided an opportunity for the author to collaborate with Russian archaeologists investigating Neolithic, Bronze, and Iron Age sites in the lower Ob River and Yamal Peninsula in the Western Siberian Arctic during 1995-96. I had previously concluded that convergent development rather than trans-Atlantic contact was responsible for similarities between Scandinavia Younger Stone Age cultures and 4000-year old Maritime Archaic cultures of Northeastern North America, and that neither had anything to do with Eskimo origins (Fitzhugh 1975). But Chernetsov’s discovery of an
early Eskimo-like arctic maritime culture on the Yamal shores of the Kara Sea (Chernetsov and Mosyjńska 1974) – the find that prompted Larsen and Rainey to propose West Siberian connections at Ipiutaq in the 1940s – had yet to be evaluated from a modern perspective. Their claim was less suspicious in 1948 than today, because it was still believed that Eskimo culture may have developed from European Paleolithic cultures that moved into the Arctic at the end of the Ice Age. This idea has now been discredited, and despite the fact that no Eskimo-like remains had been found in the intervening 3000 miles from Chukotka to Yamal (Chard 1958), the field studies needed to confirm the absence of Eskimo culture from the central Russian arctic coast had not been done. Four years of Siberian fieldwork and museum studies with Russian colleagues convinced me that Chernetsov’s ‘early arctic maritime culture’ of Yamal was neither maritime nor ‘Eskimo’ (Fitzhugh 1998; see also Fedorova 2003), and that Permian similarities to early Eskimo art were untenable from every point of view: stylistics, chronology, geography, and ritual (Figure 1.6). Subsequent research in Taimyr, along the the Laptev Sea coast, and at an 8000-year-old Mesolithic on Zhokhov Island in the northeastern Laptev Sea (Fitzhugh 1999), all gave negative results with regard to origins of Eskimo culture and Old Bering Sea art (Fitzhugh 2002).

**Primor’e to Bering Strait: Ritual Art, and Transformation**

In the meantime, research in the Bering Sea and North Pacific (Dumond and Bland 1996) identified Asian prototypes for a number of the archaeological complexes and culture elements known from Alaska, including the likely origins of 4000 B.P. Arctic Small Tool tradition ceramics and lithic assemblages (Powers and Jordan 1990). However work on such cultures as Tar’insk (Lebedintsev 1990), Lakhtina (Orekhov 1999), and Old Koryak (Dikov 1979), which are still relatively little known, has not yet revealed much that can be
closely related to Old Bering Sea art and religion. Neither, so far, have studies further south, around the mouth of the Amur, in Sakhalin, northern Japan, or Korea revealed prototype material related to Early Bering Sea art. Many of these East and Northeast Asian complexes do not have preserved organic remains, and without this crucial material, evaluating similarities remains extremely difficult. What can be said is that rock art, especially that representing faces and masks, thought to date ca. 3000-1000 B.P., is common in the Lower Amur region and northern China (Okladnikov 1981; Song 1992; 1998), indicating a long tradition of body and clothing decoration and labret use, and these practices, seen also in the Altai tombs, Mongolian deer stones and petroglyphs (Jacobson 1993, 1998; Sanjmyatav 1995; Jacobson et al. 2001; Jacobson-Tepfer 2001; Bayarsaikhan 2004), and known also
from Old Bering Sea and later Beringian cultures, are the most likely medium for links between Eastern Asia and the North Pacific-Bering Sea region. Another possible Asian-stimulated technology may be found in the introduction of ground slate, which appears in Old Bering Sea, Northeast Asian and Korean cultures about 2000 years ago, coincident with and perhaps stimulated by the introduction of metals from Central Asian and Siberian sources. This introduction seems to have been independent of the earlier Ocean Bay culture slate-grinding tradition of Kodiak Island and may have originated as a substitute for metal goods, as was the case in Old Bering Sea ivory chains and manufacture of ceramic vessels styled after metal prototypes by Siberian cultures who lacked these prestige goods.

**A Possible Scythian-Eskimo Connection**

The fine decoration of ethnographic clothing from such groups as the Ainu, Nanai, Nivkhi, and other Lower Amur River peoples, as well as those, possibly, of Alaska and the Northwest Coast, may eventually be shown to be a legacy of the earlier traditions of highly ornate clothing and body decoration of early East Asian and Pacific peoples (Fitzhugh 1988a, 1988b, 1993). Given the widespread evidence of body painting and tattooing, I believe that these artistic traditions of the northeast Asian maritime region are probably related to the decorative arts of Central Asia as seen especially in the Scythian tombs of the Altai (Molodin 2000; Edwards 2003). The idea of a deer stone art connection with Scythian art is not new and has been suggested by various Russian and American scholars (see review in Jacobson-Tepfer 2001) Mongolia’s deer stone monuments, which are believed to be an early form of animal-style art applied to a monumental human form, attracted my interest because they occur geographically along a natural path of communication between Central Asia and the North Pacific coast; because they date to Bronze and Iron Age times and are an ‘early overlap’ with early Eskimo culture; and because I believe they must be related to broader religious, spiritual, and artistic traditions of southern Siberia similar to those found among North Pacific peoples but which so far are not known from archaeological complexes of northern Siberia and the Arctic.

I am not proposing, at this time, a solution to these problems, but I do suggest a mechanism and route by which powerful symbolic elements of Asian culture may have infiltrated the indigenous cultures of the North Pacific. The specific artistic forms — whether they be Scythian, proto-Scythian, early Korean, Jomon, or others — and their dating need investigation, as does the cultural complexes and functional categories in which they occur, such as death ritual, hunting magic, representations of deities and animal spirits, and shamanism. What strikes me...
as most similar in comparing deer stone art with early Eskimo art is the transformational nature of the images, which combine features of the Asian elk – the most magnificent and powerful cervid of Eurasia – with bills of water birds, much in the way that Alaskan Eskimo have long represented transformation figures of wolf and killer whale, or seal and water bird, whose spirits were believed to change physical forms while crossing barriers between land and water, water and air, or land and air (Figures 1.7, 1.8, 1.9). It seems likely that these features may have roots in the Paleolithic cultures of Asia. The hypothesis I wish to test, however, is more specific and relates to relationships and forms of the late Neolithic, Bronze, and early Iron Age. We clearly have a long way to go in terms of understanding the meaning of these images in both Eskimo and Sibero-Mongolian contexts, and Esther Jacobson and her Mongolian and Russian colleagues have already brought us a considerable distance down the latter path. It seems likely to me, following N. N. Dikov (1958), that the deer stone carvings served as protective devices to ensure safe passage of an honored leader’s spiritual passage into the upper world, just as the body art of Altai warriors and Old Bering Sea Eskimo hunters protected them from spiritual danger in the world of the living in much of eastern Asia and the Pacific for the past 3000-4000 years. The question is, can such connections be traced archaeologically between Mongolia and the Bering Sea, and perhaps further, to the historic Eskimo and Indian cultures of the North Pacific?

Research Themes

Deer Stone as Object and Icon

Mongolia’s deer stones (Figure 1.10) represent both a subject of study and a symbolic focus that lies at the core of our archaeological, ethno-ecological, and paleoecological studies. The monuments date to a period shortly after these steppe societies had been transformed by major social and religious change resulting from animal domestication and new military technologies. Geographically, deer stones are found along the northern fringe of the steppe near the taiga border, a transitional environment rich in animals (including
Figure 1.10. (a) Deer Stone 1 at Ulaan Tolgoi (Erkhel) site in Hovsgol Aimag, northern Mongolia, displaying anthropomorphic figure with earrings, spirit deer on torso, and belt with tools. (b) Ushkiin Uver deer stone with spirit deer and belt with dagger, axe, bow and other implements. The top of the stone has been broken by lightning. Other stones have been damaged by frost and use by cattle as rubbing stones.

Investigating deer stone art and associated archaeological and landscape ritual features is only one of several factors motivating the Deer Stone Project. Other research questions include the origins and history of reindeer domestication; the cultural and ecological context of modern Dukha reindeer husbandry in relation to on-going economic, social, and political changes in Mongolia, impacts of global warming and changing environment; and broader questions of Mongolia’s cultural and historical relationships to peoples of Siberia and Northeast Asia. Related Smithsonian projects in other areas of Mongolia are exploring Mongolia’s Paleolithic past, its rock art, and its role in the development of ‘nomadic’ states and empires and the silk route trade, and to its relationship with developing civilizations in China. The Deer Stone Project explores Mongolia’s roles in cultural development, population dispersal, and culture contacts to the north and east.

Northern Connections

Although recent history has emphasized Mongolia’s strategic position as a buffer state or exploitation zone between China and Russia (Lattimore 1940, 1962; Bawden 1989; Ishjamts 1994; Christian 1998; Baabar 1999; Barfield 2001; DiCosmo 2002), history and archaeological research demonstrate that Mongolia became an important center of cultural development long before its empire period in the 13-15th centuries. In Ice Age
times the Gobi, then well-watered, was a Central Asian ‘Serengeti’ with large animal and human populations and during late Pleistocene times may have been the source of the mongolid physical type that expanded throughout much of Asia and into the New World. There is no reason to doubt Mongolia’s continued role in later cultural developments and transmissions within the steppe zone and across the steppe-taiga boundary. Our archaeological work explores Mongolia’s environmental and cultural connections with southern Siberia, Northeast Asia, and the North Pacific, focusing on the past 6000 years.

As noted previously, Mongolia’s temperate latitude and the dominance of the Silk Road, Chinese history, and recent Soviet domination has obscured Mongolia’s geographic and cultural ties to Siberia, and its links with the circumpolar region and the North Pacific. Climatologically, northern Mongolia is as ‘arctic’ as Nome, Alaska, and its landforms include such classic arctic forms as permafrost and conical ice-cored pingos which can take
decades if not hundreds of years to form (Figure 1.13). Mongolia’s arctic characteristics are not limited to contemporary conditions. During our 2001 survey Steven Young noted striking similarities between Mongolia’s tundra and alpine plant communities and the ancient vegetation of the Beringian Land Bridge, similarities that suggest a former phytogeographic connection with arctic ecosystems (Young, this volume). These connections and post-glacial environmental history of the Darkhat region are being explored by botanical and paleoecological studies of modern Darkhat and Beringian landscapes. Reconstruction of the post-glacial history of the Darkhat basin (drained before 6000 BP) and of regional climate history based on lake sediment samples are providing an archaeological context for interpreting cultural and archaeological data (Robinson et al. 2004; Robinson 2005).

**South Siberian Reindeer Herders**

A special feature of the project is its focus on the Dukha, known to Mongolians as ‘Tsaatan’ or ‘Reindeer People’ (Fitzhugh 2002b). Numbering about 700 people and 1000 reindeer, the Dukha are the southernmost reindeer-herders in the world (Vainshtein 1980, 1981). Of the four Tuva-speaking groups with homelands between Lakes Baikal and Hovsgol, only the Dukha – the southernmost group and the only group living in Mongolia – still live as full-time reindeer-herders (Figure 1.14). Located near the Russian/Tuva border, their 2000-3500m high forest and tundra pastures west and north of the Darkhat and Lake Hovsgol provide lichen forage for reindeer at the extreme southern limit of the geographic range of this species in Asia. The existence of this habitat outlier results from a special geographic feature that preserves a pocket of Siberian tundra and lichen forage in the elevated Hovsgol and nearby Sayan Mountain ranges. To the north, in Siberia, elevations drop and reindeer habitat becomes marginal or discontinuous. Today, in these neighboring regions of Russia, Tuva-speaking relatives of the Dukha have already largely given up reindeer herding, leaving the Mongolia Dukha as the only group still maintaining herds as their principal means of subsistence. However, their survival is being threatened by stress resulting from climatic warming (lichen tundra range reduction), reduced reindeer fitness, human population loss, and post-Soviet social, political, and economic change. Our work complements ethnographic studies (Wheeler 1999, 2000) and humanitarian projects such as Dan Plumley’s Totem Project and Santis Education Projects by documenting Dukha ecological knowledge, herding practices, and ritual (including shamanism), in order to better understand and publicize the challenges facing Dukha people.

**Herders, Lichen, Reindeer, and Climate Change**

Our studies of Dukha reindeer-herding practices supplement earlier studies by the Russian ethnographer, Vainstein, and Mongolian scholars. Paula DePriest, a lichen specialist from the Smithsonian, has collected botanical samples for classification and research from a variety of reindeer seasonal pastures. In working with Dukha reindeer herding experts, she has obtained ethnographic data about how reindeer feeding behavior, seasonal movements, and herding strategies relating to weather, local forage conditions, predation, disease and other factors influence the way in which reindeer are managed (DePriest et al. 2003, and
this volume). She has found Dukha lichen taxonomy closely parallels Western science species categories and discovered that much local knowledge about lichens and reindeer husbandry – for instance Dukha knowledge about medicinal and ritual practices used to maintain the health of the reindeer – has never been recorded. Climatic trends are also obvious today: our observations on the present invasion of dwarf birch into the Dukha alpine tundra pastures signals a result of climatic warming which, if it continues to convert Dukha summer pastures to taiga, may threaten Dukha survival in this southernmost isolated outlier of reindeer habitat (Plumley and Battulag 2000; Milnius 2003).

Origins of Reindeer Domestication

To date, anthropological theories of the origin of reindeer domestication have been based on ethnographic and historical models (Vainshtein 1980; Ingold 1980; Schnirelman 1980; Krupnik 1993) rather than zooarchaeology, with the result that the date and place where this important transformation in the relationship between humans and reindeer occurred still remains unknown. Despite the popularity of theories of arctic Siberian and Fennoscandian origin among northern Siberians and Fennoscandians, the Tuva and north Mongolian steppe/taiga border is a more likely location for reindeer domestication because the proximity of reindeer habitat to the primary zone of early animal domestication on the steppe (see Sukhbaatar paper in this volume). Here forest hunters familiar with techniques being used by steppe herders on other animals would have learned about and been able to apply these methods to reindeer in a region where seasonal reindeer movements between winter forest ranges and summer tundra pastures are short and do not require long distance migration as in the case of arctic reindeer herding. The Russian ethnologist, Sevyan Vainshtein (1980, 1981), a specialist on Tuva cultures and ethnohistory, has hypothesized that Tuva-style mountain reindeer husbandry (for milk and transport) was the first stage in the domestication process, which later went through a series of development stages leading eventually to the type of intensive migratory herding utilized by Eurasian arctic peoples for the past 500-1000 years.

We are attempting to test this concept by gathering information on Tsaatan ethnoecology, herding practices, species composition and abundance, and reindeer foraging behavior as well as searching for archaeological sites containing reindeer remains. Archaeological sites
will be tested to collect archaeofauna for use in beginning to define reindeer exploitation strategies for different periods in the past. We are also searching for reindeer fauna from existing archaeological collections in museums and research centers in Mongolia and Russia, and will work closely with Russian experts with knowledge of reindeer herding practices to see if the South Siberian domestication hypothesis can be verified. At present the domestication history of this species has never been explored. Given the importance of reindeer herding in the transformation of almost all peoples of northern Eurasia from hunting and fishing to herding, resolution of this problem would have important implications for understanding cultural developments in a huge portion of the world. The appearance of reindeer herding may also mark the historical turning point among northern peoples in which the ancient relationship between hunter and prey were replaced by new religions and world views associated with human technological dominance and control over the natural world (Fitzhugh 1988b, 1993).

**Bronze Age Ritual Landscapes**

Traveling between Muron and Darkhat one cannot avoid being impressed by the large number of Bronze and Early Iron Age burial mounds and ceremonial sites. A small subset of these are complex sites containing deer stones like those at Ushkiin Uver and Ulaan Tolgoi, but such sites are relatively rare compared to the nearly ubiquitous stone mounds and khirigsuur. The latter are found everywhere Mongol-style pastoralism was practiced, whether on the steppe or steppe-forest zone. Habitation sites, workshops, rock art sites, and others, by contrast, are extremely rare in the Darkhat, as are sites of most other cultural periods except modern times, probably due to heavy sedimentation from the high rainfall this region receives. In part this relates to the absence of surface exposures in the grass-covered steppe. On the other hand, since one cannot imagine that the landscape was ever abandoned, it would appear that settlement patterns of the last few thousand years must have been similar to those of the modern day, employing light felt tents and a migratory lifestyle.

Investigation of Bronze Age ritual landscapes and the origins of Asian chiefdoms are exciting subjects for archaeological study (Jacobson 1993, 1998, 2002; Jacobson-Tepfer 2001; Jacobson, Kubarev, and Tseevendorj 2001; Erdenebaatar 2004; Honeychurch and...
Amartuvshin 2005a). While much is known from nearly a century of research by Mongolian, Soviet, and other groups working in Mongolia and the Altai, many questions remain. Few sites have been accurately dated; little is known about the development history of complex sites like Ushkiin Uver and Erkhel (Figure 1.15); little excavation has been done outside of central mound burial crypts, etc. Use of new mapping, dating, and recovery techniques; settlement pattern and ‘whole-site studies’, studies of human remains, regional and environmental analysis, and use of modern theory offer promise for achieving major gains in new information about this exciting period in Central Asian history.

Continuities and Connections: Mongolia and Beyond

Another objective is to develop a late Holocene Darkhat culture history (c.f. Korean-Mongolian Joint Expedition 2001, 2002, 2003; Honeychurch 2004; Honeychurch and Amartuvshin 2003, 2005b) that can be used to explore changes observed in its cultures and environments through time, including the external factors like climate change and internal ones like fire, grazing, and forest clearance. Vainstein has proposed that the pastoralist economic systems of Tuva and Darkhat/Mongolia have been remarkably stable for centuries and even millennia. Is this view from ethnography and history compatible with archaeological evidence? What are the major turning points in its history? And how has the region interacted with respect to Mongolian, Siberian, and perhaps even circumpolar regions? Has the Darkhat primarily been of regional importance – perhaps having been a geographic cul-de-sac as an outlier or ‘observer’ of Mongolian history – or has it played a larger role in cultural developments or regional interactions? Obviously such questions require substantial archaeological evidence of a sort that is not likely to become available immediately; but progress in at least some of these areas can be expected, and in the process a broader picture is likely to become available from other areas of Mongolia, Siberia, and the northern Far East that may provide clues to more distant goals of circumpolar and North Pacific dimension.

Archaeological Research

In 2001 and 2002 we met our Tsaatan guides at Soyo where the Khugiin Gol ('Melody River'), a tributary of the Little Yenesei, leaves the mountains and emerges onto the Darkhat Plain. Soyo, meaning ‘fang’ or ‘canine’ in Mongolian, is the name of a prominent conical hill that rises abruptly from the valley floor on the south bank of the

Figure 1.16. Sanjmyatav inspects vandalized Tolijigit Boon Iron Age rock art site near Soyo in 2001.
river. In addition to being an important river ford, spear-fishing location, and staging area for hunting trips into the mountains, Soyo serves as a seasonal market and meeting place for West Darkhat Mongolian and Tsaatan herders. Not far downstream on the north bank is one of the few Bronze/Iron Age rock art sites known in the Darkhat Valley (Sanjmyatav, this vol.). When we visited it in June 2002 we found it almost completely obliterated by looters attempting to secure images from the soft shale for sale to tourists (Figures 1.16). Apparently this was not a random incident; in 2003 we encountered a band of looters equipped with vehicles, shovels, and pry bars systematically pillaging burial mounds in the West Darkhat region. Before we revealing ourselves as archaeologists we learned that they were financed by antiquities dealers in Ulanbaatar and Beijing and had expert knowledge of local archaeology and knew exactly where to search for finds. Hopefully our report to the Ulaan Uul police had a positive effect.

**Soyo Tolgoi**

In 2002, while camped at the base of Soyo hill on the Khug River, we noticed archeological materials eroding from a buried soil level containing small hearths with animal bones, a sherd of thick tan ceramic with a red exterior wash or paint, large amounts of charcoal, and fire-cracked cobbles and slabs (see Bayarsaikhan and Odbaatar, this vol.). Among the bones were large herbivore (deer or elk), small mammals, and a scapula of a sheep or goat. The eroding terrace front also produced a number of small flint finds, including a conical prismatic core and numerous tiny microblades.

The cultural horizon could be traced along the bank for about 100m, buried under 1-3m of windblown sand carried up from the eroding bank. A modern garbage pit cut into the terrace about 10m south of the bank revealed this cultural horizon extended for some distance back from the bank, suggesting the presence of a large, buried site containing faunal remains, datable materials, and a variety of artifact types that indicated occupations at least as early as the Neolithic. My colleague, Sanjmyatav, believed Soyo was the first Neolithic site known from the Hovsgol region. We later learned another Neolithic site had been found in 2003 on the east shore of Lake Hovsgol (John Olson, pers. comm.). Also of importance for environmental reconstruction was the presence of a thick mat of buried timber that Stephen Young found below the water level in the south bank of the river, now radiocarbon-dated to cal. 7180-6750 BP.

*Figure 1.17. Late prehistoric component hearth in Upper Level at Soyo 1, Feature 1. Edge-faceted stone disc fragments are among the fire-cracked rocks at right found within the hearth.*
In 2003, we returned for further work at Soyo, forewarned that last year’s radiocarbon samples had produced unexpected results. Instead of dates of 5000-6000 BP, which would have been acceptable for a Neolithic site, charcoal from the Feature 1 hearth had dated cal. ca. 1100 BP, and Feature 2, cal. ca. 900 B.P. So in addition to opening a broader area to obtain larger samples of artifacts and bone materials, we needed to clarify this anomalous dating of a site containing Neolithic tools.

Clearing the face of the exposure revealed a single buried soil horizon stained with humic material and charcoal, and several small hearths composed of tightly-clustered cobbles with thick concentrations of charcoal, partially-burned and unburned mammal bone, fire-cracked rock and pieces of thick, gritty, red-surfaced pottery (Figure 1.17). We excavated two of these hearths, opening up the bank and following the cultural layer several
meters back into the terrace front. We soon discovered that the buried charcoal-stained horizon actually consisted of two levels about 10cm apart: an upper one containing the hearth cobbles, large chunks of well-preserved charcoal and unburned bone, and a few centimeters below, a lower level with more small scattered hearth rocks, small chunks of highly fragmented charcoal, calcined bone, small pieces of thin-walled, highly eroded ceramics with cord-marked decoration, and flint tools including microblades and wedge-shaped cores. Our 1000 B.P. dates were from the upper zone and were clearly related to a late component containing a variety of domestic animal remains. A curious feature of one of these hearths was the presence of a series of thick, faceted-edge stone discs, 2-3cm thick and 15cm in diameter, most of which had been cracked by fire. Surface collections in the flood plain south of the site turned up a similar complete disc and fragments of similar thick-walled ceramics.

Excavation of several square meters of the lower horizon in 2002-2004 revealed an intact Neolithic component (Figure 1.18) a few centimeters thick centered around small scattered hearth deposits containing cord-marked ceramics, flint tools including microblades and wedge-shaped cores, burins, end scrapers, side scrapers, bifacial knives and a small triangular bifacial point (almost certainly an arrow point), and a fragment of a small tubular bead with a drilled hole made of black stone, possibly of jet. A sample of calcined bone dated to cal. 6510-5940 B.P. (for a more detailed description see Fitzhugh 2004; Bayarsaikhan et al., this vol.). The thin, scattered nature of the finds from both levels suggests small transient camps rather than permanent sites.

**Menge Bulag 1: A Tundra Pit Feature with Stone Age/Neolithic Remains**

Leaving the Darkhat Valley and climbing into the mountains to the west one enters a new landscape where the fingers of riverside steppe pasture pinch out and the Siberian larch forest begins. From here until emerging into the tundra above 2000m one finds no surface signs of prehistoric occupation, and only sporadic evidence of modern use by Mongol and Tsaatan, who use the forest zone for hunting and winter reindeer pasture. During summer the forest is too hot and fly-infested for reindeer, and the Tsaatan take them up into the tundra in the higher valleys. It is here that we spent a few days each summer in June 2001-2003 becoming acquainted with the West Tundra people, observing

*Figure 1.19. Testing the pit feature at Menge Bulag 1.*
their reindeer husbandry practices, and searching for archaeological sites, which in open country are more easily detected than in the forest.

In 2001, while scouting the edge of the Tsaatan tundra camp on the Menge Bulag (termed ‘Baran Gol’ in previous field reports), a tributary of the Little Yenesei, 20 miles east of the Russian border, I found a 7 by 8m diameter depression with an apparent entranceway cut into the terrace edge. A few flakes of black flint were eroding from the surface at the front of the structure. Unfortunately, the three small trenches we excavated in 2002 (Figure 1.19) did not reveal a house pit, as the feature had no floor, slumped walls, or hearth. Rather it was a simple conical pit excavated into the river terrace, and contained three stratigraphic levels, conforming to the pit outline, each about 25 cm thick in the center and lensing out at the surface: Level I, cobbles-free homogeneous brown soil; Level II, mottled brown sandy loam with many cobbles, the majority of the lithic industry, and scattered charcoal; and Level III, a mixed sandy gravel with clay pockets and no charcoal. A radiocarbon date of cal. 1320-1060 BP was obtained on a composite sample of unidentifiable charred material scattered in Level II. Throughout these levels we found a small number of quartz and quartzite flakes, several quartz pieces esquillees (scaled bi-polar cores), a small quartz core, a possible coarse grindstone or axe blank, and in the upper strata just beneath the turf, a single black chert flake. Near the center of the depression, 25 cm below the sod and about the same distance above the base of the cultural deposit, we found a well-preserved horse tooth, and just beneath the sod, a modern ash lens with burned bones and unburned wood. From the Tsaatan we learned that a Tsaatan Soviet-style reindeer brigade had occupied this terrace in the mid-20th century and this may account for the recent ash and bone refuse. It was not clear if the black chert is related to the quartz industry of the pit fill, and it may represent a separate component. It would be tempting to believe the date is in error, in which case the feature might date to the Neolithic or Mesolithic. In 2004 we visited this site again and found more black flint including a small microblade fragment on the eastern side of the terrace, confirming the presence of a Neolithic occupation. Bayandalai, one of the Tsaatan elders, also showed me a perfect microblade core he had found years ago, but did not remember its source.

While in the location we surveyed several kilometers along the Menge Bulag stream, but the only other archaeological sites noted were 20th century Tsaatan camps. Further surveys here in 2004 produced evidence for intensive 20th century summer use by Tsaatan groups, but no earlier remains were noted. Our surveys in 2003 in the Tsaatan spring camp region west of Tsaagan Nuur revealed nothing of archaeological importance in this marshy and heavily-forested region; however the chain of lakes to the southwest provided Kevin Robinson with excellent lake core samples for his bachelor’s thesis (Robinson et al. 2004; Robinson 2005).

**Ulaan Tolgoi**

Eight km west of Lake Erkhel, about 30 km north of Muron, is a large ceremonial complex containing scores of boulder mounds and khirigsuur (Figure 1.22). The site is found on the south and east side of a prominent hill, Ulaan Tolgoi, which stands in the center of
the valley floor. The site includes a set of five ornamented deer stones, among which are several of the finest deer stones in Hovsgol aimag, and one that may be the largest and most beautifully-carved monument in Mongolia. This stone is made of a slab of granite that stands almost 3.5 m above ground at the south end of a north-south alignment of four other slabs of different shapes and degrees of decoration. In 2002, Esther Jacobson visited the site, and its deer stones were then photographed by her husband, photographer Gary Tepfer. We visited the site for a few hours in 2001 and returned in 2002 to map one of the smaller deer stone settings and its associated boulder features. During this visit I explored the surroundings, finding the valley floor packed with khirigsuur constructions that extended up and onto the rocky summit of Ulaan Tolgoi hill. Clearly this geographic area and the hill itself had some special religious significance. With only one day to spend at Erkhel, we mapped Deer Stone 5 and surroundings, excavated a 1x2m trench 50cm south of the deer stone, and dug a small oval ring feature 50m east of DS5.

The purpose of the trench was to obtain a dating sample associated with the erection of Deer Stone 5 (Figure 1.20; for details see Fitzhugh 2004:14-19). The trench was laid out E-W with the center of its north wall 75cm south of DS5 to avoid undermining its foundation. Although some of the Ulaan Tolgoi deer stones had been re-erected and cemented in place (by earlier Russian-Mongolian teams according to Sanjmyatav), DS5 appeared to be in original position. Our excavation, which reached a depth of 40cm, showed no evidence of a pit associated with the erection of the stone. We found four stratigraphic levels beneath a thin turf zone and from the lowest of these levels (IV) we recovered two AMS charcoal samples from beneath a 25cm diameter cobble, in undisturbed context, one of which dated cal. 2150-1960 BP. Immediately adjacent to the deer stone and clearly defined in the north wall of the trench was the remains of a marmot burrow that terminated at the top of a flat slab 35cm below the ground, 50cm north of the rock and charcoal find. Beneath this level was undisturbed gravelly sand. The rock and 5cm thick slab, lying flat and in the middle of the L-IV horizon were culturally-placed and are associated with the erection of DS5. Since we were unable to note any stratigraphic evidence of a pit cut associated with the monument, it appears that the stone was placed in a pit just large enough for the stone’s
base. No artifacts, bones, or other cultural materials were found. We also excavated a small open-center oval feature (Figure 1.21) 47.5m and 100 degrees (mag.) from DS5. The rocks had been chosen for their large blocky size. We excavated a 1x.50m trench through the center of the feature, finding two soil levels: Level I being unconsolidated wind-blown sand, and Level II being a tan sandy soil level 20-30 cm thick containing charcoal stains and a large quantity of calcined bone. The fragments appeared to be quite robust and were probably from a large animal, most likely a horse, although species determination was not possible. A small AMS charcoal sample was obtained here but has not yet been dated. Our future work will include dating a number of these features to determine their chronological relationship with each other and the deer stone and kharigsuur constructions, about which there is disagreement over what they represent (contemporary sacrifices in honor of the central ceremonial figure? accretional sacrifices phased over time? horses or other species?

Figure 1.22. GPS mapping Ulaan Tolgoi Deer Stone 4 in 2003. View southeast.

Figure 1.23. Excavation map of Ulaan Tolgoi DS-4 area.
etc.). Since many of the burial mounds at Ulaan Tolgoi site would require huge efforts to excavate, investigation of their outlying features may be the most effective way to study these complex constructions.

In 2003 and 2004 we returned to Ulaan Tolgoi to expand our deer stone work and map the mounds and features in the surrounding region (Frohlich, Gallon, and Bazarsad 2004, and this volume). We excavated and mapped seven features associated with DS4 (Figures 1.22, 1.23), finding horse skulls and sections of neck vertebrae and sets of hooves in five of the seven (Figure 1.24 a, b), but few artifacts other than small, hand-sized pecking stones (Figure 1.25). Excavations at the base of the deer stone setting failed to produce charcoal or other datable materials, but a charcoal sample (S7) found a few centimeters from a pecking stone and a small piece of burned ceramic at the base of the cultural deposit produced a date of cal. 3220-2950 BP. This pecking stone had been used around its entire surface, while others were found to have working edges that matched the grooves forming the outlines of the animals and other elements in the carvings. We therefore believe these stones were used to produce the engravings. The presence of pecking stones within the horse burial features and in the lower cultural level allows us to suggest a direct link between the horse sacrifices and the production of the deer stone art and therefore, probably, their erection and dedication. AMS samples of tooth remains from several of the horse skulls found in the features surrounding DS4 provide some of the first absolute dates for deer stones, which has long been a subject of debate, beyond the general agreement of their
Late Bronze-Early Iron Age attribution (Jacobson 1993:146). These features formed a ring of six horse head burials each located 2-4 meters from the deer stone. AMS dates on bone from three of the horse skulls excavated in 2003 (DS4 Features 1, 2, 3) also produced ages of cal. 2800-3250 BP, conforming to the 2002 west trench S7 charcoal sample but not to a charcoal date in the upper level of the Feature 2 horse head burial excavated in 2002, dating cal. 2320-2050 BP. In 2004 we excavated three new horse head features that completed the ring of features surrounding DS4, and these also produced dates of cal. 2800-3200 BP. The bone dates from the horse head burials and one of the two charcoal dates from DS4 support the interpretation that the horse burials and the carving of the stone itself took place as part of a single ceremony. These dates are slightly later than dates obtained from excavations of two horse head features at a deer stone site at the Tsatstain Khoshuu site south of Tsaaganuur in 2004, one of which has been dated with a result of cal. 3330-3060 BP.

Khirigsuur and Mound Mapping

Deer stone studies are part of our broader investigation of Bronze Age ceremonial and mortuary complexes in Hovsgol aimag. Toward this end, Bruno Frohlich began a detailed mapping survey in the Erkhel Lake and West Darkhat region in 2002 using a satellite mapping system capable of millimeter-scale accuracy (Frohlich, Gallon, and Hunt 2003; Frohlich, Gallon, and Bazarsad 2004; Wallace and Frohlich, this vol.). These surveys produced detailed maps of hundreds of Bronze Age mound sites (see Appendix 1), which were distributed in a greater variety of topographic locations than previously suspected, ranging from flood plains and river-side locations to the tops of prominent hills. The latter are emerging as a major determinant of khirigsuur and deer stone site locations. Combining the results of selective excavations with detailed mapping of ceremonial site complexes including burial mounds, khirigsuur, and deer stone monuments is beginning to produce important new information on what has been one of the most mysterious aspects of North Mongolian prehistory – specifically, Bronze Age ritual landscapes, patterns of regional variation, and burial ritual, demographics, and artifact associations. (Further detail may be found in Frohlich et al. in this volume.)
In 2002, while surveying on the southwest flank of Ulaan Tolgoi about 1km west of the deer stone site, we found a circular khirigsuur with a central boulder mound that had been excavated by looters only a few days earlier (Figure 1.26). The looters had dug into the central mound, ca. 10m in diameter wide and 2m high, to a depth of about 1.75m, encountering a burial about 1 m below the ground surface. We found a human skull in the bottom of the pit and collected it and a small bag of bones, the majority of which were resident marmot and mouse, but some goat or sheep remains had been placed in the grave with the deceased. No horse or cattle bones were present.

The Ulaan Tolgoi deer stones were made of high quality granite that was not available on site or in the rest of the western part of the Erkhel basin. However, the hill rising on the south side of Erkhel Lake has abundant outcrops of excellent granite, and inspection showed this location had been used recently to quarry architectural building stone (Figure 1.27). Modern extraction was by the plug-and-feather technique, and in one instance a single rectangular block of granite 15m long and 3m high had been cleanly split out of the hillside. Scattered down the hillside were many blocks with dimensions similar to those of deer stones. Some of these slabs had weathered out of the bedrock whose parallel cleavages were stained with the same type of iron deposits found on deer stone surfaces. Quite likely Erkhel hill is the source of the Ulaan Tolgoi monument slabs.

At this point it is too early to offer generalizations about deer stones and khirigsuur, although some significant progress has been made. Neither we nor others have found human remains associated directly with deer stones. In the case of Ulaan Tolgoi deer stone site we have found DS4 was ringed by at least six horse head burials containing east-facing horse heads packaged with the seven cervical neck vertebrae and four hooves, and that the features are placed in a planned circular arrangement around the deer stone, arguing strongly for synchronous placement ca. cal. 2900 BP. The presence of fist-sized pecking stones found in and around the horse head features provides further evidence of contemporaneity between the horse burials and the carving of the stone. It thus appears that in this case the erection, carving, and horse sacrifices were conducted in a single ceremony. Further, it seems likely that other stone features located outside the horse burial features may also have been part of the dedication ritual, an idea that will have to be tested with future excavation.
Distant Echoes: A Cache of Shamanistic Objects

A rather different ritual find was made in 2001 at the top of Angarkhai Hill, Arbulag sum, between Muron and the Darkhat Valley. While camped here one evening, we found a shaman’s cache in the cleft of the rocks at the summit of what is locally called ‘Shaman Hill’. The cache had been placed here perhaps a decade or more ago in a small wooden packing crate. At some point the box had been opened and its contents had been scattered about. A shaman’s drum lay in front of a cleft in the rock together with the drum beater, and inside the cleft we found metal shaman ornaments, including a small bronze libation cup, several mouth harps, a tin cut-out depicting a shaman with a feather headdress, and other ornaments (Figure 1.28). Respecting the nature of the deposit, we photographed the collection and left the offering in place. I was impressed by how similar these materials were, particularly the drum, to objects we had been shown by the Dukha shaman at her tent at Menge Bulag. Ten years ago I had found what may have been a shaman’s cache in Yamal, thousands of miles to the northwest, which also contained a metal cut-out figure of a shaman (Fitzhugh and Golovnev 1998). Such similarities are striking demonstrations of the power of ritual and artistic concepts to spread across vast distances, as seen in Siberian elements found at the 1500 year old Ipiutak cemetery in Alaska.

Climate History Studies

Ideas expressed in a paper by Stephen Young about Mongolia’s palaeoenvironmental history and ties with the Arctic and Beringia (Young, this vol.) have begun to be pursued in collaboration with geologists Michael Rosenmeier and Kevin Robinson of the University of Pittsburgh. In 2003 we assisted Kevin’s lake sediment coring program in the mountains west of Tsaganuur which has produced data on changing climate and environmental conditions over the past 4000 years (Robinson et al. 2004). Kevin’s work led to Michael Rosenmeier’s 2004 field sampling project in which he collected environmental and biological samples (horse teeth) as part of an isotopic study of climate and environmental change.

Forensic Studies

In mid-September, 2003, Smithsonian forensic anthropologists Bruno Frohlich and David Hunt traveled to Ulaanbaatar to assist the Institute of Archaeology recover
information from a huge mass grave that had been discovered at Hambiin Ovoo within
the Buddhist Gandan Monastery in Ulanbaatar (Frohlich et al. 2003, 2004). It is believed
this site may contain the remains of as many as 3000 monks. At the time nearly 1200
remains had been removed. Collaboration between the monastery, the Mongolian Academy
of Science, and the Smithsonian is providing the first professional forensic studies of a
sample of these remains, believed to have been victims of the Stalin-inspired purges of
1937. Frohlich participated in a second forensic project in late May 2004 at the invitation
of Naran Bazarsad of the Institute of Archaeology, involving the recovery of a group of
mummified remains from a cave in the southern Gobi near the Chinese border, reported
in this volume.

Conclusion

Although it will take several more years for these studies, including those in the
tundra and West Darkhat region, to develop sufficient data, our long-range goal is to develop
a regional chronology that dates and describes cultures, settlement patterns, and adaptations
so that this information can be compared with better-known regions like Egiin Gol (Crubezy
et al. 1996; Honeychurch 2004) east of Hovsgol and the Tuva taiga to the north. A primary
goal of this research is to determine how the steppe-taiga boundary influenced cultural
development and animal domestication and how cultural and ecological boundaries have
shifted in response to changing climate and historical events.

A second goal has been to investigate the Mongolian Bronze and Iron Age cultural
and ritual landscapes (Askarov et al. 1992; Bokovenko 1994; Sementsov et al. 1998;
National Museum of Korea 2002) by mapping and excavations at the Ulaan Tolgoi site.
Our research applies GPS mapping, modern recovery techniques, and anthropological
perspectives to determine feature function, site history, and construction sequences. Major
questions to be resolved include the precise radiocarbon dating of deer stone art styles,
the function and relationships between burial mounds, khirigsuur, deer stones, and their
associated features, most of which contain cremated (datable) animal remains. These
studies will help us understand Bronze and Early Iron Age world-view and ritual landscape
patterns, as well as social and religious functions of deer stone monuments.

A third goal of this research is to begin to assess Mongolia’s role in the origins
of Scythian art and the hypothesis that the elaborate ‘Mongolian style’ deer stone art is
an early form of Scytho-Siberian animal art. I hope to be able to test the possibility that
Mongolian Bronze and Iron Age art spread eastward from the Mongolia-Sayan region
into northeast Asia and the Bering Sea, as Carl Schuster and Edmund Carpenter have
proposed (1951; Schuster and Carpenter 1986). Hopefully this work and related studies
in East Asia will confirm why Siberia has so far failed to produce prototypes – following
the Larsen-Rainey hypothesis – for the origins of early Eskimo art, whose death masks,
ivory ornaments, shamanistic elements, and animal motifs seem more closely related to
Mongolian and East Asian forms and art than to Siberian.
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References


Plumley, Daniel and S. Battula. 2002. We are Dukha: This is the Way of our People. Cultural Survival Quarterly 24(2):19-21.


Song, Yaoliang, 1992. The Deified Human Face Petroglyphs of Prehistoric China. Hong Kong: Joint Publishing Company Ltd.


Монгол бол Төв Азийн үсээс археологийн хувьд бага судлагдсан газруудын нэг юм. Гэвч Монгол үлс енгэрсөн 10 жилийн түрш улс төрүйн шалтгааны улам хүдсэн хаагдмал байдлаасаа салж, олон улсын эрдэмтээн судлаачидтай хийх хамтын ажиллагааны үе мээрхэн хурдааж байна. Баруун болон Төв Азийн холбосон Үндэсний Байгалын Туухийн Музей Смитсонийн Институт Монгол бол Төв Азийн бусад бусад нутгийн соёл хамардаг байдал нь иргэнийхээ зөвхөн амьдарч ирсэн хун ардын соёл зан заншилд Монголчуудын оруулсан хувь нэмэр чухал байсан нь дамжигчийг зөвлөж чадахад болно.

“Буган чулуу хошоо” теслийн гол зорилго нь Монголын хойд болон дорнод хэсгийн газар нутаг нь бусад бусадын улдан холбоотой эсэх талаар, бусад нутгийн соёлд бусад хайрлалт буй эрэгчдийн үеийн соёл нь хүндтэй болсон байна. Пермафрост ба амьтны аймктай гэх мэт орчин тойрынхан хувь Монгол нь түүл тойрнын үеийн соёл нь дамжигчийг зөвлөж чадахад болно.

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“Буган чулуу хошуу“ теслийн гол зорилго нь Монголын хойд болон дорнод хэсгийн газар нутаг нь бусад бусадын улдан холбоотой эсэх талаар, бусад нутгийн соёлд бусад хайрлалт буй эрэгчдийн үеийн соёл нь хүндтэй болсон байна. Пермафrost ба амьтны аймктай гэх мэт орчин тойрынхан хувь Монгол нь түүл тойрнын үеийн соёл нь дамжигчийг зөвлөж чадахад болно.
холбогдох буган чулуун хөшөөний он цаг, бутээг, агуулгыг гүнзгийрүүлэн авч узэх, Цаатангүүдийг угсааны зүйл, экологиийн талаар судлаж, улмаар цаг агаарын дулаарал нь үздүү амьдарлын хэв маягт хэрхэн нийлэнж байгааг мөн тодруулах зорилготой байлаа. Түүнээс гадна Дархадын хоторын бусиний нь агаар байгал орчны түүхийн судлаж, эдгээр нь соёл иргэншүүдийн хөгжилд хэрхэн нөлөөлдөө нэрэнгийг тодорхойлох нь төлөвөөс байсан юм.

Ур дүн: Буган чулуун хөшөө, хиргүүр бархан эвстийн үеийн байгаль дэлхийг шигүүлэн зан уйлд нь арилгагч тодруулан авч узэх, Цаатангуудыг угсаатны зүйл, экологийн талаар судлаж, эдгээр нь тогтворноос хэрхэн нийлэлж байгааг мөн ажиглаж байсан юм. Тууныс гадна Дархадын хотгорын бусийн цаг агаар байгрын орчны туухийг судлаж, эдгээр нь соёл иргэншүүдийн хөгжилд хэрхэн нөлөөлдөө нэрэнгийг тодорхойлох нь төлөвөөс байсан юм.

Тууныс гадны Дархадын хотгорын бусийн цаг агаар байгрын орчны туухийг судлаж, эдгээр нь соёл иргэншүүдийн хөгжилд хэрхэн нөлөөлдөө нэрэнгийг тодорхойлох нь төлөвөөс байсан юм. Дархадын хоторьын барханын тодорхойллоо тодруулан авч узэх, Цаатангуудыг угсаатны зүйл, экологийн талаар судлаж, эдгээр нь тогтворноос хэрхэн нийлэлж байгааг мөн ажиглаж байсан юм. Тууныс гадны Дархадын хотгорын бусийн цаг агаар байгрын орчны туухийг судлаж, эдгээр нь соёл иргэншүүдийн хөгжилд хэрхэн нөлөөлдөө нэрэнгийг тодорхойлох нь төлөвөөс байсан юм.

Буган чулуу хөшөөний суднаагаанаас гадна GPS буюу Газарзүйн байршлын системийн зурганд оруулсан зуу зуун булш, хиргүүр болоо хүрлээний үеийн оршуулын газрын өөрөөгүй зүйл, хүрлээний бүрэн цахин байдал, хүрлээний хөгжлөө болон иргэншүү болон хөгжилд хэрхэн нөлөөлдөө нэрэнгийг тодорхойлох нь төлөвөөс байсан юм. Эдгээр нь тогтворноос хэрхэн нийлэлж байгааг мөн ажиглаж байсан юм. Эцэстэн бусиний барханын орчны орчмын ур дунд Хүн нэгдлийн уеийн орчмын ажлын зүйл байсан гэж хэлж байна (Фрэол, энэ дугаарт).

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Скифчуудийн урлагийн бутээлүүдийн галаас гагц зүтгэл Монголчуудын хувь нэмээлээ оруулсныг батлах судалгаа ба Жакобсон (1993) болон бусад судлаачдад Монголын буган чулуун дээрх урлагийн бутээл нь Скиф-Сибириний амтанд дурсагдсны угсны хэсээ болох тухай ооллууд нь Улаан Толгой МЭО 3000 үеийн тэрээс зүйл болохоо болох буган чулуун хөшөөний судалгаагаар урагшаал боломжит олол байгааг мөн ажиглаж байсан. Эдгээр хөшөө чулуун дээрх сийлбэр буюу үнэнээ ихээл төстэй урлаг нь Монгол-Саяаас узэн тийшээ гарах Зуун болон Зуун хойд Азияр дамжин Берлинтүүн ээгсүүлт хэрсэн байр болох талаар Карл Шустериийн (1951) анхны ээсүүлсэн оолны угсны хөлөглөл байгаль зүйл болон зүйл боломжтой болохоо нь энэ олдсон олдвороос харахад байна. Хэрвээ бид үүнийг
лавшруулаан судлаж чадах юм бол Сибирийн эртний Эскимосчуудийн урлаг нь үүний дотор үхэхэн хүний нуурний баг, зааны ясан гоёл чимэглэл, бөгийн хэрэгсэлүүд, амтантай холбоотой зан үйлүүлгээ тэх зэрэг нь яагаад Сибирийн урлаг соёлтой холбоогоосоо илүү Монгол болон Зуун Азитай ойр холбоотой байгаа нь улмаар Larsen-Rainey-гийн харилиц хамаарлын таамаглал батлагаахгүй байсан шалтгаанд хариулт өгөх боломжтой.

Geographer Oi. Sukhbaatar, Director of the Mongolia Reindeer Foundation, riding a reindeer out of the West Taiga hills. (photo: Fitzhugh)
Even though it is traditionally known that Mongolians count sheep, goat, horse, cow and camel as their five major herding animals, reindeer husbandry has been the sixth animal herded for over a thousand years. Every Mongolian knows that reindeer live in Hovsgol province, specifically in the northern Hovsgol areas of Ulaan uul, Renchinlhumbe and Tsagaannuur. Beginning in 1985, there were efforts to relocate the reindeer in the Tsagaannuur area to make reindeer herding more viable; however, the reindeer herders continued to possess reindeer in the border areas of Ulaan uul and Renchinlhumbe, the neighboring administrative units.

The word “reindeer” is *tsaa buga* in the Mongolian language, which is a shortened version of a longer term meaning “white deer.” Thirty to forty percent of the reindeer are white-colored and almost all of the animal’s rear parts are white/gray-colored. Therefore, earlier Mongolians used to call the reindeer “white deer” (*tsagaan buga*), and throughout history the shorter version became *tsaa buga* in Mongolian. Moreover, the reindeer herders are called “Reindeer people” or *Tsaatan* in Mongolian.

I believe that the forest and taiga regions in northern Mongolia are the original steppe areas where mankind started breeding and pasturing reindeer. Of the four families of reindeer in the world, the Mongolian and Tuva reindeer are the largest. The average height of an adult reindeer in Mongolia is 110-125 centimeters and its average weight is 120-220 kilograms. Thus, while in most countries the herders harness several reindeer together as one, Mongolian and Tuva herders saddle reindeer just like they saddle horses. Also, their use of reindeer is similar to practices used for riding and burdening oxen, horses, and elephants. Mongolian reindeer have an ability to travel 40 km per day carrying 60-120 kg loads through the uneven rocky road in the mountain forest (*taiga*) areas. Because the reindeer’s walk is light and easy, the long journey does not tire riders as much as horseback riding does. Reindeer riding is the most convenient means of transportation around the forest area because reindeer are capable of enduring hardship in the mountains, such as not getting stuck in the mud and not slipping on rocks. These features result from a combination of the animal’s innate abilities and long-term training. In Mongolia, the reindeer herders have, over many years, simplified the work of herding reindeer. It has been said that when more
herders practice raising livestock, the process becomes easier and the animals get larger.

Other evidence that supports our opinion has been found in some archaeological sites. Soviet scientists published an article showing images of reindeer at a rock art site found in Tuva, located close to the Mongolian border, which became a part of Soviet Union in 1944. A similar reindeer rock art site was also found near the Zuun turag Mountain’s Har Nart Rock in Sagil, Uvs Province, in Mongolia. In June 1968, our group, guided by a skilled cattle breeder, Buyanjargal, and other local people, took a trip to Tsagaan Otog Valley near the Har Nart Rock and discovered the rock art displaying a reindeer herder with a long hunting spear (Figure 2.1).

Tsagaan Otog Valley is a sheltered place protected against bad weather, and there are, as a consequence, rocks with rock art drawings of wild goat, deer, wolf, and hunters with bows and arrows (one of them shows a male hunter with spread legs). Looking at the three different hunters (one is on foot, another is riding a horse, and the last one rides a reindeer), we know that the rock art dates after the Paleolithic period because the hunters were riding the horse and reindeer without saddles. Also, wild goats, reindeer and hunters were described as indicating the importance of male dominance. Possibly, the rock art was done during the end of the spring and beginning of the summer season because the ēter, the Mongolian name for a male reindeer, had fewer and shorter branches (three branches) of horns and also a large fat chest.

These rock art sites demonstrate that hunters of that time were very organized and hunted in groups with horses, reindeer, and dogs due to the difficulties of hunting wolf, wild goat, and deer in the rocky mountain area. Observing the reindeer (ēter) rider, seeing him without a hat and the recognizing the reindeer’s short horns, it is possible that hunters choose the beginning of the summer season for a special purpose, for this is the time when newborn wild animals are still young and are in collective groups. The hunting spear is estimated is estimated to have been 3.5-4 meters long by comparing it to the hunter who was holding it. The hunter had tied three different ribbons (not laces) around the pointed area at the middle and the end of the spear. These ribbons may be related to either shamanism or hunting practice. The middle ribbon was drawn very close to the reindeer’s mouth and it was hard to tell if it was one of the ribbons or was tied to the reindeer’s tongue. Typically, when reindeer get overheated and sweaty during a ride they walk with their mouth wide open, tongue hanging out, and pant.

The Tsagaan Otog Valley rock art suggests that reindeer breeding and riding began in Mongolia around 4000 years ago. In addition, there are some deer rock art sites found in Tagna, the rock mountain area between Buhmoron River and Uvs Lake in the western part of Mongolia. In some depictions at these sites it is difficult to tell whether an animal shown
is a deer or a reindeer. There is, in addition, another deer rock art site found in Shovgor Zaraa Rock of the Buregkhangai unit in Bulgan province in the central part of Mongolia that might illustrate reindeer. Moreover, we have heard from some local elder cattle breeders that there is rock art of a man with a deer on a tether that is found in Hanbogd, Omnogobi province near Mongolia’s border with China. Around 1980 we tried but failed to find that rock. The local cattle breeders were certain of its existence and criticized our inability to find the site. If this rock art is ever found, it would provide sufficient evidence from Mongolian archeology to prove that ancient Mongolians used to breed not only reindeer but also deer. There is also a rumor about rock art depicting a man with a tethered deer in another region, the mountains of Baga Bogd and Arts Bogd, in Uvurkhangai province in central Mongolia.

The rock art site at Tsagaan Otog Valley provides archaeological evidence that Mongolian reindeer herders began breeding, riding, and using reindeer some 4000 years ago. Additionally, it holds an important place as one form of the ancient heritage of the Tsaatan people’s art and culture.

History evidence from old scripts documents that Mongolians have bred and herded reindeer for about 1000 years. Persian historian Rashid-ad-din, who was the prime minister of Persia at the time, mentioned Mongolian herders with reindeer living in the northern Mongolian mountain area in his book, Chronicle Sudra. As he said, the mountain forest population herd reindeer, ski, and hunt; yet, they do not breed sheep and goats. He also mentioned that they used to frighten their daughters by threatening to marry them to sheep herders. Reindeer are the cleanest and most odorless animal among the domesticated animals; so, it is reasonable that they tried to scare their daughters by threatening to marry them to a herder who stinks like sheep. Reindeer herders still use a short and wide ski called “khaag” in the present days. The khaag is covered with horse fur wrapped it so that the hair angles back against the snow, making it easier for the skier to walk uphill while permitting one to slide downhill. The khaag not only represents the reindeer herder’s ancient culture and tradition, but also it is also an important game and hunting tool. The short length of the khaag allows the skier to easily ski on uneven and bumpy trails. Also it is a very handy tool for hunting because a hunter can slide down quickly from high places, and the tip of the ski is unbreakable. Moreover, its horse fur cover helps the hunter to get close to a wild animal without making noise.

Logically, it is probable that throughout history, residents of the southern part of the mountain forest region adopted cattle breeding from their herder neighbors of the steppe. Reindeer, as a kind of deer, is the most common form of domesticated animal found in the forest mountain zone; therefore, after domestication the practice of breeding and herding reindeer would have quickly spread to the residents of the central and northern parts of the mountain zone. From the 17th to 19th centuries, several hundred reindeer were counted as property of the Darkhad and Uriankhai during the cattle population census in the Bogd Shavi recording. Until 1930, Darkhat’s wealthy herders had a large number of reindeer, which they used for herding, hunting, and transportation. They used to buy wheat, cotton, and other goods from the towns of Hanh and Hatgal and carry them to Bus River during
the winter bazaars. They sold goods to the hunters and purchased fur, musk-oil, bile of bear, reindeer horn, and herbs from Tuvian and Uriankhai people to re-sell to Russian and Chinese companies in Hatgal and Hanh. This business proved to be very successful; therefore, they took a good care of their reindeer.

Some Mongolians have continued to practice the tradition of breeding and herding reindeer up to the present time. In the 1950s, when reindeer herders moved back from Tuva to Mongolia after Tuva became part of the former Soviet Union, they left most of their reindeer back in Tuva and lost some of them. For that reason, there were approximately only 400 reindeer in Mongolia in that time. Beginning in the 1960s the Mongolian government sought to encourage the growth of the reindeer population, and through their efforts the population grew to approximately 2280 reindeer as of the winter of 1975-1976. In other words, compared to 1956, the reindeer population grew five-fold. 3000 to 4000 years ago, the reindeer herding territory was much wider, including the northern parts of the present Uvs, Zavkhan, and Hovsgol provinces in Mongolia. But, from that time forward, this habitat shrunk due to the expansion of territory used by cattle herders. Currently, there is less than 6000 square km of territory left in northwest Hovsgol province for reindeer herders. For example, in 1970 there were approximately slightly more than 1000 reindeer in the north Bayanzurkh and west Ulaan-Uul parts of Hovsgol province; but today, the reindeer herding territory has been reduced by 60-80 km at its southern edge. Unfortunately, the number of reindeer has decreased rapidly since 1990, and as of 1997 there were approximately only 500 reindeer remaining. The Tsaa Buga Foundation (Reindeer Foundation) and the Tsaatan association (Reindeer Herders’ Association) have put great effort into decreasing the mortality rate of reindeer and increasing the growth of the reindeer herds. They have helped reindeer herders by providing food supplies, clothing, and medicine as humanitarian aid. Furthermore, they have achieved a decrease in the mortality rate such that the reindeer population has increased to 650, thanks primarily to medical programs treating reindeer diseases.

Despite these gains, the reindeer population remains very low and subject to catastrophe. Historically, Mongolia has been a territory where mankind started breeding reindeer and was the place where many nations and tribes, particularly those residing in cold and harsh winter climates, were saved from hunger. Therefore, like recent generations of this land, it is our responsibility, duty, and honor to save the endangered species of reindeer and to help increase its population. If we pay more attention to this work we will attract the interest of scientists, researchers, and humanitarian workers from the rest of the world who will come and help us fulfill this goal.
Монголчууд уламжлалт таван хошуу мал гэж ярьж хэвшэн эхдийн ч эхдэн мянган жилийн эмнөөс зургаа дахь терлийн мал буюу цаа бүгдий балчээрийн аргаар малаасаар иргээ. Өнөөгийн Хөвсгөл аймгийн хойд хэсгээг Улаан-Уул, Ренчилихэмбэ, Цагааннуур сумын нутагт цаа буга байдаг тухай монголчууд хэн хүнгүй эмнээ. 1985 оноос Хөвсгөл аймгийн цаа бугыг шинээр байгууласан Цагааннуур сумын нутагт бөөнцүү байршууласан эхдийн ч цаатан ардууд зэрэглээд Улаан-Уул, Ренчилихэмбэ сүмдэн зах залгаа газраар нүүрэнэлхээр явдал хэвэр байна.

Дэлхийд байгаа төрлүүн дүрвөн терлийн цаа бугын уулдрээс Монгол, Тувагийн цаа буга биеэр хамгийн том нь юм. Монголч хөнгөн цаа буга сэрвээгээрээ 110-аас 125 см эндэр, 120-оос 220 кг хуртэл жин татдаг. Иймээс дэлхийн бусад орны цаатангүй цаа бугыг хэд хэдэн заргатхаад хөлөөр хөлөөр, нуураа, жолдог төрөл дагаж явж байна. Чинхэнд шигдэж, асга хандан халпирдагдгүйг унчаатай байгаа цаа бугыг замаар зогсож 40 км хуртэл явж чадна. Цаа бугыг унаж явад нь зөвлөн унаж хэм хүмүүсийн чиглэлд сэргээн болдог нь юм. Намганд шигдэж, асга хандан халпирдагдгүйг унчаатай байгаа цаага бугыг байгаж байгаа замд хамгийн тохиromжтом унсэн юм. Энэн тэр бүгд харшуулж, унлага зөвлөгөн оруулсан үр дагавар юм. Монголд цаа буга маллаж үйлдэлээг туснээ хэлнэ үгүй, ундаас цаа бугыг байгуулж үйлдэлээг туснээ хэлнэ үгүй болдог нь юм. Цаа бугыг унаж явдаг үед нь цаа бугыг хэд хэдэн үед байгаа хэдэн хадны зургийг олж узээрэй. Энэ цаа бугыг унаж явдаг үед нь нэн нэрлэн хэрэглэдэг нь юм. Монголд цаа бугыг унаж явдаг үед нь нэн нэрлэн хэрэглэдэг нь юм. Монголд цаа бугыг унаж явдаг үед нь нэн нэрлэн хэрэглэдэг нь юм. Монголд цаа бугыг унаж явдаг үед нь нэн нэрлэн хэрэглэдэг нь юм.
чирэгдэх зориулалдсан нь тодорхой байна.
Цагаан етегийн хад наа дурслэгдсэн зургаас үзвэл Монголд цаа буга хөлөглөх явдал дор хаяж 4000 жилийн өмнө хэвшмэл болсон байна. Усн нуураас Бөхөрөн гөлөн хоорох орших уул хадан (Тагнын салбар) бүгнэ зураг сийлэгдсэн нь олон байхын зэрэгцээ буга, цаа буга хоёрны алины боловч тодорхойлоход эргэлэээтэй бугын хэд хэдэн дүрс бий.
Бичиг сударт ч гэсэн Монголд 1000 шахам жилийн өмнө цаа буга мэллж байсан тухай мэдээ бий. Персийн түүхч Рашид-ад-диний (Тухайн уедээ Ил хаант улсын өрөнхий сайд байсан) “Судрын чуулган”-д (ОН дарааллын ойлгог) Монголын умард нутгийн ойт уулсар цаа буга мэллж, хонь ямаа мэллдэг, цаа хөлөглөж, ан хийж аж төрдөг иргэд охин аын талын хөнчөө өрд бололж өгөө оглож байсан тухай бичсэн байдаг зэрэгцээ үзэхэд өртний уламжлалтай байсан нь мэлдэгджээ байна.

Ushkiin Uver ‘singing shaman’ deer stone near Muren. (photo: Fitzhugh)
3

Shamanistic Elements in Mongolian Deer Stone Art

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National Museum of Mongolian History

In traveling throughout Mongolian steppe, one soon becomes aware of the beautiful art found on the region’s deer stone monuments. These monuments, which feature deer-figured art, are known as ‘deer stones’ in Mongolian archaeological books and research studies. The largest concentration of deer stones occurs in the Asian and European steppe zone, where approximately 700 have been found associated with historically unique archaeological sites dating to the Bronze and Early Iron Ages dating from 2000 BC to 700-300 BC. Archaeologists have been researching deer stones for more than a hundred years. In Mongolia, the Lake Baikal area, and the Sayan Altai and Altai Mountain regions, there are 550, 20, 20, and 60 deer stones respectively. Moreover, there are another 20 deer stones in Kazakhstan and the Middle East (Samashyev 1992) and 10 in the far west, specifically in the Ukraine and parts of the Russian Federation, including the provinces of Orenburg and Kavkasia, and near the Elba River (Mongolian History 2003).

There are different viewpoints about the origins of deer stone art. According to H.L. Chlyenova, the artistic deer image originated from the Sak tribe and its branches (Chlyenova 1962). Volkov believes that some of the methods of crafting deer stone art are closely related to Scythians (Volkov 1967), whereas D. Tseveendorj regards deer stone art as having originated in Mongolia during the Bronze Age and spread thereafter to Tuva and the Baikal area (Tseveendorj 1979). D.G. Savinov (1994) and M.H. Mannai-Ool (1970) have also researched deer stone art and have expressed other conclusions.

The purpose of this article is not to discuss the various opinions held by the above scientists, but rather to propose some new ideas about understanding some aspects of deer stone art. The deer stone is a specially-decorated and vertically-aligned rectangular shaped rock whose surface is divided into three parts. On opposite sites at the top of most stones one usually finds a carving showing one or two large and one or more smaller round rings, beneath which are shown smaller geometric forms. Between these small uppermost carvings and the usually cross-hatched lower border band there are pecked engravings of one or more beautifully illustrated deer, or, occasionally, some other figures like horses, leopards, wild goats, men, fish, or pigs. These other animals may appear with or without the image of a deer. Additionally, a number of different weapons and tools are shown hanging from a broad border band or belt, and nearby carved bows and arrows and other motifs such as
a chevron or ‘hard palate-shaped pentagonal figure’ may be illustrated. Some deer stones have no animal figures and display only border lines and weapons.

It is clear from the distribution and geographic locations of deer stone sites that this art has been created by nomadic peoples. But it is interesting and significant to understand the spirit of its creation. Researchers have many different ideas about why deer and other objects were illustrated on deer stones. To take a specific example, it is noted on page 120 of the first of the five-volume History of Mongolia (2003) that “Deer are largely concentrated and found throughout the Central Asian regions and their fur, meat, and horns are traditionally used. Also, deer do not harm human beings. Therefore, it has been an honorable and symbolic animal for a long period of time.” On the other hand, as said by researcher S. Dulam, “While ancient inhabitants used to believe in their family representative (symbolic object or totem) as their origin, they also believed that the deer was the symbol or spirit of their creator. In other words, the image of the deer on the stone is related to ancient belief that human beings originated as deer” (Dulam 1989).

Furthermore, American scientist William Fitzhugh speaks about the developments in deer stone rock art research as expanding our knowledge of human face art and early Asian and some European mask-making traditions. Images in deer stones may indicate a long tradition of protective body ritual and decoration related to tattoo use and shamanism. Overall, he supposes that the deer stone monuments represent a spiritualized human body (Fitzhugh 2002).

In order to understand the human spiritual belief regarding deer it is necessary to consider the religious convictions of people of that time. It is likely that ancient human beings had very simple explanations for natural phenomenon and reacted to unfamiliar creatures with surprise and fear and even regarded some beings as superior to them. Researchers have suggested a link between deer stones and shamanism and the beginning of religious faith dating to 700 BC (Purev 1999:19). Consequently, it is logical to understand their intelligence and religious ideas by researching shamanism. Clearly, in a corresponding manner, contemporary traditional knowledge can be of assistance as well.
I would like to briefly describe shamanistic spirituality as it relates to deer. First of all, one of the main items of shamanic paraphernalia is the ongođiin unaa hengereg – the spirit receiving drum – which is made of deer hide (Jamyan 1998:31). A ritual hymn to make the spirit lively is: “Guiding our life and happiness; a young deer is just coming by....” After singing and performing a particular ritual ceremony, the shaman takes off his coat, puts on his shaman attire and starts evoking the spirit. In this manner, the shaman’s steed, the female deer (sogoo in Mongolian), comes to life and says things like, “In separating from its own herd (family), the female deer transformed itself in order to bring success to the conqueror,” and “it leaps into the sky through the power of the chosen hero” (Jamyan 1998:33-34). The idea of this extraordinary and mysterious deer deserves special attention with regard to deer stone imagery.

Likewise, O. Purev, a Mongolian researcher of shamanism, believes that “for a long time, shamans of Mongolian tribes and ethnic groups considered the female deer as heavenly steeds” and identified them with their shamanic paraphernalia and implements. One might therefore expect to find some correspondence between the role of deer in Mongolian shamanism and on deer stones. From our point of view, the practice of shamanism, tattoos on the frozen man from Pazyryk (Figure 3.1), and the deer image on deer stones (Figure 3.2) might be similar and may relate to deer as magical-fantastic stallions that lead dead people’s souls to heaven, the “dark space.”

Another interesting image illustrated on deer stones is the ‘palate-shaped pentagonal figure’ as conventionally described by researchers. A number of scientists have researched this figure and proposed various ideas. For example, V.V. Volkov and Novgorodova consider
this pentagonal figure as an armor shield or something similar to a human chest skeleton
found in shaman's ritual clothing (Volkov 2002; Novgorodova 1975). D. Tseveendorj and D.
Erdenebaatar have expressed similar opinions, regarding it as representing an armor shield
(Tseveendorj 1976; Erdenebaatar 2000), whereas M. H. Mannai-Od sees similarity to the
image of a wooden house found in the Boyarskii Rock art site (Mannai-Ool 1970). D. G.
Savinov agrees with the idea of a shield but believes new research may suggest alternative
interpretations. For instance, he supposes it could be some kind of 'container' for the dead
to inhabit during the transition before becoming re-animated again (Savinov 1994).

This image has been in dispute among researchers and scientists for a long time
but heretofore has not been interpreted with respect to traditional shamanistic practices
and implements. It struck us that this palate figure was very similar to a similar design
on the grip of the shaman's drum as seen by its image and symbolic concept. According
to shamanistic belief, human or animal body parts including a "main spine, four tsol
(consisting of the liver, stomach, heart and kidney), 10 joints, and 80 vessels" and objects
symbolizing the Four Elements were commonly embodied in the shaman's drum (Purev
1999:250-251). In view of this ritual, there has been the tradition to carve pentagonal palate
designs on shaman drum beaters to represent a spiritual steed's spine and ribs. Another
piece of evidence supporting our explanation is the illustration of animal spines and similar
figures found on the handle of a shaman's drum on display at the National Museum of
Mongolian History (Figure 3.3 and 3.4). Furthermore, during the 2004 expedition of the
Mongolian-American Joint Deer Stone Project 2004, we recovered several old implements
of shamanic paraphernalia which had been defaced and rusted by nature on Angarkhai
Mountain near the town of Sumber in Arbulag (Figure 1.28). These shamanic belongings
have been preserved and are now displayed at the National Museum of Mongolian History.
Among these implements is a drum handle that displays the palate design. A similar design
is also carved into the a drum beater recovered at the same site (Figure 3.5). Apparently
the custom of illustrating the palate design on the inner part of the drum is a common and
long-standing tradition in Mongolian shamanism.

Additional facts supporting this idea may be seen in a wooden shamanic implement
in the state museum of Bayan-Ulgii province that carries this design. This image is quite
comparable to the image found on deer stones (Figure 3.6). One of the traditional ritual
ceremonies practiced by shamans is to transform a dead shaman's drum into a spirit drum

![Figure 3.5 The drum handle and drum beater of the Angarkhai Hill shaman drum.](image)
by cutting the drum’s crosspieces (handles). The cut drum is commonly buried with a dead shaman so that he or she would not be carried to hell (Purev 1999:326).

Thus, we suppose it is no coincidence that the ‘palate-shaped pentagonal figure’ (Figure 3.7) on deer stones and the images on shaman drum handles, beaters, and other implements are so similar to each other. From this point of view, we suggest that the pentagon figure on deer stones is neither a shield nor a skeleton; instead, it is the general image of a spine representing a generalized animal body. In other words, this image is closely related to the ritual of a dead person’s next life and its soul and spirit. It is interesting to note that there are similar portrayals in ornaments commonly called “unjlaga” (dangler) by researchers. These ornaments are from Bronze Age archaeological sites and are mostly found in Mongolia and elsewhere in the Euro-Asian region. Hence with future study we may find new ways of interpreting and understanding deer stone art and ritual with better knowledge of Mongolian shamanism and its symbolism and paraphernalia.

References


Монгол орны хүрэл болон темер зэвсгийн түрүү үед холбогдох томоохон дурсгалын нэг бол буган чулуун хөөрөө юм. Буган чулуун хөөрөө үйл тархалт, газар нутгийн байршил дурсэл эрөнгөрөө нүүрлэлдүү дурсгал өлдөг юм маргааныг бөгөөд харин түүний үгийг учир, бүтээлдүүлэн оюун сэтгэлэлээний ёндс нь олон тооны судлаачдын сонирхлыг татах байна.

Энэхүү өгүүлэлд бид буган чулуун хөөрөө түүнд дурсэлгдсэн буга болон бусад дурсэлгүүлдүүлэн учир холбогдол туухай зариим нэг таамаглал дзвуу цохийг зорьсон юм. Ялагчид судлаачдын "тагнай хээтэй таван талт дурээ" хэмээн нэрлэсэн бүх өчлөгдөхийгоо бүтээн бөгөөд нүүрлэлдүү дурсгүүлээд байхыг ажиглаж байна. Буган чулуун хөөрд тархалт, өрхийрүү газар нутгийн байршил дурелэл зэргээрээ нуудэлчдийн дурегал гэдгийг маргааныг өгөгдөж байна.

Буган чулуун хөөрөөн тархалт, өрхийрүү газар нутгийн байршил дурелэл зэргээрээ нуудэлчдийн дурегал гэдгийг маргааныг өгөгдөж байна.

Бүтээлдүүлэн нэрлэсэн "тагнай хээтэй таван талт дурээ" нь зөвөөцөлд нийлж үгүүлдэгийг дээд мэргээд байдаг. Буган чулуун хөөрөө түүнд дурсэлгээд нэг бол буган чулуун хөөрөө юм. Буган чулуун хөөрөө үйл тархалт, газар нутгийн байршил дурсэл эрөнгөрөө нүүрлэлдүү дурсгал өлдөг юм маргааныг бөгөөд харин түүний үгийг учир, бүтээлдүүлэн оюун сэтгэлэлээний ёндс нь олон тооны судлаачдын сонирхлыг татах байна.
There are approximately twenty red-paint rock art sites known from the mountains of Mongolia, eight of which are in Hovsgol province. These rock art sites are differentiated from the other rock art sites in other provinces by their stylistics, image, and color. We would like to share our ideas and assumptions about these sites with other researchers and specialists.

**Tolijgii Boom Rock**

Tolijgii Boom Rock is located on the left bank of the Khug River, 3km east of Soyo and 40km west of the town Ulaan Uul in Hovsgol aimag. Ancient artists created this red-painted rock art portraying water birds (special spirit-helpers of North Asian shamans), wild animals, cattle, men in square fences, and other round symbols. From the archaeologists’ point of view, these rock art sites correspond to the Late Bronze Age (Gochoo and Dorjsuren 1957; Dorj 1963).

In 2002 our Mongolian and American research team made a detailed analysis of this site (Figure 4.1). It is placed in a rectangular area of a rock cliff face and has dimensions of 8.5m by 3.8m. The images illustrate a water bird, a human figure, and various signs inside a square fence, as well as a tribal symbolic motif, a deer, a horse, and a horse carriage. Some of the most archaeologically significant images have been vandalized and destroyed in recent years. One part of the image depicts a flying water bird (Figure 4.2) together with a number of dots on the right hand side of a square fence and two men with spread legs and arms. There are 64 dots arranged in geometrically order in another square fence with a man positioned on one side of the fence (Figure 4.4). In the middle of the rock face there exists a square fence containing a man inside a square of signs (Figure 4.3). This type of style representing men as dots is similar to the art style of the Stone Age.

The most interesting part of this painting is a carriage (too defaced and faint to be photographed), which was located in a 70 cm by 20 cm rectangular area and shows two wheels with 6 sectors each. The diameter of the wheels is 9 cm or 8 cm and the length of the axis was 8 cm. There are two horses and a man with wild animals on both sides of this carriage, but the image of the animals has been defaced. This is the first instance in Mongolia showing a red-painted carriage, making it especially significant. Sites with dark
Fig. 4.1. Tolijgii Boom rock art site near Soyo in 2002. View to west.

Fig. 4.2. Tolijgii Boom site with defaced panel showing water bird.

Fig. 4.3. Tolijgii Boom site showing defaced panel with a human inside a field of dots.

Fig. 4.4. Tolijgii Boom site showing a person outside a field of dots.
red images of men and deer are of interest because of their primitive images and early date, corresponding to the Neolithic and Bronze Age.

The historical acts, depictions, and periods represented by these paintings express the following points. First, it specifies family lifestyle in which humans designated a water bird as the symbol of their family totem and their territory's Bronze Age boundary. Second, it indicates that the economy included hunting and cattle breeding and the use of carriages. Third, the art shows evidence of a long tradition of recording family-related activities through different colors and shades. For example, the painting of the double-wheeled carriage corresponds to 800-600 B.C., whereas the painting of the water bird and the dots representing men and animals in the square fence corresponds to the Bronze Age. And we presume that the method and style of the painting of the men with deer relates to the Neolithic (Sanjmyatav 2003).

**Bichigt Bulag**

According to the archaeologists E.A. Novgorodova and Sanjmyatav, the red-painted art sites depicting wild animals, cattle, men, and numerous dots in square fences found on the left side of Delger Lake 45km northwest of the town of Bayanzurkh correspond to Bronze Age (Novgorodova 1984; Sanjmyatav 1993).

Studying the content and structure of the art leads us to the following conclusions. First, the depiction of a man and numerous dotted signs inside a square fence illustrates the movement and settlement of a family group. On the right side of the image there is a figure of a water bird together with large and small circles. This demonstrates a small family separating from a larger family group and living as neighbors. Second, the depiction of two long lines connected together with one vertical line, of people leading and riding horses, and of three individuals holding their hands indicates that cattle breeding was being practiced. Third, the sketch of hunters shooting wild goats and other animals with arrows confirms that hunting played a supporting role in the family economy (Figure 4.5).

There are two different panels painted in a rectangular space 60cm by 50cm, located near the right edge of a high rocky mountain 200m northeast of Bichigt Bulag. In the first panel there are seven rows with 49 dots positioned in a square fence area, which has a dimension of 22cm by 21cm. Two people are placed inside the fence. The second square fence has the dimension of 21cm by 21cm and contains 7 rows of 65 dots and includes one person at the edge of the fence. Also, two people and one flying water bird are depicted on the right side of the fence. The method and style corresponds to 2000 B.P.

*Figure 4.5. Bichigt Bulag.*

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**Rock Art**
Narangiin Bulag

There is another red-paint rock art site on the edge of Narangiin Bulag (Sun Creek), located on the eastern side of Delger Lake 25km southwest of the town of Bayanzurkh. This site occupies a rectangular panel of 80cm by 34cm. Its faded red paint depicts 7 rows and 10-12 columns of 76 dots in one square fenced area measuring 34cm by 26cm (Sanjmyatav 1993). Above this fence are 11 lines having lengths of 3cm, and 5 people, some of whom are standing on these lines. Several people are seen holding hands above and below the fence (Figure 4.6). This depicts the movement of a small family unit separating from the main family and dates to the Bronze Age.

Teeliin River Cave

Teeliin River Cave is located 30km northwest of the town New Ider in Hovsgol province. The cave entrance is crooked and vertically rectangular in shape with a width of 2.5m and gets narrower as one proceeds inside. The middle of the cave has dimensions of 1.5m wide and 1.25m height. The dark red-painted art location was created on the right side of the cave wall. The art illustrates different human body shapes and their physical activities using three different colors: dark red, black, and faded orange. It differs from other art sites in not displaying wild animals and cattle.

The red-painted depiction of a human in the middle of the panel is the most common subject of events shown. 80cm above ground level several human figures with pointed hats on their heads are depicted with cross marks (X). The human figures have thin necks and short backs and are seen with long fingers and raised hands. To the left is another red-paint image illustrating people 48-50cm high kneeling down and raising their hands. There is a vertical cross sign next to them as well. There are also depictions of two people painted in black shown holding hands in the traditional way which has received much attention from researchers. These people have huge heads, large necks, short stature, large stomachs, and short legs. They are raising their hands and spreading their legs, and there is a long twisted tool and a vertical cross sign next to them. Moreover, on the right edge of the rock, 37cm above the ground, a high-lighted figure of 15cm high stands with his two arms wide open. This image corresponds to both Neolithic and Bronze Ages in its method of depiction and combines usage of dark red, black, and faded orange colors.

Cave Rock

There is a small rocky mountain called Cave Rock on the bank of the Ider River located 2km from the center of New Ider (Figure 4.7). The dimension of the panel is 8cm by 2.5cm. The cave has a height of 1.6 m and a width of 2.5m. On the right side outside the cave door is a red-painted figure of a standing man 18cm tall with arms wide open. He has a huge head, as if he is wearing a bear head mask, a large neck, and a short slender body (Figure 4.8). The man is shown spreading his legs and expanding his palms with his
fingers spread out. Through his attitude and action it is likely he is praying to the earth, sky, and heavens, asking his wishes to be granted. The painting probably corresponds to the Neolithic.

Some scientists, including the Russians A.P. Okladnikov, V.V. Volkov, E.A. Novgorodova, and Mongolian archeologists D. Navaand and T. Sanjmiatav, believe the red-paint rock art depicting birds, people, and dot signs in square fences found in the Mongolian mountains demonstrates the structure of families and the number of its members (Okladnikov 1962; Volkov 1967; Novgorodova 1981; Navaan 1975; Sanjmyatav 1995). D. Dorj, on the other hand, insists that the bird is a representative of family safety and a symbol of growing cattle and herds, whereas D. Tseveendorj considers this art represents agricultural activity and ritual ceremony (Dorj 1963, Tseveendorj 1983).

Scientists have contradictory theories and explanations for the following reasons. First, we lack of information about some of the red-painted art found in various areas. Second, many paintings have been damaged by the elements or have been vandalized by humans and their contents are often not clear enough to interpret meaning or draw correct conclusions. Third, there has been no comprehensive research investigating the distinctions and similarities of the styles, sites, tombs, and burial places found in the region. Consequently, researchers have reached different opinions about design, content, and date.

However, researchers have come to some conclusions on the origins, development, and chronology of red-painted art in Mongolia. Taikhar in Arkhangai province and the Dulaan Uzuur and Zuraa sites in Uvs province date to the Neolithic (Perlee 1960; Okladnikov 1981; Tseveendorj 1977). Additionally, according to D. Dorj the red-paint sites at Ih Tenger Canyon, Gachuurt Canyon, and Toliigii Boom Rock correspond to the Bronze Age, specifically 1200-100 B.C. (Dorj 1963). D. Navaan dates these sites to the end of the second millennium B.P., whereas V.V. Volkov considers the origins of the rock art sites at Ih Tenger Canyon, Gachuurt Canyon, and Bichigt Bulan as being from the Bronze Age (Navaan 1975; Volkov 1967). Moreover, V.V. Volkov believes these sites can be correlated to ancient rock art by their location and tradition. N. Serodjav suggests that the red-painted art corresponds to the Bronze Age and the beginning of the Iron Age. Red-paint rock art found in Bichigt Bulan and Gachuurt Canyon is thought to date to the
Scythian era (Serodjav 1977; Novgorodova 1981), while I believe most Mongolian red-painted rock is dated to 3000-2000 BP and corresponds to the Neolithic, Eneolithic, and Bronze Age. I conclude that the red-paint rock art sites found in Hovsgol province can be dated to the above time periods as well.

Some comparisons can be made between the red-paint rock art sites in Hovsgol province and other provinces in Mongolia and neighboring countries. First, the Hovsgol sites differ from art in other Mongolian provinces by their contents, image components, and color. Second, while there are people and numerous dot signs inside square or oval shaped fences in rock art sites in Mongolia, fences are not shown in rock art found around Lake Baikal in Russia (Okladnikov 1967). Another difference is that the proportions of the human body are poorly expressed and are very primitive in the Mongolian art. Religious beliefs in the sky, heaven, and nature is strongly illustrated in Mongolian art. In addition, the image of the bird, thought to represent the individuality of the family, is not depicted in the Baikal region, nor are people shown engaged in physical activities, which suggests they were not yet involved in husbandry activities; indeed, they practiced earlier forms of gathering activities. I suggest that some of the red-paint art at Cave Rock, Teeliin River Cave Rock, and Tolijgii Boom Rock corresponds to the Neolithic and Eneolithic. Third, the red-painted rock art found in the rocky hills near Lake Hovsgol's rivers and lakes includes the symbol of a bird representing the family and a man inside of a square fence. They signify the independence of the family and the boundary of their territory.

Hovsgol art also illustrates figures of cattle, herds, and horse carriages with equipment that played an important role in animal husbandry. This suggests that human beings of that time had already shifted to animal husbandry and cattle breeding; thus, it was a period when hunting activity played a supporting role. Consequently, the red-paint rock arts at Tolijgii Boom, Bichig Bulan, and Narangiin Bulag should correspond to the Bronze Age.

One of the most significant archeological sites in the world is the red-paint rock art site of Gurvan Tsenkheriin Gol Cave (Triple Blue Rivers Cave) in Hovd province. Its faded red-dark brown and red-colored paintings contain a variety of wild animal figures that date to the Paleolithic (Okladnikov 1967). It has been suggested that this site is related to Hovsgol province cave art. Particularly, the rock art at Teeliin River and Cave Rock have three different colors: dark red, black, and faded orange. Next, it illustrates a family lifestyle and a faith in heaven and nature; hence, it is apparent that the art was done during the Neolithic. In this point of view, Hovsgol’s red-painted art site shows a continuous development of the rock art traditions seen at Gurvan Tsenheriin Cave.

As for the development of social structure, red-painted rock art suggests two main propositions. First, it indicates the family-based lifestyle of the Neolithic. Second, it is obvious that the structure of the family, husbandry, and society is described. For these reasons, the art provides ideas about historical events dating to the Bronze Age when the extended family structure began to break down and small families began to separate from the larger corporate family group.

Family-oriented animal husbandry began when people shifted to cattle-breeding.
The act of hunters shooting wild animals with arrows along with hunting dogs proves that hunting activity continued to play a supporting role in their economy at a time when carts and carriages were beginning to be used as tools of transport. This was a period when humans shifted from a gathering and hunting economy to one based on manufacturing and food production.

Research on red-paint art sites in Hovsgol area rock art shows progress in the use of new aspects of style, color, and descriptive method. As a result of this study we have new understandings of the Neolithic period, when the family structure was changing as a result of emerging technologies of food production and transport during the Neolithic, Eneolithic, and Early Bronze periods.

References


Dorj, D., 1963. Historical Research Studies on Mongolian Archeological Rock Art Sites, Ulaanbaatar, 8. (in Mongolian)


Gochoo, Ts, and D. Dorjsuren, 1957. The Archeological Field Report on Central and Western Provinces in Mongolia in the Year of 1955. Mongolian Science Center Research Study, Department of Social Science, Ulaanbaatar, 2. (in Mongolian)

Navaan, D., 1975. Eastern Mongolia During Bronze Age. Ulaanbaatar. (in Mongolian)


Perlee, Kh., 1960. Taikhar Rock, Ulaanbaatar. (in Mongolian)

Sanjmyatav, T., 1992. Archeological Field Reports from an Expedition in Hovsgol. Center of Historical Studies, Ulaanbaatar. (in Mongolian)


Sanjmyatav, T., 1999. Archeological Field Reports on Expedition in Hovsgol, Center of Chinggis Studies, Ulaanbaatar. (in Mongolian)


Tseveendorj, D., 1983. Art Sites Found in Mongolia during Neolithic, Ulaanbaatar. (in Mongolian)

Хөвсгөл аймгийн нутаг дахь эртний хадны зүргийн зарим дүрсөгөлт газрууд

Т. Санжмытав
Чингис судаллын төв
Улаанбаатар, Монгол

Монгол орны байгалийн хадан дээр улаан хүрэн зоосон будгаар дүрсөгөлт зураг сүг 20 гаруй газраас олдсоноос Хөвсгөл аймгийн нутагт 8 байна. Эдгээр зоосон зүргийн зохиомж, зүрғийн бэрхэл, энэ бусад аймгийн нутгаас олдсон зоосон зүржуудас ялагаатай байдаг тул мэргэжил нэгт судлаачидтай санал, дүржөлтөө бололоо зарлигт тавьсан юм.

Толгой бөммийн хадны зоосон зураг: Улаан уул сумын төв хойш 40 км-т байгaa Толгой бөммийн ханан хадан улаан хүрэн зоосон бүгдээр шувуу, ан амьтан, мал, дөрвөлжин хашлага дотор хүн, олон дугарга гэсдгийг эртний хумуус зурсан байна. Энэ зурагийг 2002 оны Монгол-Америк хамтарсан археологийн шинжилгээний аргын орчим судлалын зүрэн зурааг амьтан зүрэг холбогдохойд жинээлээ өвөлөө бүрдүүлж байна. Мөн зоосон зүрэг эртний хумуус сүүлээс нь хөдлөөлөж байна. Харин хүн, бүгд амьдрах зүрэг нөөлттөө үед зоосон бололтой.

Бичигт булан аймгийн хадны зоосон зураг: Баянзурх сумын төв хойш 45 км-д Дэлгэр мөрөн бөмөл хөөсэн дэх Ханан хаддан улаан хүрэн зоосон бүгд бүгдээр шувуу, ан амьтан, мал, дөрвөлжин хашлага дотор хүн, олон дугарга, археологийн судлан МЭФ II жил холбогдуулсан байна. Энэ зурагийг 200 м орчимд амьтан ханан хадан улаан хүн бүгдээр сүүл хүн, олон дугарга, археологийн судлан МЭФ II жил холбогдуулсан байна. Мөн зоосон зүрэг эртний хумуус сүүлээс нь хөдлөөлөж байна. Харин хүн, бүгд амьтрах зүрэг нөөлттөө үед зоосон бололтой.

Бичигт булан аймгийн хадны зоосон зураг: Баянзурх сумын төв хойш 25 км-д Дэлгэр мөрөн бөмөл хөөсэн дэх Ханан хадан улаан хүрэн зоосон бүгд бүгдээр шувуу, ан амьтан, мал, дөрвөлжин хашлага дотор хүн, олон дугарга, археологийн судлан МЭФ II жил холбогдуулсан байна. Мөн зоосон зүрэг эртний хумуус сүүлээс нь хөдлөөлөж байна. Харин хүн, бүгд амьтрах зүрэг нөөлттөө үед зоосон бололтой.

Анхаа хадны зоосон зураг: Шинэ-идэр сумын төв бүгд бүгд хойш 30 км-д Тээлийн голын хөөсэн дэх Ханан хадан улаан хүрэн зоосон бүгд бүгдээр хар, бүгд бүгдээр шувуу, ан амьтан, мал, дөрвөлжин хашлага дотор 78 м орчимд амьтан зүрэг холбогдуулж байна. Мөн зоосон зүрэг эртний хумуус сүүлээс нь хөдлөөлөж байна. Харин хүн, бүгд амьтрах зүрэг нөөлттөө үед зоосон бололтой.

Алдарт хадны зоосон зураг: Шинэ-идэр сумын төв бүгд бүгд хойш 30 км-д Тээлийн голын амьтан хөөсэн дэх Ханан хадан улаан хүрэн зоосон бүгд бүгдээр хар, бүгд бүгдээр шувуу, ан амьтан, мал, дөрвөлжин хашлага дотор 78 м орчимд амьтан зүрэг холбогдуулж байна. Мөн зоосон зүрэг эртний хумуус сүүлээс нь хөдлөөлөж байна. Харин хүн, бүгд амьтрах зүрэг нөөлттөө үед зоосон бололтой.
хэрш орны хадны зосон зурагтай харьцуулагч үзэхэд Нэгд: Монгол нутгаас олдсон зосон зуругууд Хөвсгөл нутгийн хадны зосон зураг сэдэвийн агуулга, зургийн бүрдэл, будгийн энгээрэн ялагаатай. Хөрөт: Монгол орны байгуулалын хадан дээрх зосон зураг дөрвөлжин буюу дугаарын тойрог дотор хүн, олон толбон тэмдэг зурагдсан байхад, Орос улсын нутаг Багталь нуурын эмнэл хадны зосон зураг зурагдаж зурагдсан онцлогтой байна.

Агуйн хад бГэл эмгэл гэлэн урьсийн хад, Төлжгий боомийн хадны зарим зосон зураг дөрвөлжин арга барил, утга санааг илэрхийлэх ба байдлыг ын бол энэлтэй үед хамаарууслах санаа дээвүүлж байна. Хөрөт Төлжгий боомын хадны зарим зураг, Бичигт булан, Нарангийн булагийн ханан хаданд зурсан зосон зуругуудын утга санаа бол Онтоодийн биеэ давсны жидаагээр тодорхойлсон тэдний шүтдэг онго болох түрүүгэ дөрвөлжин хашлага гэсэн дотор олон толбо тавьж, ан төрөө хийж, мал мэлж, хесгэ тээврээр зочиж аж ахуй эрхэн явав зэрэг нийгмийн харицааг илэрхийлсэн байдлаар нь хүрэл зэвсгийн үед хамаарууж байна.

Хөөсгөл далай орчмын хадны зосон зурагийн дотор дөрвөлжин хашлагатай байгуулагж 13 байгаагийн 3 нь түрүүгээ дүрстэй байна. Эдгээр хашлага гэсэн дотор 400 гаруй толбо тэмдэг, 80 орчим хүний зураг байгаагаас үзээд нийт хүн ам 500 гаруй буюу хагас сая байжээ гэж таамаглаж болох юм. Улаанбатар хотын эмнэл Бодл углууны ар болсон хүн ханан хаданд нэг дөрвөлжин хашлага гэсэн дотор 300 гаруй толбо тавьсан байна. Монголын хаданд зосон дотор толбо тэмдэг бэх хуусуусны той баргагаалан нэгдээд 1,6 сая хүн байжээ.

Хөөсгөл нутгийн хадан дээр уулаан хүрэн зосон будгаар зурсан дурсгалын түүх соёл, эрдэм шинжилгээний гол ёр дун бол Хөөсгөл нутгийн зөвлөж триатолдснээ зурсан зураг дөрвөлжин зүүн, будгийн энгээ сэдэвийн бүрдэлдээрөө Монголын хаданд зосон зурагийн судалгааг орчуулсан байжугаа, он цагийг неолитын зэрэг цаашлуулагч юм.

Хүн нэгдлүүдийн цусан төрлийн хүн амырлалас Овгийн байгууллын задраал хүчтэй өрнөөсөн түүхээс хөгжлийн сэ байсаныг судалдаж байгаа Хөөсгөл нутгийн зосон зуругууд неолит, энэлэл, хүрлүүн түрүү үнд холбогдуулж байгаагаар тодорхойлогдож байна.
Frohlich's GPS team mapping large khirigsuur mound south of deer stone site at Ulaan Tolgoi site west of Erkhel Lake. (photo: Fitzhugh)
Introduction

During the summers of 2003 and 2004 we carried out surveys of burial mounds in Hovsgol Aimag of northern Mongolia. Three areas were selected: Soyo (Soyo Tolgoi, Ulaan Uul Sum), Ulaan Tolgoi (Erkhel Lake, Alag-Erdene Sum), and Ushkiin Uver (Ushkiin Uver, Moren), all known for large concentrations of burial mounds (Figure 5.1). This report includes data and results of analyses based on both field seasons. Since the analytical work is still in progress we are presenting statistical information on mound variation based on our 2003 survey at Erkhel Lake. Some of this information has previously been presented in the Smithsonian Institution Arctic Studies Center report, *Hovsgol Deer Stone Project 2003 Field Report*.

Our sample size improved from 282 mounds recorded in 2003 to a total of 530 mounds in 2004. We accurately predicted that enhancements in sample size would improve our statistical procedures initiated in 2003. However, it also introduced new challenges including new patterns in the mound distributions not observed in the 2003 data. Such changes are the product of several factors including: (1) improved sample sizes, and (2) a realization that the diversity found within the mounds and their associated environments is much more complicated than first anticipated. Data is still being processed and analyzed, thus information presented in this report should be accepted as tentative.

We decided not to include references in this paper, nonetheless we want to credit Mongolian, American and Russian researchers for making their data and results available to us. This is especially true for the information in the ‘Background’ section. Among many, we would like to point out W. Fitzhugh, F. Allard, W. Honeychurch, D. Rogers, D. Erdenebaatar, D. Tseveendorj, W. A. Fairservis, R. C. Andrews, E. Jacobson, J. Bayarsaikhan, and Ts.
Ochirkhuyag. References can be found in the *The Hovsgol Deer Stone Project 2003 Field Report*, pages 58-61, (published in May 2004 by the Arctic Studies Center).

**Previous Research**

Mongolia is covered with Bronze Age burial mounds. Some are huge, extensive, and extremely visible on the landscape while others are barely identifiable. Both the amount of mounds scattered across the Mongolian landscape and which time periods are represented by mound structures are unknown. Mounds, also known as ‘khirigsuur’ or ‘kurgan’, have been reported extensively by Russian, Mongolian and more recently Asian, European, and American researchers. Many excavations have been completed, producing results currently visible throughout scores of scientific and popular publications that document years worth of data and fieldwork.

The Mongolian Bronze Age endured from the mid-2nd millennium BC to the 4th century BC. At the beginning of the Bronze Age the people inhabiting Mongolia and adjacent regions had commenced a transformation from a sedentary, agricultural subsistence strategy to nomadic pastoralism. This transformation is believed to have been complete by 900 BC. The causes for this drastic change are unknown, though several researchers have suggested that climatic changes and perhaps an economic transition to increasing demand for products of animal husbandry may have been significantly causal. Reconstructing the lifetime of these magnificent people, who succeeded in developing a social structure and economic system that endured for more than one thousand years and achieved far ranging cultural homogeneity through rapid mobility—despite a very low population density—is a fascinating process.

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Figure 5.1. Areas of 2003 and 2004 research.
While no temporary or permanent settlements have been identified for this period, Bronze Age Mongolians produced multitudes of enduring stone monuments that required an enormous input of manpower.

The known monuments have been classified into three major categories (1) slab burials, (2) khirigsuur, and (3) deer stones.

**Slab Burials**

Slab burials are centralized burial pits covered with stones and surrounded by a squared wall consisting of upright slabs of flat stones creating a protective wall-like fence. The distribution of slab burials ranges from the Khangai mountains west of Mongolia to Inner Mongolia in China, to the Gobi region in the south to the Lake Baikal area in the north.

**Khirigsuur**

Khirigsuur is the Mongolian name for Bronze Age burial mounds. The word for burial mound used on the Russian side of the border is 'kurgan.' The typical khirigsuur consists of a centralized burial chamber covered with un-worked stones (central mound). This mound of stone is surrounded by a wall (fence) which can be either circular or squared (Figures 5.2 and 5.3). During our surveys in 2003 and 2004, 530 khirigsuur and a few slab burials were recorded. We determined that sizes of the khirigsuur range from a few meters (4m) in length/diameter to more than 100m. Additionally, we found that some of

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**Figure 5.2. Ulaan Tolgoi Class III mound with circular fence.**

**Figure 5.3. Ulaan Tolgoi Class I mound with squared fence.**

Burial Mounds
the larger khirigsuur were surrounded by from one to almost a hundred external structures including smaller mounds with diameters between three and five m, and circular stone rings with diameters between 2m and 4m. Francis Allard has reported the existence of several huge khirigsuur in the Khanuy Valley, some of which exceed 400m in maximum length/diameter and which are surrounded by almost 3,000 external structures, including smaller mounds and small ring features.

The distribution of khirigsuur ranges from the Khentii mountains in eastern Mongolia to the Bayan Olgii province in western Mongolia and from central-southern Mongolia to Lake Baikal in the north. Some khirigsuur have also been reported in the Chinese Xingjian province.

Very few khirigsuur have been completely excavated. D. Erdenebaatar reports that only 16 khirigsuur have been completely or partially excavated and published, all located in southern Siberia and in northern Mongolia. Surveys and excavations completed by Francis Allard, of the University of Pittsburgh, comprise some of the most extensive research excavations and surveys on khirigsuur in the Mongolian Khanuy Valley.

**Deer Stones**

The third group of Bronze Age structures is the deer stone monuments. The deer stone monuments consist of upright stone slabs bearing beautiful anthropomorphic carvings and images of animals (Figure 5.4). On rare occasions they may depict human faces. The maximum height of the slabs has been reported at about 2.5m, and a minimum height of about 1m (sizes are difficult to determine because of the destruction of many slabs leaving, less than 1m of stone remaining). The deer stones’ function has been extensively discussed by several researchers. Esther Jacobson’s 1993 publication *The Deer Goddess of Ancient Siberia* offers a detailed and authoritative description and analysis of the deer stone images depicted by Eurasian nomads during the Bronze Age, and William Fitzhugh has described recent research of deer stone complexes in Hovsgol aimag.
The two most common expressions of khirigsuur: Mounds with circular fences and mounds with squared fences. Central mound: the centrally located pile of stone including burial chamber. Circular fence or squared fence: the surrounding wall of stones, either circular or squared. Small mounds: externally located smaller mounds. Small ring-features: externally concentrations of stones forming rings.

The temporal relationship between the three classes of monuments is not fully known or understood. William Fitzhugh has suggested a temporal connection between deer stones and khirigsuur. This is supported by our surveys and analyses of spatial mound distribution adjacent to deer stone complexes. However, more research is needed to fully understand this interaction.

The distribution of deer stones far exceeds the ranges of the first two categories (slab burials and khirigsuur). Deer stones have been reported from Inner Mongolia in the south to the Buriatiia area around Lake Baikal in the north, and from the Khentii province in eastern Mongolia to the farthest end of western Mongolia. Similar monuments have also been reported as far west as Ukraine and other countries in Eastern Europe.

**Field Seasons, 2003 and 2004**

Our survey and excavations of burial mounds was initiated in the early summer of 2003 and continued in 2004. In the 2003 field season, we recorded 258 mounds, focusing on surveying in the Soyo and Erkhel Lake/Ulaan Tolgoi areas. In addition, 24 mounds were recorded in the Ushkiin Uver area. The 2004 survey added 248 mounds, covering new finds within the Soyo and Erkhel areas and the recordings of 110 mounds a few kilometers west of the deer stone complex at Ushkiin Uver (Table 5.1). It should be emphasized that the 2003 recording of mounds in the Ushkiin Uver area was strictly for the purpose of calibrating our equipment, thus this survey did not include a comprehensive search for all the mounds surrounding the Ushkiin Uver deer stone site. Also, data on the additional 110 mounds recorded at Ushkiin Uver in 2004 does not include any GPS or metric data. The 2004 field season concluded with the excavation of two previously looted mounds in the...
Soyo area, which yielded both human and horse skeletal remains from the central burial mound and from small mound structures, respectively.

The majority of the 530 mounds were found on the valley floors or flat steppe and on southern, southwestern and southeastern facing hillsides. Rarely did we find any mounds on the hills' northern side, although a few were identified on the flat steppe adjacent to the northern side. This phenomenon may be related to extensive tree coverage on north-facing hills, a feature which appears to be missing on most of the southern hill slopes. The larger mounds tend to be located on the flat land or steppe. Medium-size and smaller mounds are located on hillsides, and usually decrease as hill elevation increases. We found a few larger mounds in ‘saddles’ between hills and some smaller mounds at lower elevations. In four instances we observed some spatial association between deer stones and burial mounds, most clearly at Ullaan Tolgoi and at Ushkiin Uver. Two additional deer stone sites were found in the Soyo area, though they are much smaller than the sites at Ulaan Tolgoi and Ushkiin Uver. At the Soyo sites we found unambiguous evidence of clandestine excavations, possibly indicating the removal of some of the better preserved or more decorated deer stones.

In general, the average khirigsuur consists of a centrally-located concentration of stones (central mound or central burial mound) surrounded by a low stone wall which can be either circular (circular fence) or squared (squared fence). Each corner of the squared fence may include one or more standing stones or small mounds some of which may contain burials. It is unclear if such corner burials are contemporary with the central mound (Figure 5.5).

Many khirigsuur are surrounded by external mounds (small mounds) located east or west of the circular or squared fences (Figure 5.6). In addition, small rings of stones (small ring features) may be found in circular patterns external to the small mounds. While we are currently unsure whether all of the architectural features found within a defined mound structure are contemporary or may belong to different time periods, we have collected skeletal samples from both central mounds and small mounds for dating.

Our principal research objective has been to collect large enough sample sizes for a statistically significant analysis, and to ensure, from a statistical point of view, that our sample populations represent the complete populations. To accomplish this goal we limited the amount of data to be collected from each mound and focused on the recording of selected variables from all visible mound structures within defined geographical areas. We applied fast and efficient data collection procedures by recording and calculating

<table>
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<tr>
<th></th>
<th>2003</th>
<th>2004</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erkhe Lake</td>
<td>87</td>
<td>31</td>
<td>118</td>
</tr>
<tr>
<td>Soyo</td>
<td>171</td>
<td>107</td>
<td>278</td>
</tr>
<tr>
<td>Ushkiin Uver</td>
<td>24</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>282</td>
<td>138</td>
<td>420</td>
</tr>
</tbody>
</table>
variables such as geographical location and elevation, horizontal distribution, mound density, metric variables, shape, direction of features, and description of remaining burial contents for tombs that had been looted. We used surveying equipment including high precision global positioning systems (GPS), total stations, and basic measuring tapes and compasses (Figure 5.7). Some of the data was processed in the field using small computers operated on generator and battery power. Using a variety of GPS receivers we obtained ranges of precision from five to ten m using hand-held Garmin GPS-12 receivers (latitude and longitude), to better than three centimeters (0.03m) using a base-rover combination of Ashtech/Magellan Locus GPS receivers (latitude, longitude and elevation).

With a GPS precision better than three centimeters we had to ensure that geometrical patterns reflecting mound architecture are displayed as accurately as possible. For example, a known circle with a known diameter on a flat and horizontal surface must be displayed as such after the data has been processed. This objective becomes a function of our ability to record points with high precision, and to use the right algorithms and map projections to produce a ‘real’ circle when displayed or plotted. At first, data recorded on circular fences plotted out as beautiful ellipsoids. In some cases this was partly correct but in most cases unquestionably wrong. After experimenting with known circles on horizontal surfaces we quickly learned that by selecting the right map projections, reference datum and adjusting
for the recording of mounds located on hillsides we could produce consistently and exceptionally accurate, beautiful circles. We selected the Universal Transverse Mercator projection (UTM, North, Zone 47 [96° E - 102° E]) based on the World Grid System 1984 (WGS84). In general the WGS84 corresponds to the North American Datum 1983 (NAD83). Our map references include Russian 1:200,000 topographic series dated to 1972, Russian surveys between 1942 and 1969 and remote sensing data including orthorectified Landsat images. We have found the Russian maps and the geo-referenced Landsat images to be very accurate.

The Ashtec/Magellan Locus GPS receivers were used extensively at Ushkiin Uver and at the Ulaan Tolgoi area. Mounds in the Soyo area were recorded by small hand-held GPS units only. In 2004 we used the Locus GPS receivers to record 55 Soyo mounds which had been recorded in 2003 using the Garmin GPS-12 unit. These duplicate recordings showed that we could repeat our own recordings with acceptable accuracy. Indeed, for each of the 55 recorded mounds, all our Locus recordings, with a precision of 0.03m were located within the point recorded by the Garmin receiver plus and minus 6m.

The 2003 survey of mounds in the Soyo area included all of the mounds in a defined search area south of the Khugiin Gol River. The survey was limited to basic recordings of size, shape, and one center recording of geographical location using hand-held GPS units. This was later extended during the 2004 season to include additional recordings of mounds toward the northeast, south of the areas surveyed in 2003, and a 20km long stretch of land north of the Khugiin Gol River.

General Observation and Statistics

The burial mounds range in size from a few meters to more than a hundred meters in diameter. We divided the mounds into three classes based on location and elevation: Class I: on low elevations and flat land (35%), Class II: on lower slopes of hills (33%), and Class III: on medium to high slopes on hills (32%) (Table 5.2). More than 75% of the larger mounds are found on flat land (Class I) (Figure 5.8) and a majority of the smaller mounds are found at higher elevations (Class III) (Figure 5.9a & 5.9b). 43% include a circular fence, 32% include a squared fence, and 25% of mounds did not include any fence. When calculating the same frequencies, excluding mounds with no fences, the numbers are 57% and 43% for circular and squared fences, respectively.

Table 5.2. Distribution of Class I, II and III mounds. Table does not include 110 mounds visually recorded in 2004 about 5 km west of Ushkin Uver.

<table>
<thead>
<tr>
<th></th>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ulaan Tolgoi</td>
<td>21</td>
<td>60</td>
<td>37</td>
<td>118</td>
</tr>
<tr>
<td>Soyo</td>
<td>102</td>
<td>79</td>
<td>97</td>
<td>278</td>
</tr>
<tr>
<td>Ushkiin Uver</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>147</td>
<td>139</td>
<td>134</td>
<td>420</td>
</tr>
</tbody>
</table>
Some of the medium and larger-size mounds include external features such as smaller mounds and rings of stones (small ring features), that are most often located in straight or curved lines to the east or west of the fences. When the number of such external features is high they will surround most if not all of the basic mound architecture. We found that about 30% of the mounds include smaller external mounds ranging from one single entity to as many as 94. We also found that only 8% of the mounds include small ring features, always external to the fences and the small mounds. Only in one case did we find small ring features but no small mounds. Consequently, it may be concluded that presence of small ring features highly correlates with the presence of small mounds. Additionally, we found that the circular fence surrounding the central mound is always depicted as a perfect circle (Figure 5.10). This is true for all slope distances, thus fences on hills which depict a significant difference between the highest and the lowest points may look like oblique or ellipsoid geometrical shapes when displayed on a true horizontal surface, as is the case when using the Locus GPS system. We also found that the additional structures, such as small mounds and small ring features, are not always depicted as perfect circles but are very irregular (Figure 5.10). In general, small burial mounds do not have such external structures, and it is obvious that the frequency of external structures correlates with increasing size of the general mound structure. It is, however, unknown if the external architectural structures are contemporary with the central mound and the fences.
Deer Stones and Burial Mounds

The temporal relationship between the three categories of monuments is open for discussion. Although we have no data suggesting a temporal relationship between slab burials and khirigsuur, our data suggests a connection between deer stone monuments and khirigsuur. The major deer stone complexes are mostly found on the flat steppe locations, as are Class I mounds. Class I mounds include about 80% of the larger mound structures.

Data collected solely in the Ulaan Tolgoi area in 2003 reveals that out of a total of 87 recorded mounds, nine are in the near vicinity of the deer stone complex. Of these nine mounds, six represent the largest recorded at Ulaan Tolgoi. Indeed, the average size of the six largest mounds is more than three times larger than the average size of the remaining 81 recorded mounds (Figure 5.11).

A total of 327 external structures (small mounds and small ring features) are associated with 17 of the 87 recorded mounds. Of the 327 structures, 266 or 81% are associated with the nine mounds found close to the deer stone complex. Given the assumption that increasingly complex mound construction correlates with increased social, political and/or economical status, this specific location may represent an area of higher ‘importance’ than the surroundings. The deer stones are most likely of spiritual and
symbolic importance, thus emphasizing the social and cultural importance of the location of the deer stone complexes.

Other observations support this hypothesis, although such data still needs to be quantified. Most external structures, especially the small mounds are often located either at the eastern or western side of the circular or squared fences. We determined that mounds located to the east of the deer stones have their external mounds located west of the fences. When mounds are located to the west and northwest of the deer stones, the external mounds are often located to the east of the fences. There are exceptions to this, especially within the group of the nine mounds located close to the deer stones. In such cases small mounds and small ring features appear to surround most of the circular and squared fences, although higher frequencies seem to be found in the direction of the deer stones. These observations are presently being analyzed and will be presented in detail at a later time (Figure 5.11).

On the issue of mound density (i.e. number of mounds per square kilometer (km²)), we find that the Soyo research area covers 195 km² and the Ulaan Tolgoi area covers 16.8 km². In recording 171 mounds at Soyo and 87 mounds in the Ulaan Tolgoi areas (based on 2003 data, only), we determined that the mound density at Ulaan Tolgoi (5.2 mounds/km²) is almost 6 times higher than in the Soyo area (0.9 mounds/km²). However, these numbers
are somewhat misleading. The Soyo area includes a much higher percentage of flat steppe when compared to the area at Ulaan Tolgoi. This is important given that the 2003 survey data indicates that approximately 75% of the mounds are Class II and Class III mounds, and are located on the hills and lower hills only. Regarding ratios between hill and steppe, with adjustment for inconsistencies between Soyo and Ulaan Tolgoi, we find that the 'adjusted' mound density at Soyo is 2.4 mounds/km. This adjusted density is still approximately two times lower than the density at Erkhel Lake. We argue that this difference can be related to the presence of the substantial deer stone complex at Ulaan Tolgoi.

The final results from the analysis of the location of external structures and mound densities indicate a need for an improved, and enlarged foundation of data. The additional mounds surveyed in 2004 and omitted from the above discussion will marginally improve this dearth. The 2004 surveying revealed that the variability of the different mound distributions and patterns may be much more diverse than previously thought. However, this data set is still being processed and will be presented later.

Central Burial Mounds/Burial Chambers

We have not yet completed any archaeological excavations of undisturbed mounds. Such excavations will commence following the conclusion of surveying. We believe that the survey data will allow us to improve our selection process when identifying mounds for excavation. However, increasing incidences of looting have resulted in the destruction of many mounds through clandestine excavations. Inexperienced, non-sanctioned excavators have wreaked tremendous, irreparable damage, particularly as they have not yet learned to use stratigraphic variation and changes in soil densities to select sites for excavations.

Figure 5.11. Four squared and two circular mounds located adjacent to the deer stone complex at Ulaan Tolgoi. The deer stone complex includes five deer stones, two medium size circular mounds and approximate 650 smaller stones.
However, during the 2003 season at Soyo we witnessed a new generation of looters in action, making it obvious that slowly, clandestine excavations are becoming more sophisticated and better organized.

Observations of the buried remains revealed by both sanctioned and clandestine excavations have verified that all exposed central mounds included remains which could be identified as human. We also found that exposed external structures were either empty or included horse skeletons, most often crania, mandibles, and a few cervical vertebrae. Until the human and horse remains have been dated we cannot determine whether the external structures and central mounds represent contemporaneous or asynchronous relationships.

During the 2004 season we excavated two previously looted tombs in the Soyo area and north of the Khugiin Gol river, and found human remains in the central burial chamber and a horse skull and cervical vertebral remains in one of five external mounds (Figure 5.12). We failed to find any material of interest within any of the tested small ring features.

Analysis of Ulaan Tolgoi Burial Mounds (2003 Survey)

A total of 87 mounds were identified within a 16.8 square kilometer area west, northwest, and northeast of the major deer stone monument located 6km west of Ulaan Tolgoi. The study area was defined in relation to topographical features. It is believed that all mounds within the search area have been recorded.

Each mound was recorded by the Ashtech/Magellan Locus GPS system (n = 79). Eight additional mounds, identified the last day of surveying, were recorded by our handheld units (n = 8). These eight mounds were also recorded in 2004 as part of our quality control of data integrity.

The distribution between the various classes (I, II & III) follow the pattern found at Soyo. The larger mounds are found at the lowest levels of the hills and on the flat steppe, while the smallest mounds are found at higher elevations. Two mounds, (E03-29 and E03-30), exhibited significantly different architecture and may belong to different time periods. Mound E03-29 appears to be a typical slab burial with vertically placed flat stones making up the centrally-located burial chamber as well as the four walls creating the squared fence around the central mound (Figure 5.13). Mound E03-30 included a squared fence, and several small mounds. However, instead of locating such small mounds externally east or west of the fence, they were all placed within the four corners constituting the surrounding fence. One additional burial chamber was placed adjacent to the central mound. Apparently, this burial chamber was added at a later time, as indicated by the manner in which the stones were ‘attached’ to the original central mound (Figure 5.14). The remaining mounds appear to follow the architectural pattern described earlier.
Table 5.3. Distribution of mounds with circular and squared fences. Table does not include 110 mounds visually recorded in 2004 about 5 km west of Ushkin Uver.

<table>
<thead>
<tr>
<th></th>
<th>Circular</th>
<th>Square</th>
<th>No Data</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ulaan Tolgoi</td>
<td>55</td>
<td>53</td>
<td>10</td>
<td>118</td>
</tr>
<tr>
<td>Soyo</td>
<td>121</td>
<td>73</td>
<td>84</td>
<td>278</td>
</tr>
<tr>
<td>Ushkiin Uver</td>
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<td>9</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>135</td>
<td>105</td>
<td>420</td>
</tr>
</tbody>
</table>

Ulaan Tolgoi: Squared Fences vs. Circular Fences

Based on 420 mounds recorded during the 2003 and 2004 seasons we identified 180 mounds (43%) that included a circular fence, 135 mounds (32%) that included a squared fence, and 134 mounds (32%) without a fence (Table 5.3). The Erkhel Lake area yielded 51% of mounds with a circular fence and 49% of mounds with squared fences (mounds with no fences have been excluded). The same numbers for the Soyo area are 62% and 38% for those with circular and squared fences respectively. In the Ushkiin Uver area we recorded 31% of mounds with circular fences and 69% with squared fences. However, the Ushkiin Uver data includes a total of 13 mounds only, thus these numbers may be significantly flawed (Table 5.3). We believe that the Erkhel Lake data represents the most accurate data. The Soyo data is flawed by the adding of more than 60 Class I mounds around the Khugiin Gol river, and at the same time, not yet completing the search for Class II and Class III mounds on the southern hillsides north of the river. We argue that the distribution of different types of fences follows an almost 0.50 to 0.50 ratio and that added information based on upcoming surveys will support this assumption. At the present time, we do not believe that our data represents a normal distribution. The following statistics are based on data from the 2003 survey at Erkhel Lake only.

Eighty-two mounds, out of 87 recorded, could be identified either as including a circular or a squared fence surrounding the central mound. Of the 82, 50% (n = 41) were recorded as squared and 50% (n=41) as circular. Five mounds did not yield any information regarding surrounding walls, most likely because of erosion or because they belonged to

Figure 5.12. Dashzeveg Bazargur (left) and Tsend Amgalantugs excavating small mound feature in the Soyo mound no. S04-40 located north of the Khugiin Gol River. A horse cranium, mandible and four cervical vertebrae were identified and collected for dating. Human skeletal remains were found in the robbed center mound. Nothing was found in an excavated small ring feature.
Table 5.4. Squared mound statistics. Ulaan Tolgoi area only. D1 to D4 represent directions of linear lines (azimuths) between corner points.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>35</td>
<td>331°</td>
<td>65°</td>
<td>11.8°</td>
<td>24.2</td>
</tr>
<tr>
<td>D2</td>
<td>36</td>
<td>59°</td>
<td>149°</td>
<td>99.1°</td>
<td>24.6</td>
</tr>
<tr>
<td>D3</td>
<td>35</td>
<td>332°</td>
<td>70°</td>
<td>11.5°</td>
<td>25.7</td>
</tr>
<tr>
<td>D4</td>
<td>35</td>
<td>64°</td>
<td>145°</td>
<td>103.7°</td>
<td>23.4</td>
</tr>
</tbody>
</table>

a different time period. At this time we do not have any indication as to why the central mounds are surrounded by either circular or squared fences. Also, we cannot compare the average sizes directly because of the different geometrical patterns. However, by showing significant and positive correlations between center mound diameters of mounds with the dimensions of circular and squared fences, the diameters can be used as an indicator of differences within the basic mound architecture. For example, the average maximum diameter of the central mounds with circular fences is 8.0 m, and 8.3 m for mounds with squared fences. Showing similar sample size and standard deviation, the correlation coefficient (r) between circular fence diameters and central mound diameters is very high (r = 0.904, P = 0.000). Correlations between the central mound diameter and any of the four linear walls making up the squared fences are similarly very high (0.742 < r < 0.799, P = 0.000). These results allow us to use central mound diameters for both types (circular and squared) as reflections of maximum mound sizes. Consequently, Student-t statistics, based on central mound diameters, show no group differences between mounds with squared fences and mounds with circular fences (t = 0.346, DF = 67 and P = 0.730). Based on this analysis, we conclude that there is no size difference between mounds with squared fences in comparison to mounds with circular fences.

We hypothesize that the choice between either of the geometrical types is based on the presence of either a male or a female body within the burial chamber (central mound). This can only be verified by excavations of burial chambers and a subsequent analysis of the human skeletal remains. If our hypothesis is accepted we may be able to deduce further conclusions, particularly in regards to sex, gender, and status, about the people building the mounds. For example, if the selection of type (circular or squared) is related to the sex of the interred person, and there is no significant variation between the systems in regard to size we may argue for the presence of a more egalitarian society. This may be expected within nomadic or semi-nomadic cultures rather than in sedentary cultures. So far, our sex determination of skeletal remains found in looted burials is tentative, rudimentary, and based on very low sample sizes, and is consequently insignificant for support of the hypothesis. A much larger sample size of human skeletal remains from archaeologically excavated mounds will be require for further testing and possible confirmation of the sex and gender based hypothesis.

Additionally, influences on the directional orientation of the four walled, square fences are under contention. Francis Allard argues that astronomical knowledge informed Bronze Age builder’s directional plans. While we have not yet completed analyses regarding explicit selection processes for direction, in 2003, we recorded the direction of each of
the four wall segments connecting corner points in mounds with squared fences. Such segments are not necessarily linear but can be a non-linear, curved arc connecting two corner points. The directions have been calculated using projected linear chords between corner points. Such chords are derived from the Locus GPS mapping software where all points are projected onto a horizontal plane defined by the map projection (UTM, North, Zone 47, WGS84). In practice, this creates and allows us an independence from variation between the true geographic meridian and the magnetic meridian. In 2004 we recorded the direction of squared fences using a traditional compass and adjusting for the variance between magnetic meridian (magnetic north) and the geographical meridian (true or geographic north). A comparison of the 2003 with the 2004 readings revealed marginal if any differences in the results.

As such, our directional readings are comparable with readings made by Bronze Age people, utilizing astronomical knowledge, such as the position of the celestial north pole. However, we may still have to correct some of our data as variations between celestial directions and squared wall directions may vary depending on how the latter value was recorded, i.e. from a slope or horizontal distance. We have projected directions of chords without finding a specific pattern and suggest that direction is a functional choice related to surrounding topographical features. In the case of larger mounds, especially Class I mounds, the choice may be related to directions and placements of entrances and other architectural features. However, influences on direction may prove much more complex.

The average directions of each of the four walls constituting the squared fences are given in Table 5.4. Standard deviations and sample sizes are similar and the averages of two almost parallel lines are almost similar (11.5° vs. 11.8°, and 99.1° vs. 103.7°). This variation, however, is large enough to create variation between the lengths of parallel lines. Consequently, the average lengths of parallel lines are respectively 15.6m vs. 16.4m, and 14.3m vs. 14.9m. (Table 5.5) In short, the squared mounds are slightly longer in a north-south direction than in the east-west direction.

We have not included any error potentially produced by using data from a horizontal map projection rather than the more relevant use of slope distances. This does not create a problem for the large mounds situated on the flat steppe (Class I), and on the lower
elevations (Class II). However, data from mounds that are defined as Class III and located at higher elevation may produce significantly different results because of the consequent large discrepancy between slope distances and horizontal distances. Therefore differences in the lengths between perpendicular pairs of lines may become more significant given use of slope distances instead of horizontal distances, since the slope is frequently in a north to south direction.

Spatial Distribution of Mounds

During the fall of 2004 all positional data collected for each mound were entered into a Geographical Information System (GIS). GIS creates an interface between relational data base information and a graphic display. This allows us to view and evaluate our information in a graphical mode based on access to topographical maps, and remote sensing data such as Ikonos, Quick-Bird, Spot and Landsat. At this time we have processed the entirety of positional information, size and shape data, class data, and records pertinent to numbers and location of external structures such as small mounds and small ring features. This information may be viewed, in part, in Appendix 1.

At this time we are using Russian 1:200,000 topographical maps and a series of orthorectified Landsat Thematic Mapper (TM) imagery. The Landsat images are based on the combination of visual bands (no. 2), and two infra-red bands (no. 4 and no. 7), creating a natural, color-like image. We have obtained a complete Landsat coverage of Mongolia. As all of the images are geo-referenced, we can select mounds to be plotted using a pre-defined symbol showing a spatial distribution in a defined area. Additionally, the software (ESRI/ArcInfo and Leica/Erdas) can be requested to use different colors or shapes for various attributes assigned to each mound in the data base. For example, all the mounds in the Soyo area could be represented by small circles, using blue for mounds with squared fences and red for mounds with circular fences. Or various classes of mounds could be represented with different sizes, shapes and/or colors. GIS’ power lays in that the information displayed is in an inherently dynamic state. Criteria for display and consequent interpretation can be altered depending on the question, category and the information selected from the data base.
Table 5.5. Squared mound statistics. Ulaan Tolgoi area only. L1 to L4 represent length of linear distances between corner points.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>35</td>
<td>5.0 m</td>
<td>58.0 m</td>
<td>15.6 m</td>
<td>11.0</td>
</tr>
<tr>
<td>L2</td>
<td>36</td>
<td>5.0 m</td>
<td>47.0 m</td>
<td>14.3 m</td>
<td>9.2</td>
</tr>
<tr>
<td>L3</td>
<td>35</td>
<td>4.5 m</td>
<td>57.0 m</td>
<td>16.4 m</td>
<td>11.5</td>
</tr>
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<td>L4</td>
<td>35</td>
<td>5.0 m</td>
<td>50.0 m</td>
<td>14.9 m</td>
<td>10.2</td>
</tr>
</tbody>
</table>

In all of the figures depicting the distribution of mounds, there will be a certain, intentional overlap of the symbols representing the position of the individual mounds. This may be attributable to a double recording of a mound, especially if the mound is located in an overlapping area surveyed both in 2003 and in 2004. In general, the relative symbol size used to depict the mounds exceeds the actual size of the mound, producing an overlap. The relevant statistics can be viewed in Appendix 1 (mounds) and Table 5.6 (deer stones). The precision selected for mounds is one second of arc of latitude (2.8m) and one second of arc of longitude (1.2m). For deer stones, the numbers are 1/10th of a second of latitude (0.3m) and 1/10th of a second of longitude (0.12m). This precision in the displayed coordinates far exceeds the precision obtained with the Garmin GPS-12 receiver, which at the best gives us a precision of between 6m and 10m, but corresponds well with the precision obtained by the Locus GPS receiver with a precision of better than 0.3m. However, this is further complicated by the spatial resolution of the used map image. For example, Landsat images produce a pixel size of 15m by 15m. Accordingly, the high precision we obtain from the GPS receivers becomes rather irrelevant when using Landsat images. However, when the same data is used with images with significantly higher resolution, such as the QuickBird remote sensing images (resolution between 0.60m and 1.0m.), then only Locus receivers will produce a product of similar precision. In practice, we suspect that the deer stone locations are accurate to within 0.5m and that the center location of each mound is accurate to within 10m. The exception to this is the center coordinates for a majority of the Ulaan Tolgoi mounds which should be accurate to within 0.5m.

We have not included the elevation (ellipsoid height) because of the known inaccuracies of this variable when using single unit GPS receivers. However, we have very accurate ellipsoid heights for each recorded point measured by the Locus receivers and will include such data in the tables when the potential for correcting the Garmin data has been fully explored.

**Soyo Tolgoi**

The 2004 season expanded our survey to the north of the Khug River. A total of 278 mounds have been recorded and although related data is still undergoing analysis, information related to spatial distribution and clustering has been generated (Table 5.1). In the area to the north of the Khug River, surveying was only carried out for Class I and Class II mounds, leaving a potentially large number of Class III mounds yet to be identified on the southern hillsides facing the river.
Table 5.6. Deer stone locations recorded to 1/10 of one second. Deer stones at Ushkiin Uver and Ulaan Tolgoi, all recorded individually (Locus GPS receivers). General location, only recorded for deer stones at Soyo and locations between Ulaan Tolgoi and Ushkiin Uver (Germin GPS-12 receiver).

<table>
<thead>
<tr>
<th>ID</th>
<th>LOC</th>
<th>YEAR</th>
<th>TYPE</th>
<th>N</th>
<th>LATITUDE</th>
<th>LONGITUDE</th>
</tr>
</thead>
<tbody>
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<td>UU-DS-1</td>
<td>Ushkiin Uver</td>
<td>2003</td>
<td>Deer Stone</td>
<td>1</td>
<td>49° 39' 19.1&quot;</td>
<td>99° 55'42.1&quot;</td>
</tr>
<tr>
<td>UU-DS-2</td>
<td>Ushkiin Uver</td>
<td>2003</td>
<td>Deer Stone</td>
<td>1</td>
<td>49° 39' 19.5&quot;</td>
<td>99° 55'42.1&quot;</td>
</tr>
<tr>
<td>UU-DS-3</td>
<td>Ushkiin Uver</td>
<td>2003</td>
<td>Deer Stone</td>
<td>1</td>
<td>49° 39' 20.0&quot;</td>
<td>99° 55'42.0&quot;</td>
</tr>
<tr>
<td>UU-DS-4</td>
<td>Ushkiin Uver</td>
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<td>Deer Stone</td>
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<td>49° 39' 21.4&quot;</td>
<td>99° 55'39.0&quot;</td>
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<tr>
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<td>Deer Stone</td>
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<td>49° 39' 20.1&quot;</td>
<td>99° 55'38.8&quot;</td>
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<tr>
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</tr>
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</tr>
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<td>49° 39' 18.9&quot;</td>
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</tr>
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<td>Deer Stone</td>
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<td>49° 39' 18.5&quot;</td>
<td>99° 55'39.0&quot;</td>
</tr>
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<td>Deer Stone</td>
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<td>99° 55'39.0&quot;</td>
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<td>99° 55'39.9&quot;</td>
</tr>
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<td>Deer Stone</td>
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<td>49° 39' 17.6&quot;</td>
<td>99° 55'39.3&quot;</td>
</tr>
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<td>Deer Stone</td>
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<td>Deer Stone</td>
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<td>99° 48' 15.1&quot;</td>
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<td>99° 48' 15.0&quot;</td>
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<td>Deer Stone</td>
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<td>Deer Stone</td>
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<td>49° 55' 55.7&quot;</td>
<td>99° 48' 14.0&quot;</td>
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<tr>
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<td>Soyo</td>
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<td>Deer Stone</td>
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<td>50° 58' 37.0&quot;</td>
<td>99° 22' 26.5&quot;</td>
</tr>
<tr>
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<td>Deer Stone</td>
<td>2</td>
<td>50° 57' 07.1&quot;</td>
<td>99° 20' 47.1&quot;</td>
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<td>DS-COMPL</td>
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<td>Deer Stones</td>
<td>5</td>
<td>49° 48' 54.0&quot;</td>
<td>99° 54'02.8&quot;</td>
</tr>
</tbody>
</table>

One objective for future research in the Soyo area is to verify the extent of the mound distribution. At this time we lack information on mound distribution outside of areas surveyed in 2003 and 2004. We observed some Class I and possibly some Class II mounds during commutes between Soyo and Ulaan Tolgoi and between Ulaan Tolgoi and Ushkiin Uver, however the full extent of mounds between these regions remains unknown.

We have defined three major clustering of mounds within the Soyo distribution: Areas A, B, and C (Figure 5.15). Area A, measuring 10.5 km² includes 97 mounds of which most are defined as Class III mounds (on southern hillsides). Within this group there are four distinct clusters, all located between the base of the hills and the tops (Figure 5.16). Each cluster includes between 20 and 30 mounds and appears to be located on parts of the hillsides that, most notably, face south. Additionally, there exists space, quite similar in appearance an orientation, available between these clusters where mounds might be positioned and still meet the southern hillside criteria. We may find additional criteria for this clustering following the processing of all of the recorded survey data and completion of further archaeological excavations.

Area B includes mounds surveyed during both the 2003 and 2004 seasons. It measures about 18.3 km² and includes 60+ mounds. A majority of these mounds are Class I mounds, defined by their location on the flat steppe (Figure 5.17). Clustering of smaller groups of mounds appears in some areas especially closer to the Khug River. We hypothesize that the original number of mounds was significantly higher and that some mounds have
been significantly eroded by changing flow directions of the Khug River. In general, the Class I mounds found within this cluster are significantly larger than similar numbers in other areas with Class I mounds. Also, since the hills north of the Khug River have not yet been fully explored, we expect to add a significant number of Class II and Class III mounds to our data base following complete survey of the area.

Area C, measuring 16.4 km², includes two small clusters of mounds containing 23 and 21 mounds respectively. A majority of the mounds, especially in the eastern cluster, are Class II mounds, located in the border areas between hillsides and the flat steppe (Figure 5.18). Except for being located in an east–west direction on the upper level of a steep bank, there seems to be no geographical or geological reason for isolating these two clusters. The eastern cluster includes two locations with deer stones (marked as black triangles in Figure 5.18). Both deer stone locations are close to the mounds and both have been exposed to severe clandestine excavations and robberies. At the first deer stone site, there are two deer stone fragments measuring 40cm by 41cm by 29cm and 94cm by 49cm by 25+-/ cm respectively. The larger stone includes carvings similar to those found on deer stones at Ushkiin Uver and Ulaan Tolgoi. The second deer stone site, located within a small cluster of three mounds, includes two deer stone fragments. These mounds are slightly larger in

Figure 5.15. Landsat image of Soyo area, West Darkhat Valley. Areas A, B & C enlarged in Figures 5.16, 5.17 & 5.18. Image size: 20.5 x 23.9 km. Class I, II and III mounds depicted respectively as white circles, grey circles and black circles. Two deer stone sites depicted as black triangles (in Area C). Grey surface colors represent flat steppe land. Black/dark grey colors depict forest. And light grey/white colors depict slopes with little or no vegetation coverage.
dimension than the rest of the mounds within the cluster. The stones measure 297cm by 45cm by 20cm and 125cm by 37cm by 11cm respectively.

We have concluded that the Soyo area includes several clusters of mounds, all exhibiting different distribution patterns. This variation cannot be explained strictly by changes and variations found in the landscape, and correspondingly, must have some dependence on additional factors. These may include factors related to kinship, social status, economical status, spirituality or the variation may even be attributable to mounds and mound clusters belonging to different archaeological time periods. Many of these issues may be resolved with the integration of results from future archaeological excavations.

**Ulaan Tolgoi - Erkhel Area**

A total of 87 mounds were surveyed west of the Ulaan Tolgoi site in 2003; all but 8 of which were mounds recorded using Locus GPS receivers. An additional 31 mounds were recorded, mostly located in the hills northwest of Erkhel Lake (Figure 5.19). Three clusters have been isolated: Cluster A with 64 mounds, located on the southern facing hills west of the deer stone complex (Figure 5.20); Cluster B with 10 mounds, located north of the deer stones; and Cluster C with 26 mounds, located about 6 kilometers east-north-east of the deer stones. No mounds were recorded between Clusters B and C. A small cluster

![Figure 5.16. Soyo area A. Four clusters of mounds all located on southern hill sides. Class I, II and III mounds depicted respectively as white circles, grey circles and black circles. Black areas represent forest growth and grey areas steppe or grass growth. Image size: 3.6km x 3.3km.](image-url)
of 16 mounds was identified on two small hills located about 2 kilometers northeast of the deer stones. Compared to the clustering found within the Soyo Area A, no such patterning is visible at Ulann Tolgoi. The majority of the 64 mounds in Area A are Class II and III mounds, thus found on the southern facing hillsides, while the mounds found around the deer stones are all Class I mounds. The Class II mounds are located on a large slightly hilly plateau connecting the hillsides with the steppe. The Class I mounds surrounding the deer stones appear to be associated with the deer stone complex, as discussed above. The Class III mounds located in the hills do not cluster into groups as observed in the Soyo area but appear to be positioned on the surfaces with the least slope, taking advantage of the few flat areas found on the hillsides (Figure 5.20). A few mounds in Area A have been looted, yielding some human remains.

**Ushkiin Uver**

The 14 deer stones at Ushkiin Uver are surrounded with burial mounds. They are all Class I mounds. We have recorded 24 mounds. This comprises only a small fraction of all the mounds, including Class II and Class III mounds located in the hills toward the west of the deer stone complex. In June of 2004 we observed roughly 100 mounds on the southern hillsides between 3.6km and 5.5km west-south-west of the deer stone complex (Figure 5.21). These mounds were observed and recorded from the top of adjacent hills, and consisted largely of Class II and Class III mounds. An additional 10 + Class I mounds were observed on the steppe toward the deer stone complex.
The Ushkiin Uver mound complex may become the largest and most comprehensive of the three studied areas. The deer stones and the mounds so far identified to the west are all situated within a major complex of hills all very suitable, at least from a geographical and geological point of view, for mound locations. We argue that this approximately 36km$^2$ complex of small mountains and valleys may yield a significantly high number of mounds.

**Discussion and Conclusion**

Our analysis of the spatial variation of mounds based on survey data in three distinct areas in the Hovsgol aimag has proven that it is possible to collect high quality survey data using a combination of advanced GPS receivers and traditional surveying methods. Further, integrating data into a GIS system makes it possible to view and conceptualize the interactions and relationships of various combinations of variables in a graphic environment. Currently, our data has been processed via very simple analytical methods to our data, allowing a basic familiarity with the data. With partial focus on the responses of one or two variables when exposed to a second or third variable with alterable values, we have explored such issues as how size variables alter as elevation decreases and increases and how the distribution of circular and squared mounds varies in the context of the different mound
Figure 5.19. Ulaan Tolgoi research areas. Image measures 10.6km x 9.6km. Each mound, including all types and classes, are depicted by a white circle. Deer stone complex including 5 deer stones depicted by black polygon. Mounds to the west and north of deer stones recorded in 2003 and mounds just northwest of Erkhel Lake recorded in 2004.

Figure 5.20. Ulaan Tolgoi Area A. Mounds with circular fences and squared fences are depicted as white circles and squares, respectively. Mounds with no fences are depicted as white triangles. Because symbol size exceeds more than 100 meters, mounds located close to each other may be 'covered' by a single symbol only. Area measures 4.4km x 4.1km.
Below are summarized results pertinent to classes, clustering, shape, and mound distribution:

1. Mounds are found on the flat steppe (Class I), on southern hillsides (Class III), and in border areas between hills and steppe (Class II). They are classified by size, with Class I mounds being the largest and Class III the smallest. Each class includes approximately one third of the mounds recorded in 2003 and 2004. These fractions may change when we have completed surveys in areas both with known mounds and in those where Class III mounds may be present. All three classes are represented in areas where mounds are identified. However single mounds or small clusters of Class I mounds may be found in isolated areas. We argue that Class I mounds may be younger than Class II and Class III mounds, and that mounds identified as khirigsuur may represent a temporal variation spanning across several archaeological time periods.

2. Mounds cluster into groups. Landscape variation, such as different slope distances, influences the location of mounds. When mounds are located on southern hillsides (Class...
III) the builders tend to select the most horizontally level locations. This also appears to influence the direction of squared fences, optimizing the use of the most horizontally oriented surfaces. In some cases the clustering of mounds cannot be associated with landscape features. We argue that clustering is also caused by factors such as kinship, sociality and economics, and possibly spiritual factors. Most likely, the location of each mound is a product of many components of which slope distances, hillside location, and social factors are just a few.

(3) We found approximately equal numbers of mounds with squared and circular fences. In the Ulaan Tolgoi area, the distribution is proportional, exactly half and half, while in the Soyo area the mounds with circular fences appear to outnumber the mounds with
squared fences. We have not identified any correlation between fence type and landscape patterns. We argue that the two fence types represent a selection process based on kinship, gender or socio-economic factors. At this time we hypothesize that different fence types are related to the gender of the interred individual. This assumption will be tried through attempting to analyze Bronze Age Mongolian conceptions of gender and through more comprehensive excavations to determine the sex of individuals within central mounds. As of yet, excavations and skeletal analyses have been restricted to looted mounds. And the male and female sample sizes are too small for reliable hypothesis testing.

(4) We have not yet determined if high density groups of mounds are present between known groups such as the Soyo and Ulaan Tolgoi or if mounds are found randomly in the landscape in high and low densities in relation to factors such as the presence or absence of deer stones. We have learned that between 50% and 75% of the mounds are very difficult to identify visually. This is especially true for Class III mounds. Consequently we would need to survey a number of areas between known mound locations to obtain a full understanding of the complete spatial distribution and variation. It is unlikely that we will find major groups of mounds similar in size to those found at Ushkiin Uver and Ulaan Tolgoi. However, some Class I and possibly Class II mounds have been observed between these groups. This represents an invitation to take a closer look at the more than 530 km² of hills and valleys located between Erkhel Lake and Ushkiin Uver. Surveying these areas through extensive foot survey in pursuit of our objectives will be one of the next areas of focus (Figure 5.22).

Acknowledgments

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Typical Class I mound. Most Class I mounds are located on the flat steppe and are in general significantly larger than Class II and Class III mounds. (photo: Frohlich)
Хөвсгөл аймагийн нутагт 2003, 2004 онуудад хийсэн хайгуулын явцад илруулен олсон булш, хиргисууруудийг бүртгэх ажлын урдчилсан үр дүнгээс


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(GIS) үндэс бааз болгон хэрэглэсэн болно. Алфа тоо баримт ба векторын графикийг хамтруулан хэрэглэнээ цуглуулах үндэс болно. Альбам ба векторийн хэлбэр ба векторийн графикийг хамтруулан хэрэглэсэн болох нь бидэнд олгосон ба энэ нь оо р аргаар бол биеэлдэх боломжгүй юм.

Бидний одоогийн байдлаар хүрэн урдчилсан ур дүн нь булууныг ангилан ялгаж танихад түүгүйлсэн бөгөөд энэ нь өмнөддүүгүй холбогдох боломжийг бидэнд олгосон ба энэ нь орд аргаар бол биеэлдэх боломжгүй юм.

Булшнуудын ойролцог үлдээд хэлбэрийн ханан чөлөөгүүдөө (йөрөгөгийн хашлагагаа) 45% нь дээрхийг хашлаагаар хэрэглэнээ цуглуулсэн мэдээллээ чухам яагаад ашиглаж суулав ба дуган дуган боломжийг бидэнд олгосон ба энэ нь орд аргаар бол биеэлдэх боломжгүй юм.

Бидний одоогийн байдлаар хурсэн урьдчилсан ур дун нь булшнуудыг ангилан ялгаж танихад түүгүйлсэн бөгөөд энэ нь өмнөддүүгүй холбогдох боломжийг бидэнд олгосон ба энэ нь орд аргаар бол биеэлдэх боломжгүй юм.
ясны хэсгүүд (гавлын яс, нурууны нугаламны яс гэх мэт) зэрэгч дээж болгон авахад бид цагаа зарцуулаган. Булшны функцийн тал дээр бид одоог хүрээгийн санаал зэрэгцэн маргалдааар байгаа бэлээ. Тоногдсон болон сүйтэгдэн болшнаас нугалсан шарилын араг яснууд (хүний ба морьны) мөн түүнчлэн буган чулууны ногоц бүрдээлэн хамаарах араг яснууд (морьны) аль юм удаах хамаарах нь бидний маргаан байгаа ырвигийг системийг ойлгох учрыг нь тайлахад ихээхэн тус нэцэр болно гэж бид нийт дээд байгаа.

Бид 2005 оны судалгааны ажлаар 2 ба 3-р ангилин булын шүүгэд хэсглэн бүртгэлээ тэмдэглээгээр төлөвлөөгчдөө байгаа. Түүнээс гадна, 2004 онд бүртгэсэн булын шүүгэдийн 25% орчмыг тоо баримтаа улам лавшруулан бунартай хөдөөх үүднээс далхийн бүртгэлээ 100 гаран 2-р ангилин булын болон 10-аад 1-р ангилин булын шүүгэдийн тус тус ажиглагдан буртгэлээ. Храмсалтай нь энэ бүртгэл бидний дээр дүрдсэн арга технологийн хиймэл зөвлөх болно. Уушигийн өөр өөр баруун урд хэсгийн буган чулууны орчмоос 100 гаран 2-р ангилин булын болон 10-аад 1-р ангилин булын шүүгэдийн нь борхуунаас хүнсэн бусад Өрөөнд хоёр дээр бүртгэлээ өөрчлөлтөөнөөр хэмжээнүүдийн хүсээгчийн тархалд тээвэр эсвэл буудааны тархалаа сүүлд баярлахад багагүй арга техникийн хиймэл зөвлөх болно. Энэ нь элэхүүд булын шүүгэд Өрөөнд нэгтгэлээ өөрчлөлтөө бүртгэлээ өөрчлөлтөө буган чулууны хүсээгчийн тархалд тээвэр эсвэл буудааны тархалаа сүүлд баярлахад багагүй арга техникийн хиймэл зөвлөх болно. Булшны функцийн тал дээр бид одоогийг дээж болгон авахад бид цагаа зарцуулаган. Булшны функцийн тал дээр бид одоог хүрээгийн санаал зэрэгцэн маргалдааар байгаа бэлээ. Тоногдсон болон сүйтэгдэн болшнаас нугалсан шарилын араг яснууд (хүний ба морьны) мөн түүнчлэн буган чулууны ногоц бүрдээлэн хамаарах араг яснууд (морьны) аль юм удаах хамаарах нь бидний маргаан байгаа ырвигийг системийг ойлгох учрыг нь тайлахад ихээхэн тус нэцэр болно гэж бид нийт дээд байгаа.

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Burial Mounds
Ulaan Tolgoi khrigsuur mound complex south of the deer stone site. (photo: Frohlich)
Introduction

The landscape of Northern Mongolia is covered with small hills of stones that mark the locations of burials. These Bronze Age burial mounds, otherwise known as khirigsuur or kurgan, are the subject of a great deal of study and curiosity in the archaeological communities of Russia, Mongolia, Europe, and America. They consist of a circular pile of rocks surrounded by either a perfectly circular ring of rocks or four linear walls forming a square (Figure 6.1). Some mounds lack these walls because of erosion or other factors, which may include differing time periods. Many of the larger burial mounds are surrounded...
Figure 6.2. Three of the five deer stones at Ulaan Tolgoi. The deer stones are surrounded by more than 650 stones. Two Class I mounds in the background partly obstructing the Russian jeep.

by smaller external mounds. Some are sufficiently large that they are visible from a distance while others are much smaller and can be seen only in close proximity.

We believe that some selection criteria were used for the placement of these mounds, and we will use Geographic Information Systems (GPS) in order to uncover patterns. Although some basic trends are visible from the ground, many patterns are only visible when viewed on a map. We believe that discovering these patterns will lead us to the underlying reasons for mound placement as well as give us directions for future fieldwork.

**Description of data**

Most of the burial mounds in question can be grouped into two general types based on the shape of their surrounding walls: circular and square. However, the shapes of several mounds cannot be categorized since they lack surrounding walls.

There are three basic categories of mounds, aptly labeled Class I, II, and III. These classifications are based on location within the countryside. Class I mounds are located on the flat steppes, Class II on higher ground, on the edges of hills, and Class III on the tops of hills. Mound location strongly correlates with mound size. Class I is the largest, with approximate average diameter of (20m); Class II is smaller (10m), and Class III is the smallest (6m).

Possible patterns of distribution and reasons for mound placement are largely unknown. In some areas, mounds occur in higher concentrations in close proximity to
Figure 6.3a & 6.3b. Soyo area A depicting large concentration of mostly Class III mounds on southern facing hill sides. Top image includes Landsat image (grey colors and black colors represent grass coverage and wood coverage, respectively. Bottom image shows the mound distribution depicted on geo-referenced Russian topographic map. Image size: 3.6km x 3.3km.)
stone monuments commonly referred to as ‘deer stones’. Deer stones are large, upright stone monoliths of consistent shape named for the deer carvings that cover their surfaces (Figure 6.2). Field observations support close association between large groupings of mounds and deer stones.

The builders may have also have based selection criteria on geographical features. For example, mounds appear almost exclusively on the southern slopes of hills, possibly in relation to southern slopes almost never being forested, whereas northern slopes, which rarely bear mounds, being consistently forested. These and other possible relationships will be thoroughly explored through the use of Geographic Information Systems (GIS).

**Application of GIS methods**

Geographical Information Systems (GIS) is a very powerful type of mapping software that allows the user to combine various types of geographical data for analysis. This software can be used for analysis of any dataset that includes information on geographic location. Data sets that can be incorporated into this system include point data from geographic coordinates, digital elevation models, and even scanned maps. The user has complete control over how the GIS is constructed based on the goals of the project. In our case, since we wish to uncover the mound builders’ criteria for mound placement, we will use the GIS to search for patterns in mound location. To achieve our research goals most efficiently, an intentionally simplified GIS system was utilized.

The goals of the project dictate the way that information was collected and has been displayed. Since any patterns would occur on a large scale, our geo-databases included the center points of the mounds. From this a shape-file was created that plots the burial mounds as points overlaying maps and images of the local terrain, so that patterns in the burial mounds in relation to each other, the deer stones, and geographical features would become apparent. Coordinates of the deer stones were included in another layer in the GIS. Any vague impressions of patterning from ground observations can be confirmed or rejected by viewing these mounds in relation to the landscape.

Additionally, this software allows for quick production of maps that differentiate geographic data based on any relevant factor or factors that were originally included as a field in the geo-database. In this case, simply using different symbols for different shapes and types was the most useful for discerning patterns.

Relying on multiple base-maps has also proven very useful in this project. We were able to look at the mound locations overlaying geographical data that were displayed in two different ways. In this case, one background image that was taken from space and resembles a photograph and another background image that is simply a scanned or digitized map were used. On each, terrain and ground-cover are clearly visible, but in different ways. As a result, alternating between the two can reveal more patterns than could be seen on either map alone (Figure 6.3).

**Data**

During the 2003 and 2004 field seasons, the Soyo and Erkhal areas were surveyed
and center points of the burial mounds were recorded. The points taken in the Soyo area were recorded using a handheld GPS receiver with 5m to 10m precision. The Erkhel points were recorded using a dual receiver GPS system with 15mm to 30mm precision.

Due to project goals, time, and funding constraints, only a limited number of variables—concerning information with the highest priority—were recorded. Rather than take points around the circumference of each central mound and surrounding wall, the center points and a maximum diameter were recorded. Since the size of the surrounding walls correlate with the center mound diameter, points were not taken to record their diameter.

In the Erkhel area, circumference points and points defining distinguishing characteristics were all recorded with the Ashtec-Magellan locus system. In the Soyo area, lower precision handheld GPS units were used to record center points. Depending on logistics such as weather, some mounds were also recorded with a compass and measuring tape.

Center points were taken with the GPS system. Latitude and Longitude were recorded in the WGS 1984 system using various formats including Decimal Degrees, and Degrees, Minutes and Seconds. These units were all converted to Decimal Degrees later for the purposes of standardization and simplicity.

In addition to mound type, location, and position, the team recorded other relevant
information, including the classification (Class I, II, and III), the number of visible external mounds, the number of stone rings, whether or not human remains were visible in the chambers of mounds that had been previously looted, and any additional comments.

Since our goal is to analyze relationships between mound location and geography, these geo-databases were used in conjunction with our other data. In order to have a background image to compare the points with, we purchased a group of commercially available Landsat images. This system records light reflectivity of different bands, some visible, and some not. We used images that included bands 2, 4, and 7, which were assigned colors that would make it look like a color photograph. The resolution of these three bands is 30m x 30m. Overlaying these three bands is a panchromatic band that has a resolution of 15m x 15m. Thus producing a resolution about four times higher than the bands that include only three basic colors.

Although these images look similar to satellite photographs, there are several important differences. First, the image was created by compiling recordings of reflectivity on three bands. Those bands were then colored to most accurately mimic the actual landscape. Water appears purple-blue, for example, and cliff faces appear whitish-gray. This means that even if the resolution were high enough, the burial mounds still may not be visible in these images if they reflect light in the same way that the surrounding landscape does.

Fortunately, terrain is visible in these images. We can quite clearly see the crests of hills, for example. In this area of northern Mongolia, trees cover only the northern slopes of hills, and this tree cover stops almost exactly on the crest. The trees appear as a darker green color on these images due to a difference in reflectivity.

We also have several digitized Russian maps at our disposal. These maps include contour lines of uncertain accuracy, place names, etc. The series of maps we are using are on a 1:200,000 scale. These maps were geo-referenced to the Landsat images by matching a number of control points such as river divergence points and other distinguishing landmarks. Overall, these maps correspond to the Landsat images very well. They are useful when paired with the Landsat images because they show relief in contours, supplementing that which is visible on the Landsat images.

Since the accuracy of the elevations accompanying the contour lines of these maps is dubious, no attempt has been made yet to vectorize those lines for the creation of a digital elevation model. If these lines are accurate at least in relation to one another, the resulting digital elevation model could be useful for the creation of a slope map if not an elevation map. This possibility will be considered in the future.

**Results**

Visual analysis of the locations of the Bronze Age burial mounds in relation to each other and to the local geography does yield some visible patterns. After more study, these patterns may be used to create a general profile of burial practices for the builders that can then be confirmed or rejected using data from other areas. The results reported in this paper are based only on the mounds in the Soyo area, since the 2003 survey data from Erkhel is not yet in a final form.
After merely displaying the mounds as points over a background of Landsat images, the only clearly visible pattern is that the builders preferred not to locate their burial mounds in inaccessible areas, such as cliff faces. However, the symbolic differentiation between mound shapes and classes (discussed above), does yield some interesting results.

When the mounds are differentiated by the shape of the surrounding walls, it is difficult to see any real pattern. Square walled to circular walled burial mounds occur in equal proportion, approximately half and half. The lack of apparent patterning may be explained by the current proposition that the dichotomy in wall shape maybe in relation to the attributed gender of the interred individual. Further excavations and corresponding determination of individuals’ sex are needed.

Consistent with field observations, nearly all Class I mounds are located on the flat steppes near the river, while Class II and III mounds are located on higher ground (Figure 6.4). The reasons for this difference are currently unknown, but could include chronological factors.

Closer inspection of certain densely covered areas reveals more subtle evidence of selection criteria based on geography. For example, the Class II and III mounds on a large southern hill are clustered in four groups. The slope of this hill is roughly consistent all the way across. However, the Russian maps show that the clusters correspond with the southern-facing areas of the hillside rather than the southeast- or southwest-facing areas. This grouping could be related to ground cover or other geographic features that are directly related to slope orientation.

In the southeastern sector of the Soyo area, another interesting pattern appears. A group of Class II mounds forms a line. A whitish-gray slash appears beneath this line in the Landsat images. Field notes and the Russian maps confirm that this slash represents a ridge. Two deer stones also rest in this area. These factors could signify selection criteria based on both geographical and cultural factors.

Conclusion

In several instances, our Geographic Information System has revealed patterns in mound placement that would not have otherwise have been discovered. Even when relative mound location is plotted or sketched into field notes, the visible groupings revealed by GIS are not noticeable. However, even a simple overlay of the mound locations as symbols on the Landsat 7 images reveals the presence of some selection process based on geographical and cultural criteria.
Mongolian Abstract

Монголийн умард нутаг дахь хүрэл зэвсгийн үеийн булшуудыг GIS буюу Газарзүйн Мэдээллийн Систем ашиглан бүртгэсэн нь

Элиза Уолас ба Бруно Фролих
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Монголын тал нутаг хирисүүр өмнөө нэрэлгээд эртний дүрсгалын баярлаг билээ. Эндээр булшуудыг Монгол, Оросын судлаачид бага хэмжээгээр судласан бөгөөд сүүлдийн үеөө Ази, Европ, Америкийн судлаачид орног хүрээтэйгээр судлаж байна. Эндээр булшуудын харим нь мэц тэмцээнэй байхад зарим нь археологичдийн мэргээлэлд хүрч нудээр ч хараахад аанзарламгүй жижиг байх нь олонтаа тохноодог: Монголын умард бусийн нутаг Хөвсгөл аймгийн хийсэн судлалын ажлуудын нэг болох хүрээтэй үеийн булшны бүртгэл дээр түлгуурласан дугнэлтийн талаар бид энэ судалгааныхаа ажилд тусгасан билээ. 2003-2004 оны хооронд авгасан хайтуулын ажилийн хүрээнд 500 гаруй байрлуулгыг тодорхойлсон бөгөөд бид хэлбэр хэмжээ болон тархалтаас хамарсан мэдээллүүдийг бүртгэн авсан. Энэ удаагд бид Газарзүйн Байршил тогтоох системийн буюу Ashtec/Magellan Locus GPS-г, Garmin GPS-12-г туслаж байна.

Газарзүйн Мэдээллийн Систем нь газрын зураг тодорхойлох программ хангамжийн маш оновчтой арга буюу бүрэн байрлалаа төлөөдийг зөвлөлдөө боломжтой. Газарзүйн байрлалын талаар мэдээллүүдийг нэгэн програм хангамж насан дагууласан тоон баримт мэдээллүүдийг бүрдэл дээр анализ хийж шинжлэхэд энэ программ хангамж нь хэрэглээгээ болно. Газарзүйн координатын тоон зуулын хүрээнд, даярын тувшинээд дээш дэжилт загвар, газрын зүүнхий хуулбар байгаагаар тэгүүлээд мэдээллүүдийг бүрдэлд дээр анализ хийхийн төлөө мэдээллүүдийг сүүлд програм хангамжийг хэрэглээгээ болно.

Бидний гаргахыг хүсэн булшны тархцын хэв маань мэдээллүүдийг бүрэн хэрэглэнэ гээд бүтэн бүрэлдэх боломжтой. Монголын умард бусийн нутагдах хүрэл зэвсгийн үвеийн булшуудыг GIS буюу Газарзүйн Мэдээллийн Систем ашиглан бүртгэсэн бөгөөд бид магн газрын тархан булшны тархцын хэв хэрэглэнэ гээд болно. Монголын умард нутагдах хүрэл зэвсгийн үвеийн булшуудыг GIS буюу Газарзүйн Мэдээллийн Систем ашиглан бүртгэсэн бөгөөд бид магн газрын тархан булшны тархцын хэв хэрэглэнэ гээд болно.
болон газарзуй геологийн онцлог талаас нь судлах ёсийн боломжтой болсон юм. Хайгуулны ажлын үзэргийн ажилтан санах зөвлөөлдөө нь эдгээр булшинуудыг газар нутгийн байдлаар тайлбарлах нь харашуулан харсын дараа батлагдсан мэдээлэл бүр няцаагдах боломжтой. Түүнээс гадна, газарзуйн тоон баримтас дээр гарсан асуултуудыг бүрдүүлэнээр хэлбэрээр гэх мэт бусад олон хэлэлцээд сэнгэн хөөр шинжийг тайлбарлах боломжтой. Arc-View программ хангамж нь бүлийн газарзуйн тоон баримт эргэлтийн захар том нэг хүчин зүйлүүлд дээр түлгуурлан хооронд нь ялгаж салган газрын зүгт эд хэрэг болгох чадвартай. Бидний хувьд хэлбэр зүжигчэн зориулан өөр өөр тэмдэглэсэн энгийн өөр эрэгээ нь хэв шинжийг ялгахад хамгийн хөгжлийн тохиромжтой арга байсан.

Олон төрлүүлэн газрын зураг дээр түлгуурлах нь мах эрэгтээ архаг болох нь ажлын үе нь батлагдсан ба бид хэрэглээг гаргаж газар нутгийн байдлын судалгааны ажил руу шилжихэд хялбар болгож байлаа. Ийм учраас бидний ажиллагааны анхны загварууд жингий бутэцтэй байгалийг үзжээ. Таамаглал болон загварууд дээр болох энгийн байлгах нь дугнэлтийг харьцангуйгаар түрээн гаргаж улаараг гарах байсан. Түүнээс гадна хэлбэр нь хэвээр байгальд хэлбэр нь багтаж байгаа юм. Газарнүүд болон газрын гадаргын зураг альн дээр дагаад гарах байдал болох буюу хэрэглээг гаргаж байсан. Бидэнд хэрэглэсэн зорилго өөр өөр тэмдэглэсэн энгийн өөр эрэгээ нь хэв шинжийг ялгахад хамгийн хөгжлийн тохиромжтой арга байсан.

Бидний ажиллагааны архихын загварууд мах эрэгтээ бутэцтэй байгалийг үзжээ. Таамаглал болон загварууд дээр болох энгийн байлгах нь дугнэлтийг харьцан түүлтүүгээр турэн гаргаж улаараг гарах байсан. Түүнээс гадна хэлбэр нь хэвээр байгальд хэлбэр нь багтаж байгаа юм. Газарнүүд болон газрын гадаргын зураг альн дээр дагаад гарах байдал болох буюу хэрэглээг гаргаж байсан. Бидээс хүнддээ зургангүй нэг хэнд газрын зураг зөвэрөөсөөр авсан өнгийн гэгэн байсан байна. Түүнээс гадна бидэнд хэрэглээг гаргаж газрын зураг зөвэрөөсөөр авсан өнгийн гэгэн байсан байна. Газрын зураг альн дээр дагаад гарах байдал болох буюу хэрэглээг гаргаж байсан. Бидэнд хэрэглэсэн зорилго өөр өөр тэмдэглэсэн энгийн өөр эрэгээ нь хэв шинжийг ялгахад хамгийн хөгжлийн тохиромжтой арга байсан.

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Tsaatan woman riding reindeer in Menge Bulag summer tundra. (photo: DePriest)
The Mongolian Tsaatan, literally ‘reindeer possessing people,’ are nomadic hunter-gatherers and reindeer herders of the Sayan Mountains of northwestern Mongolia (Plumley 2002) (Figure 7.1). They traditionally speak ‘Hovsgol Uigur,’ a dialect of Tuvan that is heavily influenced by Khalkha Mongolian. At present an estimated 200 people speak ‘Hovsgol Uigur’ and 235,000 speak speak Tuvan. These languages are related to the ancient Turkic ‘Uighur’ language (attributed to Bat-Ochir Bold in Z. Enebish, 2001). The Tsaatan are ethically related to reindeer herders in the Sayan Mountain Regions of the Tuva Autonomous Region and the Tofalars in eastern Siberia, Russia (Figure 7.2). The group calls itself ‘Dukha,’ which may represent the Chinese name for Tuva — Dubo — and is one of a series of orthographic variants of Tuva — Tofa, Tuba, Tuha, and Tyva.

The Tuvan reindeer herders of Mongolia and Tuva traditionally were in close contact through trading, intermarrying, and sharing of hunting territories. Indeed, until the Russian Revolution of 1918, the Sayan Mountain region of eastern Tuva and northwestern Mongolia were part of a single polity, ruled by a feudal Altyn-Khan. In 1921 Mongolia and Tuva became separate states under the protection of Russia, and in 1944 Tuva became a part of Russia. In part, the Mongolian Tsaatan are descended from Tuvan reindeer herders that crossed to Mongolia to avoid collectivization, according to reindeer herder Sanjim (personal comm.). Until a 1958 treaty, the Tuvan-Mongolian borders in this region were under dispute, and the breakdown of the Soviet Union in the late 1980s led to renewed tensions along this border. These tensions have closed the border in recent years, reducing contact among the reindeer herders and the extent of their traditional herding and hunting ranges.

Today, the Tsaatan are one of the most southern reindeer herding cultures, pasturing hundreds of kilometers south of the reindeer herds of the arctic tundra. Reindeer herding in the Sayan Mountains is proposed to date back several thousand years, to the first millennium B.C. Sevyan Vainshtein, a leading Russian ethnographer, suggests that reindeer herding

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1 These terms are Mongolian for ‘Reindeer,’ ‘Reindeer Lichen,’ and ‘Reindeer People.’
originated in this area (Humphrey 1980:9), developing from the hunting of wild reindeer to the use of semi-domesticated reindeer for meat production. Later, domesticated reindeer were maintained and used for transport between hunting and pasturing grounds and, perhaps under the influence of Turkic horse herding after the 10th century (Humphrey 1980:136-137), for riding and milking. Vainshtein hypothesizes that the Sayan reindeer herding cultures represent one of the oldest uses of reindeer for transport (citations in Humphrey 1980) and served as the center for the spread of reindeer culture throughout Siberia. Reindeer herding, transport, and riding is mentioned in texts as early as the 13th century (Humphrey 1980:132); reindeer herding and pack-carrying is noted by Rashid al-Din, and reindeer pack-carrying and riding was mentioned by Marco Polo. Today, Tsaatan herders hold small numbers of reindeer, averaging in the twenties for each family group, to provide milk and cheese, hides and felt, transport and transportation and, only rarely meat (Figure 7.3a-f). These numbers and practices are completely consistent with the Vainshtein’s report of reindeer herding in a 1931 census of Tuva (Humphrey 1980:122).

Of the approximately 400 Tsaatan in the Hovsgol Aimag (province), around 200 in just over 32 family groups currently are nomadic reindeer herders. They are assigned to two sums (counties), Tsaggan Nuur and Ulaan Uul (2000 Mongolian Census). They live in summer camps to the east and west of the Darkhat Valley, in the watershed of the Shishhid Gol—a tributary of the Yenesei River draining through Tuva and Siberia into the Arctic Ocean. Together the camps herd approximately 700 reindeer, ‘tsaabug’ in Mongolian,  

"The people who dwell there are called Mescript, a rude tribe, who live upon the flesh of animals, the largest of which are of the nature of stags; and these they also make use of for the purposes of traveling (Komroff, ed., 2002: 97)." Or as translated by Yule "and these stags, I assure you, they use to ride upon (Polo et al., 1993)."
down from a maximum of several thousand during the Soviet-dominated eras. In contrast to wild reindeer of the high Arctic, these woodland reindeer do not migrate long distances, but instead are herded among different elevations. Individual herds, ranging from 10 to 100 reindeers owned by a family group living in a canvas teepee called an ‘urts’ (Figure 7.4a), move from high elevation summer feeding grounds on the alpine tundra to lower elevation winter feeding grounds in the deciduous larch taiga. In addition, some families have wooden huts in their winter camps (Figure 7.4b).

During the summers of 2001-2004, we traveled to the seasonal feeding grounds west of the Darkhat Valley, near Ulaan Taiga. This area is the herding ground for approximately 20 family groups in the western Tsaatan group. These family groups camp together in the summer in a feeding ground that is called ‘Menge Bulag’ (Figure 7.5). It is a cool, windy alpine meadow, with sufficient grasses, sedges, young shrubs, lichens, and adequate water to support the combined herd of at least 400 reindeer, and small numbers of other domesticated animals—horses, cows, and goats. The critical factor is the absence of biting insects, e.g. mosquitoes and warble flies, which are associated with reindeer weight loss due to herd agitation. The Tsaatan arrive in Menge Bulag in mid-June just after snow melt and remain there through the rainy season in July.

The feeding ground is alpine tundra with meadows, marshes, birch shrubs, and fell fields zones. The grasses, sedges, herbs and green twigs are an essential source of protein and minerals for the reindeer in the early summer, although reindeer lichens, called ‘hag’ in Mongolian or ‘shulan’ (orthographic variant ‘shulung’) in Tuvan, are their mainstay. The meadows and marshes also are used for grazing horses (increasing efficiency of reindeer herding), and some cows, goats and sheep, which are an important supplement to their diet. In summer most of the reindeer herd wanders freely, while the calves and the reindeer used for milking and transportation are kept tethered near the camps. Lichens are found in all areas of the feeding ground, and in the birch shrub and fell-field zones they approach complete ground cover. In these two areas we identified approximately 30 lichen-forming fungal species, eleven of which are widespread and abundant. These abundant lichens are recognized by the Tsaatan herders and given traditional names (DePriest et al., 2003). The
effects of reindeer grazing on lichens is especially obvious near the camp; the lichens there have been nibbled down but left rooted in soil or mosses – the rooting is critical for their recovery. In a more distant feeding ground, along the Jamts River (orthographic variant Jams), not used for the past 15 years, the lichens can reach depths of 10cm. Occasionally wild reindeer have been reported from this site (Syroechkovskii, 1995:104-105).

In early August, the Tsaatan divide into smaller groups of three to five urts herding up to 100 reindeer. The groups disperse, moving several times over the next three months to find fresh pastures. With colder temperatures and fewer biting insects, the herds are
moved to mid elevations in the shrub zones, where the dominant shrubs have turned in color to red or orange (Figure 7.6).

Although most of the shrubs themselves are only used as food in the early spring, these communities offer adequate lichens for fattening the reindeer. In addition, the reindeer feed on grasses, sedges, and even horsetails (Equisetum) along the edges of small lakes and streams (Figure 7.7a). Reindeer are reportedly herded along one river just west of Menge Bulag, the Joloc, in the fall because of the abundant horsetails. During this season reindeer seek out mushrooms, especially boletes, often expressing a kind of “mushroom mania.” The herders control the herds to prevent individual reindeer from wandering away from the camps and becoming lost as they search for mushrooms.

Although fattening the reindeer for winter is important, the fall pastures are selected based on additional factors. One is protection from predators, especially during the October rut. During late summer and fall as other prey diminish, packs of wolves hunt increasingly in the vicinity of the camps. To protect reindeer from the wolves, the herd is kept near the camp except for specific times in the morning and afternoon when they are herded onto the pasture and carefully watched. In one fall camp used by Bayar’s family (Figure 7.4a), the reindeer were penned into a small, protected valley by felled larch trees. This allowed the reindeer to feed freely throughout the day with protection from wolf predation. Another factor is the proximity of the camps to hunting and gathering. Tsaatan herders hunt throughout the year, but in the fall they increase their gathering activities. Two commonly gathered items are blueberries, gathered from the shrub communities in large quantities for immediate consumption, and pine nuts gathered in the lower elevation forest and stored for the winter (Figure 7.7b).

In the winter, the herd is divided into even smaller groups associated frequently with a single urtz or winter hut. These winter camps are located in the larch forest margins to insure thin, loose snow and access to frost resistant grasses, and to provide adequate firewood for the herders (Figures 7.4b and 7.8). Lichens represent a major portion of the winter forage of domesticated reindeer, often 60-70% of their intake. Most of the lichens...
are on the forest floor covered by snow, and the reindeers crater through the snow layer to reach them. In addition, reindeer may also eat lichens off the tree boles, branches and rock cliffs. The herd is moved frequently when the snow becomes ice-crusted or too deep for effective reindeer cratering to reach vegetation. The larch forests are subject to frequent forest fires, often destroying the camps and winter huts (Figure 7.9).

By spring the herd is weakened and near starvation. The winter of eating lichen carbohydrates without supplemental sources of proteins or minerals leads to softened bones and the reindeers cannot be ridden until they recover in the early summer (Zhigunov 1968:7). The herd is moved with care to areas of early snowmelt and grass and sedge germination (Figure 7.10). The spring pasture is an extensive area of natural springs and marshes that is reserved for use only in the spring. Lichens are abundant along the drier edges of these marshes, but grasses and sedges are the main fodder in this season. The spring pasture is diverse, with a large number of flowering species. When the herd arrives in the spring pastures it is often divided, separating out the fertile reindeer does for protection from disturbance and for access to optimal grounds during birthing. The calves born during April or early May and the herd is kept on the low-elevation spring pasture as long as possible,
until warming temperatures in early June increase the number of biting insects and the snow has melted in the high-elevation summer pasture. In mid-June, the herders and their reindeer herd return to the summer pasture at Menge Bulag.

The Tsaatan reindeer culture is threatened by lack of veterinary care for their reindeer herds, by loss of herding salaries and education systems provided through the Soviet system, by geopolitical partitioning of the traditional grazing grounds, and by intensifying pressures for more sedentary lifestyles. Furthermore, large-scale global warming and
landscape changes potentially will degrade the feeding grounds. These factors threaten not only the ability of the herders to continue their hunting gathering lifestyle, but also threaten the extinction of this example of a traditional reindeer culture and the loss of their unique knowledge of reindeer herding. Without intensive study, the Tsaatan’s keys to understanding the origins of reindeer herding will be lost forever.

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References


Цаа буга, Цаахаг, Цаатан: Духа буюу Монголын Цаатан нарын талаар хийсэн Угсаатны зүй-Экологийн судалгаа

Паула Т. Деприест
Смитсони Хүрээлэн дэх Байгалын Түүхийн Ундэсний Музейн Ургамал судлалын тэнхим

Духа буюу Монголын Цаатнууд нь Монголын баруун хойд хэсгийн Саяны нуруунд амдырах цаа буга маллаж нүүдэллэдг анчин гэрээчнүүг хумуус юм. Төрөлдөг малдаг цаа буга амдырах бөгөөд болсон тунд болон тайгийн билээрийн тээвэрлэлээ хамаарах цаатнууд нь мод, бут, эмийн ургамал, хаг, мөөг ээргийг эрт дээр үзээ уламжлан түүн чадамгайгаар таниж модны нэрлэг ірсэн байна. Аль тундарт зусах ба тайгад оволжихийн хоорондох улирлын чанартай нүүдлийнхэн үсэр тээд нэлээн олон төрөл зүйлүүн ургамлыг олж хэрэглээдгээ байна. Морин суул (Equisteum sp.) гэх мэт ээргэр төрөл зүйлүүн зарим нэг үү цаа буга маллаж гарлыг гардын хөнөөр нүүдэллэдг жад олон урагштай байна. Боргоцойн самар (Pinus sibirica) гэх мэт нь үү Дархадын хотгорын доод заааар орших л хөвчөөс овлийн тээвэрлэл түүнээс нүүдэллэдг байдлаар. Зарим нэг үү дээр үзээ уламжлаг болон хэрэглэдэж байсан боловч одоо хориглолдсон байна. Эдгээр Бусийн голын хавь орчмоос зүнэл улиралд хус модны угс цуглуулах уламжлаг заан угсийн дагуу хус модны угс (Betula sp.) түүх зэрэг орно. Хамгийн сонирхолтой нь Жолх болон Жамс голын дархан цаазат цөөн газарт тааралдах Монголд ховдогсон тосогдлоог хадуу (Aibes sp.) гэх мэт нь шилмүүс эдгээр моднууд Босгийн мөргөлд хэрэглээдсээр ирсэн байна.
West Taiga Tsaatan at Menge Bulag tundra camp in June 2001. (photo: Fitzhugh)
Research scientists of the National Museum of Mongolian History (NMMN) have participated in the Deer Stone Project jointly with the Smithsonian Institution of Washington DC for the last two years. In 2002, museum archeologist Ts. Ochirhuyag and ethnographer Ts. Ayush worked closely with Paul Rhymer and Caroline Thom, model-makers from the Smithsonian. Our group successfully made a latex mold for a deer stone with a human face, one of the monuments from the Ushkiin River Valley, 26 km west of Muren in Hovsgol Aimag. The Smithsonian Institution completed a fiberglass cast from the mold and brought a full-size replica of the deer stone to the NMMN in 2002. We then installed it in the museum’s “Ancient Mongolian History” gallery, and since then this deer stone cast has become one of the most popular archaeological exhibits in the museum.

In 2003 our participation in the Project continued with the goal of excavating at archaeological sites near Lake Erkhel and Soyo, an area near the towns of Alag Erdene and Ulaan Uul, in Hovsgol Aimag. During this period we also conducted ethnographical research on the Tsaatan (Dukha) reindeer herders. Besides my involvement in the archaeological work, I conducted ethnographic research among the Tsaatan and gathered research data (Fitzhugh 2004).

From an ethnographic point of view, the Hovsgol area is very interesting region. In the beginning of the last century ethnographically diverse tribes of Turkish and Mongolian origin lived here who differed slightly from each other in lifestyle, language dialect, cultural background, and population size. For example, the Darkhad, Tsaatan, and Ar Shirhtei Uriankhai people inhabited the western part of Lake Hovsgol, particularly from Ulaan Taiga to the Tengis River, while the Khasuud and Soyod Uriankhai people lived northeast of the lake. Buriat, Ovor Shirkhten Uriankhai, and Mongolian Uriankhai people populated the area around the Uilgan, Uuriin, and Arig Rivers, around the southern part of the lake. Furthermore, the Hotgoi people used to reside near Lake Delger, to the south. To one degree or another, they all still reside in these regions today. The historical dates and explanations for these ethnic group migrations are relatively dissimilar.

The exact dates of the Tsaatan migration to this region are still unknown. During the theocracy period of Javzandamba Hutagt, Tsaatan resided adjacent to Mongolian tribes, and they likely belonged to one of the administrative tribal units. According to the population
census in 1764, there were 192 reindeer recorded (Badamkhatan 1962) and from this fact we can assume that Tsaatan people had already migrated to their current location by the middle of the 18th century. In some previous researchers’ opinion, the Tsaatan consider themselves to be originally from the Uigar family and a branch of the Tuvan people who inhabit the region of East Soyoun [usually spelled ‘Sayan’ in English usage -- ed.] Mountains (Badamkhatan 1962, Badamkhatan 1965, and Potanov 1969).

The current geographical territory of the Tsaatan includes the forest mountain taiga zone northwest of the town of Tsagaannuur, Hovsgol province. By their location, the Tsaatan are divided into two main parts, the western taiga and eastern taiga Tsaatan. During our June 2003 expedition we visited the western taiga Tsaatan while they were in their spring camp. More than 10 families were living in two separate areas called Shavartai Shanmag (“muddy place”) and Nuurtai Shanmag (“watery place”). There were five accommodations in Shavartai Shanmag, and two urts (Tsaatan tents) were owned by one town family (hot ail in Mongolian, a group of closely-related families). Three other urts belonged to another family. However, there were eight accommodations in Nuurtai Shanmag and one of the families owned four urts; another owned two urts and each of the last two families owned one. During our expedition we visited 9 of these 12 families to learn distinguishing quality of their lifestyle, home accommodation, food, and religion by means interviews conducted over three days.

The Tsaatan still maintain their traditional methods of nomadic lifestyle including herding reindeer and hunting wild animals. In 1991, they privatized their reindeer herds and currently there are 15 families that own approximately 300 reindeer as their private property in the western taiga. The number of reindeer per family is not really equal; some families have 60-70 reindeer and an average family has 20-30 reindeer. A few families have less than 10 reindeer, and some have only a single reindeer. Moreover, each family has a small number of horses and some now keep cows and goats. Throughout their history, the Tsaatan have bred horses for a longer period than other Mongolian livestock, and horse breeding has come to play an important role in Tsaatan life. The Tsaatan use horses from the end of spring until autumn to carry loads. Also, they ride horses to hunt and transport goods between the towns and their taiga camps. Nevertheless, they do not use horses to carry loads when they migrate from one place to another. In addition, they rarely ride horses to herd reindeer. Although the Tsaatan have started herding other domesticated animals besides reindeer, with the exception of horses, it is nearly impossible to herd and care for cattle throughout the year in the forest mountain taiga zone. For that reason, some of those 15 families are able to keep reindeer, cows, and goats in their summer camps. During other seasons, some leave reindeer with their relatives and move down from the mountain with their other animals. The remaining families leave their cows and goats with Mongolian neighbors and spend the winter in the mountain taiga with their reindeer.

The Tsaatan raise their reindeer to carry goods, ride, milk, and occasionally to eat, but their primary use is for riding and carrying loads. Due especially to muddy and snowy areas in the taiga, for most of the year the Tsaatan ride only reindeer in their everyday activities, including moving around the steppe and mountains, herding reindeer, hunting,
visiting neighbors, and traveling to town. The Tsaatan continue to maintain their traditional methods of breeding, raising, and using reindeer to the present day. In other words, they move their reindeer to new pastures during the four seasons of year consistent with their nomadic lifestyle. The 15 families we visited live relatively close to each other during the spring season. The period they reside nearby is the summer season when they camp together at Menge Bulag. For the duration of the autumn and winter season they live far away from each other in groups of at most two families. Herding reindeer is relatively simple and easy during the summer and winter; however, reindeer scatter all over the pasture to eat flowers, leaves and mushrooms during the spring and autumn. Therefore, the herders constantly have to chase and follow their reindeer during these periods. There are different methods to control their scattering, the most common being to loosely tie two or more reindeer together by their legs or to tie an animal’s head to its front leg. During the end of the spring and summer seasons, they milk reindeer twice a day, and after the morning milking they attach the young calf reindeer to its mother. But after the noon milking, they let the reindeer pasture with their young. At night, Tsaatan customarily tie female reindeer and their young to stakes near camp with a rope. Lately, some Tsaatan families having many reindeer have started using wooden fences for livestock, similar to the practice of Mongolian herders. Currently there are three families who use such fences.

One of the cultural traditions related to the Tsaatan lifestyle is the use of various tools and devices for riding and loading goods on reindeer. The Tsaatan used to put a halter on young reindeer and use different saddles depending on the purpose, for riding or packing goods. They still keep these traditions in the present, but have adapted them, using a Mongolian saddle, which is smaller than their traditional saddle. The average family has at least two riding saddles and 6-7 pack saddles (yangirtsag in Mongolian). When they move from one place to another, they usually make two trips: first they carry all their belongings and then they move their home. It has been a common custom among the Tsaatan to borrow loading tools and necessities from neighbors and to help each other. One of the unique traditions related to packing is that every family prepares a special saddle (ermeelj) for a newborn baby. It is their custom to respect the ermeelj and place it in a special area in their home at the time they do not use it. The ermeelj has a unique form that differs from other saddles. It has upright pieces on both its front and backsides which are taller than other saddles. The East Sayan Tuva, Tofalar, and Mongolian Tsaatan still preserve this ermeelj tradition (Vainshtein 1972).

Another cultural tradition of the Tsaatan is hunting. They go hunting during all seasons of the year, but especially from autumn to spring they hunt wild animals and fish in the rivers and lakes to obtain meat and fur to help meet their needs. Because the Tsaatan own a small number of cattle and do not use reindeer meat, there is the need to supplement their diets with wild animals, birds, and fish. They usually hunt deer, roebuck, female deer, wild pig, bear, grouse, and wood grouse, duck, and fish. They ride either reindeer or horses to hunt, and they shoot large animals such as deer, wild pig, and birds with guns. The Tsaatan use fishnets or fishhooks for fishing, while they set traps for smaller animals such as sable and rabbit. In the last few years, because increasing market demand, the
Tsaatan have started collecting deer and moose antlers to sell in addition to hunting. They ride reindeer to collect deer antlers when spring comes and snow melts. Last year, six families sold deer antlers with the value of approximately one million Mongolian tugurugs in the market. This amount of money is very helpful for buying their major food supplies such as rice and wheat.

The Tsaatan live in their urts, traditional homes; however, some families have built small wooden houses or have put furniture in their urts. While the size of an urt depends on the number of family members and their financial status, the roof of a typical urt is constructed of 20-30 long slender wood poles. It is common to build urts larger during the summer in order to have a bigger space so that cool breezes can enter the house. Each family has a small iron stove and chimney pipe of 3-4 sections. This is more than the length of a typical Mongolian ger (traditional house tent) chimney pipe because the Tsaatan urts is taller than a ger. Moreover, Tsaatan families have begun to build wooden floors in the door area of the urts, and some families have covered the entire floor of their urts with wood planks. Also, many have gotten used to having small wooden beds in their urts. Three of the families within western taiga Tsaatan have built small wooden houses in which to dwell. But they are not able to live in these houses year-round; instead, one family lives in their house only during the summer, whereas the other two families spend their winters also in their houses and live in their urts for the rest of the year. In summary, the above newly-adapted homes make the Tsaatan’s life in their urts comfortable, clean, and warm.

I will next speak about the Tsaatan diet and its traditions. The main sources of their food are reindeer milk products and wild animal meat. Additionally, they have gotten used to eating horsemeat and beef. However, they do not customarily eat reindeer meat. For example, last year there were only three families who prepared reindeer meat for their winter meals. We were told that four families had used horse meat and one family had used beef in their winter food preparations. In contrast, three families had only wild animal meat from hunting for their meals. Indeed, almost every family used wild animal meat, fowl, and fish. The Tsaatan eat mostly meat, rice, and flour during the warm seasons, from the end of spring through summer.

Compared to other Mongolian people, the Tsaatan traditionally use lots of fowl and fish for their meals. They mostly boil fish or cook it in soups. There are two ways of cooking fish: frying and boiling. They fry smaller fish either on the stove or fire and prepare soups with larger fish. During the warm seasons, all families use reindeer milk products; however, the amount is not sufficient because they are not able to milk many reindeer and the productivity (milk yield) per reindeer is very low at this time of year. Families with more reindeer milk approximately ten reindeer, but most families milk only six or seven reindeer. There are some families who milk only four reindeer. Only a few families are able to use cow or goat milk during the summer. Besides making milk tea, the Tsaatan use reindeer milk to prepare yogurt, cheese, and dried curd, which is made in either large or small curd sizes.
During the summer season they usually eat bread and pancakes with their milk tea and milk products. I would like to point out that the tradition of baking bread and preparing pastry has become an important factor in their food supply. Because they do not have enough cooking oil to fry dough like other Mongolians, baked bread is the main pastry in both cold and warm seasons. Currently, every Tsaatan family makes bread on the stove by using a large metal cooking pot, and their bread has a big round shape. The variety and quantity of their food supplies through the year often do not meet their food requirements. A particular problem is not being able to store and preserve meat as other Mongolians do. By the middle of spring, their stored meat is gone and they face a lack of nutrition in their diet. This continues until autumn when they can begin to hunt once again.

The last part of this article is about Tsaatan traditional religion and beliefs that I learned during the expedition. In the present, the Tsaatan continue to practice shamanism, their traditional religion. There are two male shamans (zairan) and one old female shaman (udgan) among the western taiga Tsaatan. We met the udgan shaman and one of the zairan shamans, and they all had their traditional shaman costumes and other implements. The zairan keep their costumes and implements in a special cache. The udgan placed her paraphernalia in the position of honor in her urs and covers them with a curtain to hide them from view and harm. We tried to interview both shamans about shamanism and their religious beliefs, and also we wanted to take documentary photos of their costumes and implements. However, we did not have an opportunity to accomplish this goal. Instead, we collected some interesting details about a shrine, a special holy object that every Tsaatan family maintains and respects in their urs.

All Tsaatan families keep a small object wrapped in a cotton bag in the position of honor in their urs. While some families keep one of these objects, others may have two. The names they use for these objects differs, such as “eeren,” “ongod,” and “sakhiul,” signify a “protecting spirit.” By tradition, Tagna and Soyon Dukha people call it only “eeren.” This object, called ongod, is wrapped in a cotton bag and contains tails, nails, and snouts of different animals, such as bears, squirrels, sables, and ducks. These things are wrapped and stitched with white, black, and blue-colored cotton pieces that may number

Figure 8.1. Harness equipment and types of rope hobbles used to keep reindeer from wandering far from camp.
as many as several hundred.

A shaman gives this ongod to a family when a couple builds a new home or there is a newborn baby in the family. The shaman creates this sacred object for them, and the act of creation is called ongod bosgo. The newly-created sacred object will protect and look after the wealth of the family and its destiny. The Tsaatan believe that the sacred object watches over them and takes care of them. Thus, every Tsaatan worships and respects it. If some disaster or bad luck happens in their life, such as a member of the family gets sick, a reindeer dies, or something proves unsuccessful, then they assume that protecting spirit has become enraged. In such cases they invite the shaman to console the spirit by wrapping, binding and putting more colorful cotton wraps onto the sacred object. The Tsaatan belief shamans belongs to the latest stage of historical development of shamanism. Specifically, they believe that shamans turn into protective spirits after their death and that this spirit continues to inhabit the shaman’s clothing and personal belongings. Moreover, they see
the objects as reflections of a human figure. It is interesting that they have maintained their
traditions beliefs about the protective spirit. It is said that occasionally an `ongod` appears in
the figure of bird or wild animal, especially as a bear. They often imagine the `ongod` as a
bear and consider bears as protective spirits of the earth. The origin of this belief is closely
related to ancient shamanism, which was common among the people of the Tagna-Soyon
region and Siberian forest taiga.

This research paper describes the results of the ethnographical research study on
the Tsaatan in 2003. In conclusion, it is very important to do more research on Tsaatan
traditional lifestyle and current situation to gain a realistic understanding of their culture
and conditions. Currently, the Tsaatan are known as unique native people who maintain

Figure 8.4. Reindeer being used to transport goods and supplies.

Figure 8.5. A Tsaatan child's reindeer saddle.
Figure 8.6. A community settled in three urts.

Figure 8.7. Inside an urts.

Figure 8.8. The interior of an urts.
Figure 8.9. Preparing breakfast.

Figure 8.10. Some types of foods made from reindeer milk.

Figure 8.11. An ongon-sakhul of a reindeer herding family.
distinctive traditions and live in a beautiful natural setting. In fact, Tsaatan live in an extremely difficult environment, and their reindeer husbandry is not lucrative enough to meet their basic needs. They have little income other than trading a small number of antlers on the market. They would like to breed more Mongolian cattle and increase the size of their livestock, but a lack of finances makes this difficult to accomplish. Everything the Tsaatan need in order to live comfortably -- housing, warm clothing, and sufficient food -- is in critically short supply. Therefore, the Deer Stone Project joint research team sees an urgent need for the Mongolian Government to undertake an aid and cooperation project to increase the basic supply of rice, flour, vegetable oil, sugar, and canned meat to the Tsaatan people.

References


Ц.Аюуш

MYTM-н эрдэм шинжилгээний ажилтан

Энэхүү илтгэлд 2003 онд "Буган чулуун хешё" теслийн хэрээн Хөвсгөл аймгийн Цагаан хуур сумын Цаатан нарын дунд явуулсан угсаатын зүйн судалгааны зарим үр дүнүгээр дүрсүүлэх ёстой. Тухайлбал цаантгудын уг бус нутгийн нууцлаж ырсен он цаг эдуустээгийн нутагшилт, тэндийн ах ахуйн уламжлал, нууцлал, унакла болон тээврийн тоног хэрэглээлээрээ ойлгох, орхон сууц, хоол ундын төрөл зүйл, бэлтгэх арга, мэн цаантгудын бөө мөрөгөлийн талаарх судалгааны хэрэглэгчдээрийн зарим ажиглал, дүгнэлт хийсгээгээр оролдсон.

Хөвсгөл аймгийн үе нутгийн түүхийн хувьд багагуй сонирхолтой нутаг. Оңгөрсөн зуунд эхэн гэхэд бүгдээс тусламжийг хэрэглэн 18-р зуунд 2-д хагас гээд цаантгудүүд нодаагийн нутагталаа нууцлаж ирээд байсан нь лавтай байна. 1764 оны Шавийн тоо буртгэлийн дусанд "өтгөн 192 цаа буртгэв" гэсэн эмдэнэл үзээд 18-р зуунд 2-р хагас гээд цаантгудүүд додогийн нутагталаа нууцлаж ирээд байсан нь лавтай байна.

Цаантгудууд Хөвсгөл аймгийн Цагаан хуур сумын баруун болон умард бүгд нутгийн өндөр уулын тайгийг нутаглаж байна. Нэг айлд байх цааны тоо ихээхэн зөрчөгтэй. Зарим айлд 60-70 цаа, ихээхэн нь 20-30 арчны цаантай 20 хүрээл айлд 30 орчим цаантай. Тэдний хэдий нутагтай ганаасан ганаасан айл болтой байна. Мөн айл бүр цеэн тооны адугаатай, бас тэндийн нутгийн бус сууц үед үхэр, ямаатай болоод байна. Цаантгудуудын нутгийн уул нутгийн уламжлал болон ачилгын тоног хэрэглэл юм. Нэг айл 2-оос доошгүй эмээлэн, 6-7 ачааны янгаргыгтагтай нэг буудлаас нөгөөд нууцлээ нэг айл ихэвчлэн 2 удаа нүүдэл хийдэг. Эмээл "зөөвер нуух" гээгээ йхийг хөгжүүлэх, дараа нь өөр орно нуулгэлээр байна.

Цаантгудуудын хоол ундын нэр нэр нөгөөд нутанууд цаа цагаан, ангиин гаралтай хоолд хохон давамгайлж байна. Мүнх махан хүнсэндээ адур, бас суулийн үед үхрийн мах хэрэглэх зөвөөг элэгччэл болоод байна. Харин цааны мах махн хүнсэнд нөгөөд нөгөөд Михэлэн хэрэглээлээг байна. Талх барих, түүнүүгээ хоол хүнсэндээ хэрэглэж зөвлөн 203 онд цаантгудын хоолд мах чухал зүйл болохгүй эгээ эхлээс байна.

Цаантгудууд одоо эдүүлээ болох мөрөгөлийн хөгжилтэй хаягтай явна. Цаантгуд айлд ороход урц бүгдэн хойжиргийн хөдөлгөө даяаруулж байгаа зүйл зөвлөгөө болно. Зарим айлд нэг, заримд нь хөрх ч уутгай ийм зүйл байдал. Тэд түүнүүгээ "ээри, "онгод", "сахиван" гэж мөрөөлөөр төөрөөр нэрлэн. Бөгөөд нэгд нь зарим үед шувуу, амьтдын дүрсэр угсдэж, харгалдан гээг буюу
ялангуяа баавгайн дурээр онгоноо тесөөлөх, баавгай онгоноо бүр газар дэлхийн онго-ээрийн гэх узэл ч хадгалагдаар иржээ. Энэ нь Тагна-Соён, Сибирийн ой тайгаар оршин сууж байсан угаа ан-аад түр дөрөөд дууны бирийн онгоны тухай тесөөллийн ул мөр гэж хэлж болно.

Ер нь ёдтөөгүүдийн амьдралын уламжлалт хэв маяг, тэдний енээгийн байдлыг ёддүү гарынчин байдалын төлөв хэрэгцээ, товчоор хэлбэр, тэднийг үзэн зөв ойлогч явдал чухал байна. Ёдтөө нарны гоё сайхан байгалийн дунд овермес сонин дадал зөвхөн айдаж гэлээ хуврал хумуус мэт эсвэл ойлгох гэж бичих болно. Ёдтөөгүүд енэдөөр байгалийн хамгийн хүнд төлөвөөр дунд ашиг шим нэн бага жагуурь эрхэлж байна.

Bayandalai with leather lasso rounding up horses. (photo: Fitzhugh)
Fourteenth Century Mummified Human Remains from the Gobi Desert, Mongolia

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Introduction

This is a candid and tentative report on a visit to a subterranean cave located in the southern Mongolian Gobi desert, close to the Chinese border. We will briefly describe the history of the cave, how we organized our expedition, what we found, and how we plan to proceed with our investigations. As with many anthropological projects that starts out with relatively unsophisticated planning in mind, we soon realized that this undertaking would yield a hidden treasure of data, a voluminous amount of information and many unexpected opportunities. Many hours of study and research are ahead of us. This will demand not only time and money but also challenge our proficiency in creating a true multi-disciplinary research environment. This is the story of how it all began.

Background and Dating

During the winter of 2003-2004, the Mongolian Academy of Sciences decided to investigate an underground cave located in the southern Mongolian Gobi desert that reportedly the cave included some mummified human remains. It became the duty of archaeologists and anthropologists in the Academy’s Institute of Archaeology to visit the cave and decide how to best protect its contents. Increased traffic in the area has made the cave generally known, especially among groups organizing tourist visits to this part of the Gobi. The Institute recognized this problem and, being concerned about damage to the remains, a small expedition was scheduled for the spring of 2004. The expedition was
organized as a joint venture between the Mongolian Academy of Sciences (represented by Naran Bazarsad) and the Smithsonian Institution (represented by Bruno Frohlich).

The subterranean cave, also known as the Hets Mountain Cave, the Hun Agui (Human Cave) and the Hets Agui (Hard Cave) is located about 5 kilometers north of the Mongolian border with China and about 25 kilometers east of the 108° East Meridian (Figure 9.1). It was first brought to the attention of government officials in 1974 by local herdsmen but it took eight years for the cave to be visited by researchers from the Mongolian government. Around 1980, the General Secretary of the Mongolian Revolutionary Party, Mr. Adiya, learned about the cave and requested the Mongolian Academy of Science initiate a study of its contents. Consequently in 1982 the cave was visited by two scientists: archaeologist N. Ser-Odjav and physical anthropologist D. Tumen. They reported that the cave had been disturbed but still contained twelve bodies representing seven children between newborn and seven years, four males and females around 30 years old, and one 60 year old male. Ser-Odjav found ceramics from the Khitan period and also some woman’s pants and wooden plates. Based on these finds he dated the remains to around AD 10, thus about 2000 years old. At this time we do not know what happened to these artifacts, however. Some do not agree with N. Ser-Odjav’s dating. Another possibility concerns a legend presently circulating between local herdsmen. The tale suggests that a local thief named Dasha...
massacred his entire family during a killing rampage and later escaped criminal charges by fleeing across the border to China. Originally a Buddhist lama, Dashsamba became a thief. This event should have taken place between 1937 and 1939, during the same period when the Stalinist regime in Ulaanbaatar was involved in mass executions of Mongolian Buddhist monks.

Recently we submitted two samples for radiometric dating. The first sample (ID: Gobi 1C, Beta 203719) consisted of about 40 grams of rope made from animal fibers. The rope sample was part of an approximately 140 gram rope associated with body 1C. The second sample (ID: Gobi 3A, Beta 203720) included human skin tissue obtained from an approximately 1 year old infant. The sample weight was approximately 25 grams and came from the infant’s abdominal area. The following results were received from Beta Analytic: Rope sample (Beta-203719): Conventional radiocarbon age: 470 +/-40 BP (where present is 1950), and the 2-sigma calibrated result: Cal AD 1410 to 1470 (Cal BP 540 to 480). Skin sample (Beta-203720): Conventional radiocarbon age: 560 +/-40 BP, and the 2-sigma calibrated result: Cal AD 1300 to 1430 (Cal BP 640 to 520). In both cases the INTCAL 98 database was used for calibration. Thus using the 2 Sigma calibrated age, our samples range from AD 1300 to 1470.

Logistics

A small surveying team, including professionals with a history of working well together in laboratory setting at the Institute of Archaeology, at the Smithsonian Institution, and during excavations of mass burials at Hambiin Ovoo outside Ulaanbaatar was organized.
This included T. Amgalantugs, B. Erdene, N. Bazarsad and B. Frohlich. Natsag Batbold, an archaeologist from the Institute of Archaeology was included as an expert in Mongolian archaeology with extended experience in surveying, exploring, navigating, and excavating in difficult and challenging environments. David Hunt, of the Smithsonian Institution joined us in Ulaanbaatar on our return from the Gobi and is presently collaborating with the rest of the group on a planned study of the human remains. Mr. G. Sukhbaatar was hired as our driver and provided excellent expertise in getting the team to and from the target area (Figure 9.2). A one-car solution was selected in order to keep the transportation logistics to a minimum. However, this solution also increased the potential danger of being stranded in a hazardous desert environment with no means of communication to the outside world. This problem was solved by working closely with units of the Mongolian Army’s border patrol which operated within a few kilometers of our chosen routes and working area. Indeed, a small border patrol camp named ‘Sulenkheer’ was located three to four kilometers northwest of the cave. This relationship proved to be of exceptional value and we enjoyed the presence of members of the Border Patrol as well as the magnificent hospitality offered by its members and their families.

Preparation started well ahead of the scheduled departure time. Naran Bazarsad, her two students (Erdene and Tugsuu), and N. Batbold prepared all necessary permits, including permission from the Mongolian Military authorities to operate in areas close to the Chinese border. Bruno Frohlich brought necessary surveying equipment, light sources, camera equipment and other field equipment from the Smithsonian Institution. Supplies for caving, hiking and operating in rigorous conditions, and packing and shipping material were purchased from the ‘Black Market’ and other stores in Ulaanbaatar. Maps were

Figure 9.4. Natsag Batbold entering the second tunnel.

Figure 9.5. Lateral section of cave.
obtained from the Mongolian Government and from private map stores in Ulaanbaatar and in the U.S.A. Camping and food supplies including emergency supplies for at least a three week period were also obtained to cover our planned one week stay in the Gobi Desert. Fuel (diesel) was purchased at stopping places between Ulaanbaatar and the southern Gobi Desert.

The project was designed to last seven days, not including the two days of driving approximately 900 km. each way between Ulaanbaatar and the Mongolian-Chinese border. We departed from Ulaanbaatar on May 24 following well-paved roads toward Nalayh, about 25 kilometers east of Ulaanbaatar. From Nalayh we continued south on dirt roads and tracks, passing Choyr, and completed our first day of driving about 10 kilometers north of Saynshand, the capitol of the Dorno Gobi aimag. In plotting our route to the southern Gobi we followed relatively good dirt roads running parallel with the Peking-Ulaanbaatar railroad track, until we reached Saynshand when we followed a more western and southwestern route leading us toward Zuunbayan. From Zuunbayan we continued south and southwest toward Hovsgol sum and on advice from other travelers going north, continued in a southern direction toward Sulinheer. In Sulinheer, we visited the area’s principal Mongolian Army camp to obtain the final approval for traveling in the border area. At Sulinheer we learned of a newly developed track starting in a small settlement close to the Chinese border, that lay in an almost straight line northwest from the cave area (Figure 9.1).

Figure 9.6. Cave viewed from western end.

Figure 9.8. Horizental view of cave. Hatched areas include major concentration of human remains. Cave entrance is a meter southeast of Group 1.

Mummified Remains
The Cave

In the midmorning of May 26 we arrived about 1.3 kilometers southeast of the cave and after a short exploration of the surrounding area, we established camp on a flat plateau 130 meters northeast of the cave (Figure 9.3). Our first priority was to establish the exact geographical location of the cave. Using our Ashtech-Magellan Locus GPS receivers, we obtained the following results: geodetic location is: 42° 33' 33.75746' north latitude, and 108° 14' 57.85615' East longitude, and the ellipsoid elevation is 1,106.09 meters. This location corresponded with data obtained from less accurate hand-held GPS receivers which located the cave with a precision of between six and ten meters, significantly less accurate than the Locus system’s precision, which is better than 2-3 centimeters on all three axes (longitude, latitude, and elevation).

The cave was entered on the first attempt by Natsag Batbold and Naran Bazarsad (Figure 9.4). The presence of human remains was verified and the cave’s general layout and entrance system were noted. The cave consists of a subterranean space accessed through a small circular opening and several tunnels that are separated by platforms (Figures 9.5, 9.6). The cave and its entrance system of tunnels and platforms were surveyed and mapped by N. Batbold and T. Amgalantugs (Figure 9.7). In detail, the cave’s circular opening, approximately 0.9 x 0.6 meters leads to a system of two platforms that are connected by three tunnels. The first platform is located 2.4 meters below the entrance. From the first platform, a 4.2 meter long vertical tunnel connects the first and second platform. From
the second platform a 2.4 meter long tunnel with a slope of about 45° extends toward the entrance of the cave chamber (Figure 9.5). The cave is oriented in an approximately west to east direction and has a maximum length of 16.8 meters. The cave’s maximum width, of 5.9 meters, is at the eastern end. The width adjacent to the entrance is about 3 meters (Figure 9.8). The maximum height, found at the central and western end of the cave, is 3.4 meters (Figure 9.5).

In general, human remains were found in three areas or groups (Figure 9.8). Two of the groups included concentrated remains of complete bodies, most of them still in their original position and location (Figure 9.9). Most of the bodies were well preserved, with the majority of skeletal tissue present and 10% to 80% of the soft tissue still intact. The soft tissue’s excellent preservation appears to have been produced by a rapid process of natural mummification, leaving all body parts in their original position and location. However, it was evident that the remains had been disturbed by later visitors to the cave and in some cases, body parts had been removed and relocated within the cave.

First we determined that the human remains should be removed and transported to the Institute of Archaeology in Ulaanbaatar. Having noted recent destruction of the cave’s contents and some forceful removal of human body parts, including several heads, we decided that the remains should be removed as soon as possible. Because of this, we
were not required to focus on a detailed study of the remains since this could wait until we returned to Ulaanbaatar. Accordingly, we focused on the following objectives: (1) architectural and geological description of cave and cave access; (2) description of the human remains in their ‘in-situ’ positions; (3) collection of tissue samples for dating and other analytical purposes; (4) completion of test excavations; (5) preparation of remains for transportation to Ulaanbaatar; and (6) description of geological features surrounding the cave (Figure 9.13).

Several groups of human bodies and body parts were identified (Figure 9.8). For some of the disarticulated remains their original positions could not be ascertained. In one of the major bundles (Group 1) we found seven articulated and partly articulated bodies stacked on top of each other (Figure 9.9). One body seemed to be in a sitting position but with the head and some of the extremities missing (Figure 9.9). This body could be the one previously reported by N. Ser-Odjav as a sitting woman embracing an infant. However, an infant was not found. The remaining six bodies had previously been stacked in a heap, suggesting a quick disposal of the remains without ritual (Figures 9.9 & 9.10). Ligaments on the individuals were all well preserved and in some cases muscle, skin, intestinal tissue, nails, and hair were present. However, of the seven bodies only three included heads (Table 9.1). As careful search for the missing cranial/skull material did not yield any results, it is hypothesized that some of the remains, especially the heads, had been removed during previous visits to the cave over the last few decades. The seven bodies represented four males ranging from 12 years to 40+ years old, two adult females, and one child of unknown sex.

Three articulated bodies (Group 3), all infants under one year of age, were found about five meters from the group of bodies described above. Their preservation was excellent, particularly the soft tissue in the thoracic and abdominal regions, the colons and some of the smaller intestines were all in very good condition. However, none of the bodies included a head.

Various body parts and individual bones were found in several other places (Figure 9.8). One child’s cranium was located in a small alcove about 1.7 meters above the cave’s floor. This anomaly may be a result of previous trespassing. Intriguingly, a single human
Table 9.1. List of articulated human bodies found in Hets Mountain Cave

<table>
<thead>
<tr>
<th>ID</th>
<th>SEX</th>
<th>AGE</th>
<th>CAUSE OF DEATH</th>
<th>CRANIUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.A</td>
<td>Female</td>
<td>Adult</td>
<td>Unknown</td>
<td>No</td>
</tr>
<tr>
<td>1.B</td>
<td>Male</td>
<td>16 yrs</td>
<td>Unknown</td>
<td>No</td>
</tr>
<tr>
<td>1.C</td>
<td>n/d</td>
<td>8 yrs</td>
<td>Unknown</td>
<td>Yes</td>
</tr>
<tr>
<td>1.D</td>
<td>Female</td>
<td>40 yrs</td>
<td>Strangulation</td>
<td>Yes</td>
</tr>
<tr>
<td>1.E</td>
<td>Male</td>
<td>40 yrs</td>
<td>Strangulation</td>
<td>Yes</td>
</tr>
<tr>
<td>1.F</td>
<td>Male</td>
<td>12 yrs</td>
<td>Unknown</td>
<td>No</td>
</tr>
<tr>
<td>1.G</td>
<td>Male</td>
<td>Adult</td>
<td>Unknown</td>
<td>No</td>
</tr>
<tr>
<td>3.A</td>
<td>n/d</td>
<td>1.0 yr</td>
<td>Unknown</td>
<td>No</td>
</tr>
<tr>
<td>3.B</td>
<td>n/d</td>
<td>1.0 yr</td>
<td>Strangulation</td>
<td>No</td>
</tr>
<tr>
<td>3.C</td>
<td>n/d</td>
<td>0.5 yr</td>
<td>Strangulation</td>
<td>No</td>
</tr>
</tbody>
</table>

Innominate bone (hip bone) with a white surface color was also found. Such light coloration is an indication of exposure to direct sunlight for a period of days or even weeks. As all of the material found within the cave is brownish, indicating preservation solely within the enclosed cave environment, the presence of this white-colored bone present an anomaly.

We were able to determine the cause of death for all individuals with preserved cranial or cervical (head or neck) tissue. This is unusual as even in recovered bodies including mummified soft tissue it is initially impossible to establish causes of death. In general, we have been able to confirm that a majority of the bodies represented individuals who had been murdered by hanging, strangulation or other causes pertinent to the application of traumatic forces to the head and neck regions (Table 9.1). In two cases, a rope was still tightly wrapped around the cervical areas suggesting strangulation. In the case of a 40 year old female, severe trauma to the neck had dislocated some of the cervical vertebrae, and the mandible had been forced out of its articulation with the temporal bones. Deep indentation in the posterior neck tissue around the 4th cervical vertebrae suggests the use of a solid and strong bar made from wood or a metallic material. The woman’s upper body and the neck must have been in a fixed position while the head was forcefully pulled in a posterior direction, causing the observed trauma in the neck vertebrae and in the temporo-mandibular joints (Figure 9.11). Also, the high quality of preservation revealed a cut in her tongue’s anterior part caused by a forceful closure of the mouth and resulting in dismemberment of the distal tip of her tongue. The cut appears to follow the arching shape of the maxillary and mandibular dental arches (Figure 9.12). In two other individuals, rope or rope fragments associated with deep indentation in the neck skin tissue suggests forceful strangulation. Although it may be evident that most if not all of the individuals left in the cave had been killed by hanging, strangulation, or the application of traumatic forces to the neck areas, we cannot verify this for all of the individuals. This is because the missing cranial material was most likely removed recently. The present direct diagnoses are based on the observation of external surface lesions and do not include potential lesions in internal tissue. We hope to diagnose and observe internal lesions when diagnostic equipment such as x-ray and computed tomography (CT) can be applied. Also, advanced analytical research in a controlled laboratory environment should add a significant body of data supporting our reconstruction effort of this very sad event taken place about 600 years ago.

Mummified Remains
Return to Ulaanbaatar

We succeeded in completing a majority of our tasks within a three day period (Figure 9.13), closed-up camp on May 29, and initiated our return to Ulaanbaatar. We made a courtesy visit to the Mongolian Army’s Border Patrol camp located a few kilometers northwest of the cave. An oral report was given to the Commander informing him about our activities including our decision to remove all the human remains and that such remains were being transported to Ulaanbaatar under the protection of the Mongolian Academy of Sciences. Furthermore we were pleased to leave some of our supplies with the Border Patrol including fruit juices, canned food, bread, crackers, jam and other food sources deemed unnecessary for our return travel to UB.

We returned to Ulaanbaatar following a western route, crossing the 108° Eastern meridian about 50 kilometers north of the Chinese border into the Omnogobi aimag and continued toward a small settlement named Nomgon. Nomgon includes a small house adjacent to a few older and decaying mud-brick ruins. A few kilometers before we reached Nomgon we ran into a small group of government officials from the Mongolian Ministry of Ecology. A lot of clandestine gold exploration was taking place in this area and we were told that gold diggers came in huge SUVs loaded with explosives and blew up hills and other promising gold-containing geological strata. The officials told us that there could be more than hundred such clandestine operations active at any time, and that most of them were successful.

We continued toward Hanbogd, about 70 kilometers northwest of Nomgon, and passed through fascinating and beautiful desert landscape. For as far as the eye could see we observed smooth and rounded black basalt formations, testifying to thousands or possibly millions of years of wind and water erosion. From Hanbogd we continued north toward Manlay and after refueling our vehicle, we crossed the line between the Omnogobi Aimag and the Dund Gobi Aimag, arriving early evening in the town of Mandalgovi. We succeeded in finding a small hotel, while N. Batbold and our driver G. Sukhbaatar stayed with the vehicle to ensure the safety of our mummies and equipment. Before we reached Mandalgovi we stopped at a small ger where the family provided us with a great meal in traditional Mongolian fashion. Additionally, a guest at dinner was a Buddhist lama who spread out all his paraphernalia with the intent of protecting everybody there from sickness.
getting sick (Figure 9.14). On May 30 we started from Mandalgovi and followed the track toward Ulaanbaatar. About 70 kilometers south of the capital we encountered our first re-exposure to ‘modern civilization’: a small collection of gers which was likely identified as a Mongolian ‘truck stop’ offering food, soft drinks, refrigeration, and TVs. And although none of it worked because the generator was broken, we certainly knew we were getting closer to home.

Early in the evening of May 30, we unloaded our vehicle, got our mummies safely stored at the Institute of Archaeology, and delivered everybody to their respective homes with their equipment.

We had accomplished our goal in seven days, keeping our project within the original planned time frame. We logged 1,908 kilometers, of which 98% were driven on unpaved tracks or roads including about 20% on unmarked surfaces. We had succeeded in putting together a small but highly efficient team, found our cave, recorded its contents, and returned everything to our Institute in Ulaanbaatar. Our success is a reflection of fine team work, outstanding support from our institutes and departments, and an excellent collaboration between various Mongolian and American government agencies, including the Mongolian Academy of Sciences, the Mongolian Army, and the Smithsonian Institution.

Planned Research

We are now faced with the intricate task of planning, securing, and executing the ongoing research, and to achieve relevant and accurate reconstructions of the events leading to this horrendous incident. The forensic reconstruction of the cave contents will be arduous, hampered partially by the difficulties of studying the remains in situ and by alteration, destruction, and removal of the remains in recent decades. However, this forms an integral part of the scientific challenge.

The analytical phase has been initiated and we have obtained our first radiometric dates derived from rope and skin tissue samples (Figure 9.13) with results between AD 1300 to 1470 (2-sigma calibrated). This dating contextualize them into a period of volatile cultural change and crisis, allowing us to begin focusing our research on well-defined objectives, including the reconstruction of diet and an estimation of the nutritional status. There are several reasons for this approach. For example, the historical record suggest that Mongolian population groups suffered profound malnutrition during the Yuan Dynasty (AD 1279 to 1368) most likely caused by increased demands on Mongolian resources. The Mongolian Yuan administration’s relocation in AD 1264 to present day Beijing and the subsequent switch toward a sedentary behavior resulted in an economic, cultural, and geographical disconnect with the nomadic base population. The nomadic base population plunged into a crisis for the duration of the Yuan dynasty, and most likely for a substantial number of years after the fall of the Yuan dynasty in AD 1368. Records indicate widespread, continuing and aggravating poverty and starvation among Mongolian soldiers and herdsmen. Indeed, the Yuan administration in Beijing was forced to export grain to starving Mongolian groups, enforce laws on group relocation, and legally limit the rapidly increasing child slave trade created by individual families’ desperate attempts to avoid starvation.

Finally, we have decided to use this project as a further tool to promote our scientific
and educational collaboration between the Smithsonian Institution, the Mongolian Academy of Sciences, and various museums in Ulaanbaatar. We intend to use all available facilities within our own organizations to enhance our understanding of the data. Also, when necessary, we will collaborate with other experts on the interpretation of the information. Smithsonian Institution (National Museum of Natural History) has made funds available for shipping the remains to the Smithsonian for further analysis and at the same time ensured support for Mongolian scientists and students to be part of this experience. In addition to Mongolian and American anthropologists, the research team will include radiologists, pathologists, anatomists, and forensic scientists who we have collaborated with on many other projects. And most importantly, we want to include students, interns, volunteers and other researchers in our research and discussions, making this not only a truly multi-disciplinary research project but also a wonderful educational experience.
Монголын Говиоос олдсон 14-р зууны үед холбогдох хүний занданшуулсан шарил

(1) Доктор Базарседын Наран, (2) Доктор Бруно Фролих,
(1) Батболдын Нацаг, (2) Доктор Давид Хант

(1) Монголын Шинжлэх Ухааны Академийн Археологийн Хурээлэн,
Улаанбаатар
(2) АНУ-н Смитсонийн Институт дэх Байгалийн Түхийн Ундсэн Музейн
Антропологийн Тэнхим

2004 оны хавар Монголын Шинжлэх Ухааны Академийн Археологийн
Хурээлэн, Смитсонийн Институтын Антропологийн Тэнхимийн гишүүдөөс
бүрдсэн таван хүний баг Монголын Говийн Хятад Улетэй хил залгаа
өмнөөс өмнөд хүн азгтг язвэд 13 метрийн зайд байрлах багтааны
үксэд улт агуулаас дор хаяж 12 ширээг занданшуулсан хүний шарил олдсон бөгөөд
зарим нь тоноодож байсан байн. 2004 оны эхээр Монголын Шинжлэх Ухааны
Академийн үрд мэдээлэлд олз ашиг хайгддаг тонож сүйтгэхэн хэсгийг
сұлдаг, мен угсэн хэсгэйг хамгаалаасанд авах шийдвэр гаргасан байна. Бид
нарын 2004 оны 5 сард очиход агуу үксэд хэсэг нь чгэсэн тоноодож сүйтгэсэн
байсан ба бид хамгаалах бус сұлдаг зарилгоор угсэн хэсгэйг Улаанбаатар хот
дуу нуултгэсэн шилжүүлээр шийдвэрлэв.

Улдэгдэл хэсэнт хамгаalaа анх Монголын Академийн шийдвэрлэвлээс бүх зүйлүүг
аюултуулаа. Монгол Улсын Засгийн газарт буртгэгдсэнд бага бөгөөд
угаитай 13-15 ширхэг. Эдгээр нь хатуу ба зөвлөн зарим нь бүтэнээрээ хадгалагдаан
үксэн байсан бөгөөд 13 метрийн зайд байрлах багтгүүлээхүүдийг
хамгаалаагүй болох боловч энэ агуу нь бага шарын бүтэн Aires нийтдэд
бүтэн байлгаж байсан гэж бид таамаглан дагуула. 2) Агуугаас олдсон нийт
ширээний тоо 7-8 ширхэг. Бидний энэ удагааны жагсдагдсан нь харахад хэдэн
зарим нь хүнүүг артын бүтэн байгууламжийнд байж болох боловч энэ агуу
нь бага газарын тоотоочоор үүсэх гэж бид ууж байна. 2) Агуугаас олдсон нийт
ширээний тоо 13-15 ширхэг. Эдгээр арван шарын нь хатуу ба зөвлөн
эдений нь зарим нь бүтэнээрээ хадгалагдаан үксэн байсан бөгөөд байгалаас
шандандуулагдаан байсан учраас ингээд байх магадлалтай. 3) Эдгээр нь шийдвэрлэв.
3 шарын нь гавлын яс нь бага болсон шийдвэрлэв. Гавлын яс нь бага болсон
эдний нь 30 нь зарим нь бүтэнээрээ хадгалагдаан үксэн байсан бөгөөд болсон
гэж бид таамаглан дагуула. 4) Нилэн хэдэн тоон улгийн танихын
аргагүй болсон яшулд зарим нэг газар тархан байрласныг олсон бөгөөд энэ нь монд буюу агаар ашиглах гэсэн сууцлагдсэн болсон гэж зөвлөв. 5) Бүтэнээрөө улдсэн шарилуудыг бүртгэн үзээд дөрвөн насанд хүрээн хүнүү, хоёр өсөөр насны хүнүү, нэг өрөө эмгэнэл байсан байх магадлалтай байна. Насанд хүрээн хүмүүс болон өсөөр насны хүмүүсийг ажиглахад дөрвөн эрэт эмгэнээс болсон гэж ялгаж болохоор байв. 6) Үүний шалтгаан нь буюмлал, дуужилд алан өсөл үхүүний орчин үхүүгээ гэмтэнээнээ болсон байх магадлалтай байв. Гэмтэнээн хэсээс авсан зөөлөн энэ нь зураасны харахдаа буюмлолох явлдад олс олс аж эрэгтэнээн байж болошгүй. Хүүхэний орчимд ороосон байдлаар өсөл өмнөгөө ойролцаа болон олсны байдлыг олсноо болна. 40 гар насны эмгэнээс нь нүүрээн нь болон чамхахаа үндий дунд хсээс эмгэнээс авсан тод ул мэр харгандаан байв. Энэ нь бусдаасаа төр мянгаа амна илдсэн болохыг харуулж байна. 7) Энэ нь цаг үүний хувьд эдийн үед хамаарахад хогдоо одоогоор тогтоогоор улам. 

Нутгийнхны ан дамжсан ярианаас үзээд 65-70 жилийн омног энэ хавд хүмүүсийг хороосон явдал гарч байсан байна. Бидний судалгааныг ажил сэргээр шарилтай холбоотой ямар нэгэн соёл хөрснөгүй чанартай ул мэр баримт ажиглалдаагүй. Шарилаваас авсан эдийн шинжилгээ болон олны өсөлэт хийсэн шинжилгээний ол нь тодорхойлсон харилцагын аль болох хүрээн гарах болно. 8) Шарил одоогоор Улаанбаатарын Археологийн Хүрээнээс халгалдаж байгаа бөгөөд цаашлын Смитсоний Институтын томографийн аппарат гэх зээлтэл, хөрөнөө улруулахад арга техник хэрэгсэлд ашиглаж судалгааны шинжилгээний эдийн үр дүнгүүлэн хийсэнээ тодорхойлж байна. 

Бид оорлойн хэсээс хэрэгцэн дотоод хоногийн дотор бүтэнээн ба 1908 километрийг техникийн ялгүү жижиг са再也дийг тулсаат. Бид цөөгөб хүнээс бүрдсэн боловч өндөр бүтэнээн хамт олны бүрдүүлэн авахгүй ол.toJSONString, доторх зүйлсийг нь зөмлөгчлөө бүтэнээн, Улаанбаатардаа Институт руугаа бүх зүйлээ авсан буцаа зэрэгтэй мас амжилттай ахилласан. Бидний амжилт нь хамт олны гар нийлсэн ажиллагаа, институт болон тэнхимээ үзээлээс тусламжмужууд болон Монголын Шинжлэх Ухааны Академид, Монголын Ардын Арми, Смитсоний Институт гэх зэрэг Монгол Америкт засгийн газрын байгууллагаагааны хамтын ажиллагааны үр дүнд бий болсон юм.
Some Comparative Analysis of Alpine/Arctic Plants in Hovsgol Province of Northern Mongolia

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Introduction

Historical aspects

Even though the flora and vegetation in the Arctic zone and mainland Alpine belt were formed separately in the Tertiary period, flora in the Arctic and Alpine became mixed during the Quaternary, making it extremely difficult to distinguish between them (Fukarek 1982). After the retreat of glaciation only a tundra type of flora and vegetation has existed in northernmost Mongolia and it has been undergoing change ever since. Nevertheless, some of the flora from the glacial period still exists today. *Caragana jubata, Saussurea dorogostaiskii, Ptilogrostes mongolica, Abies sibirica, Allium altaicum* are examples of such relics that remain in the Hovsgol region (Ulziihutag 1989). *Allium altaicum* also spread from the Hovsgol to the Gobi-Altai mountain regions (Hilbig 1995).

It is possible that after glaciation there were few forests and little vegetation in the Hovsgol region. However, *Hippophae, Artemisia, Ephedra, Sellaginella, Thalictrum, Betula*, as well as various kinds of grasses and sedges probably dominated in this area. Currently, *Hippophae* is not found in the Hovsgol region. But, through a phytogeographic study, it has been noticed that *Hippophae rhamnides ssp. mongolica* L. did once exist in the eastern and western parts of Lake Hovsgol. It is presumed that the earliest populations might have been relocated to the river banks of western and central Mongolia by the effects of the northern forests penetrating into the Hovsgol area (Ts. Tsendeekhuu 1996). Certainly there have been similar changes taking place until the present time in Hovsgol, Siberia, North Asia, and North America’s Pacific Ocean regions. Still, there were times when flora and vegetation from distantly located areas shared similar elements. 18,000 years ago, none of Alaska, Siberia, Lake Baikal, and Lake Hovsgol’s forests were covered with ice; therefore, it is possible that flora and vegetation in these areas had similarities. Consequently, we believe that there is a possibility of comparing the history and current situation of the flora and vegetation in Hovsgol region’s tundra area to its surrounding region and the other corresponding Alpine and Arctic areas.
The Bering Land Bridge, which used to connect Asia and American lands and their biota, deserves special attention. During the last stage of the Ice Age the sea levels were lowered such that the bottoms of the Bering and Chukchi Seas emerged, eliminating the water passage between the two continents and connecting the continents of Asia and America. But by 14,000 years ago the land bridge began to be submerged, only to emerge again by 13,000 years ago, if not earlier, allowing Asians to migrate into America. The Bering land bridge was submerged for a second time 11,000 years ago and the Strait has kept this form until the present (Hulten 1974). During the Pleistocene period, the Bering area experienced a dry-cold climate and had a tundra type environment. For that reason, it is possible that the climate and environment in this area were very similar to the dry environments in the Asian uplands and Mongolia (Young 1994).

Before the Quaternary period and during the Tertiary Eocene, or 36 million years ago, *Artemisia* and *Tanacetum* of the *Asteraceae* family appeared in tropical vegetation and extended into the Asian and American continents across the Bering land bridge. In particular, the *Artemiceae* genus developed in Asian deserts and on the American continent in the same period; therefore, the recent Mongolian subgenus *Dracunculus* is closely related to members of the genus found in the North American Pacific Ocean sector (Dariimaa 2003). This relation is counted as being very ancient. Nevertheless, by looking at the literature of historical geography and flora and of vegetation paleogeography, we see that it would be promising to make a comparative analysis of alpine/arctic tundra plant history and current aspects between the Hovsgol region and Alaska.

**Table 10.1. Vascular plants of Hovsgol province.**

<table>
<thead>
<tr>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>63</td>
<td>230</td>
<td>609</td>
<td>Grubov 1955</td>
</tr>
<tr>
<td>67</td>
<td>259</td>
<td>746</td>
<td>Batraeva and others 1976</td>
</tr>
<tr>
<td>68</td>
<td>262</td>
<td>750</td>
<td>Ivelskay and others 1979</td>
</tr>
<tr>
<td>90</td>
<td>305</td>
<td>914</td>
<td>Gubanov 1996</td>
</tr>
</tbody>
</table>

We now consider the flora and vegetation in the Hovsgol tundra region. There are many plants in Hovsgol province which originated from the North Boreal region. These plants penetrated and spread to the desert zone; furthermore, the plants and vegetation which existed prior to and after the Ice Age mixed together (J. Oyumaa 2001). According to the above researcher’s floral analysis, the flora and vegetation around the Hovsgol Lake area are most likely related to the flora in the Northern and Southern Siberia from looking at their historical background. The most abundant plants and vegetation are found in only the Hovsgol Lake area. Such plants include various species, *Betula rotundifolia*, *B. humilis*, *Rhododendron parvifolium*, *Rhododendron adamsii*, *Ribes altissimum*, *Caragana jubata*, and *Salix*. *Vaccinium vitis-idaea*, *V. uliginosum*, *Empetrum nigrum*; and *Dryas oxyodonata* are also found in this area. They are all short and their heights are not more than...
10 centimeters. Lichen and moss are very significant in the Hovsgol area. Lichen doesn’t grow evenly throughout the whole area; instead, it is distributed unevenly through certain areas. Moreover, most of the lichen stands consists of such species as Cladonia alpestris, C.rangiferina, Stereocaulon paschale, Cetraria cuculata, and others. Consequently, further research recording and determining the tundra flora and vegetation in the western part of the Hovsgol Lake should be continued. One of the reasons is that the Darkhat Valley and surrounding mountain and the border areas are so remote that researchers have not traveled there to explore or study them.

From the Mongolian botanist’s point of view, Hovsgol and Hentii mountain flora could be divided into the following groups:

1. Lichen stands (Cladonia, Cetraria, Alectoria, Stereocaulon) and moss stands on alpine tundra;
2. Moss, scrub stands (Betula rotundifolia, B.humilis, Hylocomium splendes and another moss, Salix glauca) on mountain tundra;
3. Moss, sedge-moss stands, scrub-moss stands (Betula humilis, Salix glauca, Rhododendron parvifolium) on mountain tundra;
4. Larix sibirica and Pinus sibirica stands on mountain boreal conifers (Vegetation Map of Mongolia, 1996).

It is necessary to consider reindeer, their pastures and food, and the lifestyle and culture of the Tsaatan (reindeer herders). Tundra areas have for millennia been important summer pasturage for reindeer, they also figure importantly in the lives of the nomadic northern reindeer herders (Young 1994; Sukhbaatar, and DePriest, this vol.). Hovsgol forest and alpine taiga marks the southern edge of the Dukha (Tsaatan) people and their domesticated reindeer breeding in Mongolia. Herders traditionally move and select natural pastures through the four seasons of the year. They cannot prepare forage for their reindeer, because the plants eaten by reindeer are mostly lichen -- especially during the winter and early spring -- and birch, willow, sedge, grass and other flowering herbs.

While recording the classification of the lichen stand, 17 families, 30 genus, and 88 species have been found in the Hovsgol forest and alpine tundra regions. 17 of the 88 species were reported for the first time ever in Mongolian flora (Tsogt 1976). Moreover, 13 flowering plant families, 24 genus, and 53 species have been found in the far western part of Lake Hovsgol. From the above species, 9 were reported in the Mongolian flora for the first time. Types of lichen found in the Darkhat Valley and its surrounding mountain area are: Pessania (1 species), Peltigera (6), Cladonia (14), Stereocaulen (1), Aspecilla (1), Sguamarina (2), Ochrolechia (2), Iemadophila (1), Cetraria (6), Alectoria(1), Corniculata (1), Thamnolia (1), Calopca (2), Fulgensia (1), and Rinodina (1). Cladonia, Cetraria, and Peltigera are dominant in this area.

However, we do not agree that the above classification recording of the Hovsgol lichen is complete enough. Mongolian researcher Tsogt (1992) determined that the following lichen are the convenient food plants for the reindeer in their pastures in the whole area of Hovsgol province: Cladonia (4), Cladina (2), Stereocaulen (2), Cetraria (4), Dactillina (1),

Alpine/Arctic Plants
Alectoria (2), Thamnolia (1), Peltigera (5) and Parmelia (2). According to his research, Hovsgol reindeer eat some of these most of the time and others rarely.

In 2002-2004 Paula Depriest, a lichen specialist from the Smithsonian Institution in Washington D.C., selected samples for classification and research from a variety of reindeer summer and autumn pastures and explored the traditional knowledge of lichen (DePriest 2002, and this vol.; Fitzhugh 2004.) Consequently, the studies and results on the classification, ecological importance, and use of lichens of the American, Mongolian and Russian researchers should be combined and summarized.

Justification of the Project

Hovsgol’s flora is very different from florae in other flora geographical areas in Mongolia. Its origin is similar to that of South Siberia (Lake Hovsgol Atlas, 1989, Jamsran and Oyuntsetseg 1995), and East Siberia (Batraeva and others 1976). On the other hand, even though Alaska’s flora belongs to the classification of the Atlantic and North American subregion, it is also similar to the Northeast Siberia and Arctic zones. From this it is reasonable to assume that throughout history, the flora of the Mongolian Hovsgol region has been connected to that of the Siberia and Arctic/Alaskan flora. However, there is no research or other materials that can yet prove this idea.

Considering this, the Hovsgol Deer Stone Project has played an important role in verifying the comparison between the history of northern Mongolian’s Hovsgol region tundra environment, climate, botany, and zoology and that of Siberia, the North East Asia-Pacific area, the Bering Land Bridge, and Alaska in historical context. Further studies of botanic, paleoelogic, climatologic, and human-related questions should be undertaken by comparative analysis.

Purpose and Objectives

This study will provide preliminary facts and evidence comparing some of the genus and species of the Hovsgol tundra flora and their coefficient similarities to those in neighboring areas of geographically distant provinces. The specific aims of this study are:

1. To calculate coefficient similarity of some of the families, genera, and species in the Hovsgol’s botanical and geographical region through comparison with Arctic and Alaskan florae. The climate of the uplands of northern Mongolia is comparable to that of modern northwestern Alaska. It can plausibly be equated, even if roughly, with the late Pleistocene climate of this area (Young 2003);

2. To determine the number of genus and species of the Ericaceae family that are found only in the Hovsgol region by comparing them to neighboring area or distant provinces within Mongolia. Where Ericaceae dominate the undergrowth, the stands are often relatively open with smaller trees, reminiscent of black spruce stands on moist north-facing slopes in the Alaskan interior (Young 2003);

3. To report the food plants of the reindeer, including their genus and species.
Research area and methodology

The research study took place at the Tsaatan Menge Bulag summer camp located near the Jamso River, Evtiin River, and Hugiin River at the Soyo and Ulaan Uul in Hovsgol province (N51-11.451'E98-54.972', h=2200m). The flora key (Gubanov, Grubov, Hulten and Flora Central Siberia and Kazakhstan, etc.) was used in the analysis. Also, the value $S_s$ was calculated along with Sorenson's coefficient of similarity (Martin Kent and Paddy Coker 1992). The value $S_s$ is defined as $S_s=2a/2a+b+c$, where $a$ is the number of species that occur in both flora, $b$ is the number of species in the first flora, and $c$ is the number of species in the second flora.

Preliminary Results and Discussion

Floral Analysis

When comparing the main groups of the vascular plants, a big difference was noted in some cases. For example, great differences were found between the number of species in the Hovsgol and Alaska regions. However, the number of the *Pteridalis* and *Gymnospermae* are almost the same and as for *Angiospermae*, the number of Dicots families and genera are almost identical. The total number of the vascular plant families is practically the same in both Hovsgol and Alaska. Nevertheless, the total number of the genera and species of vascular plants is different in both areas (Table 10.2).

At the flora family level, the coefficient of similarity is the same ($S_s=0.43$) in both Hovsgol (90) and Alaska (89). The following table shows the coefficient of similarity of the main family of the vascular plants in Hovsgol and Alaska by selecting the flora mainly from Mongolia.

According to the results in Table 10.3, within Mongolian and Alaskan flora, the following families are most likely similar at the genus level of comparison: *Juncaceae, Fabaceae, Primulaceae,* and *Betulaceae*. In addition, *Chenopodiaceae, Asteraceae, Fabaceae* and *Alliaceae*, the other families are somewhat similar at the genus level. The families *Juncaceae* and *Orchidaceae* are very similar in both regions at the species level.

Over all, the subsequent nine families are very similar in Hovsgol and Alaska: *Fabaceae, Cyperaceae, Caryophyllaceae, Primulaceae, Poaceae, Betulaceae* and *Ericaceae*. Here we did not include the *Alliaceae* family because there was only one species. Generally,

Table 10.2. Comparison of the main groups of vascular plants.

<table>
<thead>
<tr>
<th>Main group</th>
<th>Hovsgol</th>
<th>Alaska</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Family</td>
<td></td>
</tr>
<tr>
<td>Pteridalis</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Gymnospermae</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Angiospermae</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Monocots</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>Dicots</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Genus</td>
<td></td>
</tr>
<tr>
<td>Pteridalis</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Gymnospermae</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Angiospermae</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>Monocots</td>
<td>225</td>
<td></td>
</tr>
<tr>
<td>Dicots</td>
<td>305</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Species</td>
<td></td>
</tr>
<tr>
<td>Pteridalis</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Gymnospermae</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Angiospermae</td>
<td>213</td>
<td></td>
</tr>
<tr>
<td>Monocots</td>
<td>665</td>
<td></td>
</tr>
<tr>
<td>Dicots</td>
<td>914</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total vascular plants</td>
<td>90</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td></td>
<td>305</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28</td>
</tr>
</tbody>
</table>

Alpine/Arctic Plants
Table 10.3. Comparison of the main families of vascular plants in Hovsgol and Alaska.

<table>
<thead>
<tr>
<th>Dominant families in Mongolian flora</th>
<th>Coefficient similarity (Ss)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Genus</td>
</tr>
<tr>
<td><em>Astraceae</em></td>
<td>0.18</td>
</tr>
<tr>
<td><em>Fabaceae</em></td>
<td>0.37</td>
</tr>
<tr>
<td><em>Poaceae</em></td>
<td>0.27</td>
</tr>
<tr>
<td><em>Rosaceae</em></td>
<td>0.25</td>
</tr>
<tr>
<td><em>Brassicaceae</em></td>
<td>0.22</td>
</tr>
<tr>
<td><em>Cyperaceae</em></td>
<td>0.36</td>
</tr>
<tr>
<td><em>Ranunculaceae</em></td>
<td>0.24</td>
</tr>
<tr>
<td><em>Chenopodaceae</em></td>
<td>0.15</td>
</tr>
<tr>
<td><em>Lamiaceae</em></td>
<td>0.00</td>
</tr>
<tr>
<td><em>Caryophyllaceae</em></td>
<td>0.35</td>
</tr>
<tr>
<td><em>Strophularicaceae</em></td>
<td>0.21</td>
</tr>
<tr>
<td><em>Polygonaceae</em></td>
<td>0.20</td>
</tr>
<tr>
<td><em>Apiaceae</em></td>
<td>0.30</td>
</tr>
<tr>
<td><em>Salicaceae</em></td>
<td>0.33</td>
</tr>
<tr>
<td><em>Alliaceae</em></td>
<td>0.50</td>
</tr>
<tr>
<td><em>Boraginaceae</em></td>
<td>0.21</td>
</tr>
<tr>
<td><em>Gentianaceae</em></td>
<td>0.23</td>
</tr>
<tr>
<td><em>Orchidaceae</em></td>
<td>0.50</td>
</tr>
<tr>
<td><em>Juncaceae</em></td>
<td>0.40</td>
</tr>
<tr>
<td><em>Primulaceae</em></td>
<td>0.13</td>
</tr>
<tr>
<td><em>Saxifragaceae</em></td>
<td>0.00</td>
</tr>
<tr>
<td><em>Plumbaginaceae</em></td>
<td>0.00</td>
</tr>
</tbody>
</table>

The families were not similar at the species level of comparison; however, they were very similar in the genus level. Also 90% of them were similar in their number of genera and species. The fact that the majority of the plant genera in the Hovsgol region are also found in Alaska demonstrates that there might be some historical connection between the Asian and North American flora and vegetation. In this research study, 41 dominant genera of the Alaskan tundra were selected for comparison from the flora of the Arctic and Alpine. By looking at Table 10.4, within Mongolian and Alaskan tundra vegetation seven of the genera (Equisetum, Dryopteris, Botrychum, Eriophorum, Caltha, Oxycoccus and Arctous) were very similar in Hovsgol and Alaska although they were not particularly similar at the species level. In general, 30 of the 41 genera were similar in both Hovsgol and Alaska comparisons. Specially, the following genera have the most similar properties overall: seven genera from the Pteridalis tribe, three genera from the Cyperaceae and two genera each from the Ranunculaceae, Juncaceae and Ericaceae.

Comparison of the Ericaceae family

The Ericaceae family and its genera and species in Mongolian flora are only found in the Hovsgol tundra area. Specifically, there are 6 genera and 13 species of Ericaceae in the Mongolian flora and 5 genera and 11 species in Hovsgol’s tundra and taiga. However,
Table 10.4. Coefficient of similarity (Ss) of the dominant genera in the Hovsgol tundra. (Note: the most similar genera have high values).

<table>
<thead>
<tr>
<th>The most similar genus</th>
<th>Coefficient similarity (Ss)</th>
<th>Mongolia-Alaska</th>
<th>Hovsgol-Alaska</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lycopodium</td>
<td></td>
<td>0.4</td>
<td>0.28</td>
</tr>
<tr>
<td>Equisetum</td>
<td></td>
<td>0.47</td>
<td>0.46</td>
</tr>
<tr>
<td>Botrichium</td>
<td></td>
<td>0.36</td>
<td>0.25</td>
</tr>
<tr>
<td>Selaginella</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Dryopteris</td>
<td></td>
<td>0.5</td>
<td>0.4</td>
</tr>
<tr>
<td>Cystopteris</td>
<td></td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Woodsiia</td>
<td></td>
<td>0.26</td>
<td>0.31</td>
</tr>
<tr>
<td>Pinus</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Picea</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Abies</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Larix</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Agrostis</td>
<td></td>
<td>0.32</td>
<td>0.35</td>
</tr>
<tr>
<td>Bromis</td>
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<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Calamagrostis</td>
<td></td>
<td>0.15</td>
<td>0.12</td>
</tr>
<tr>
<td>Festuca</td>
<td></td>
<td>0.16</td>
<td>0.15</td>
</tr>
<tr>
<td>Hierochloe</td>
<td></td>
<td>0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>Poa sp</td>
<td></td>
<td>0.16</td>
<td>0.19</td>
</tr>
<tr>
<td>Carex</td>
<td></td>
<td>0.17</td>
<td>0.15</td>
</tr>
<tr>
<td>Eriophorum</td>
<td></td>
<td>0.37</td>
<td>0.3</td>
</tr>
<tr>
<td>Kobresia</td>
<td></td>
<td>0.33</td>
<td>0.46</td>
</tr>
<tr>
<td>Junca</td>
<td></td>
<td>0.24</td>
<td>0.12</td>
</tr>
<tr>
<td>Lusula</td>
<td></td>
<td>0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>Cyripedum</td>
<td></td>
<td>0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>Populus</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Salix</td>
<td></td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>Betula</td>
<td></td>
<td>0.18</td>
<td>0.17</td>
</tr>
<tr>
<td>Polygonum</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Caltha</td>
<td></td>
<td>0.36</td>
<td>0.36</td>
</tr>
<tr>
<td>Thalictrum</td>
<td></td>
<td>0.25</td>
<td>0.31</td>
</tr>
<tr>
<td>Saxifraga</td>
<td></td>
<td>0.28</td>
<td>0.23</td>
</tr>
<tr>
<td>Dryas</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Potentilla</td>
<td></td>
<td>0.16</td>
<td>0.23</td>
</tr>
<tr>
<td>Rubus</td>
<td></td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Arctuus</td>
<td></td>
<td>0.4</td>
<td>0.5</td>
</tr>
<tr>
<td>Oxyccoccus</td>
<td></td>
<td>0.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Rhododendron</td>
<td></td>
<td>0.22</td>
<td>0.22</td>
</tr>
<tr>
<td>Vaccinium</td>
<td></td>
<td>0.25</td>
<td>0.27</td>
</tr>
<tr>
<td>Primula</td>
<td></td>
<td>0.1</td>
<td>0.13</td>
</tr>
<tr>
<td>Gentiana</td>
<td></td>
<td>0.13</td>
<td>0.15</td>
</tr>
<tr>
<td>Artermisia</td>
<td></td>
<td>0.45</td>
<td>0.13</td>
</tr>
<tr>
<td>Hieracium</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
from this family the genus Oxycoccus and species Vaccinium uliginosum are not yet found in Hovsgol. Arctous (1), Chamaedaphne (1), Ledum (2), Rhododendrum (5), and Vaccinium (2) are found in the Hovsgol tundra, and the genera of the Ericaceae family are similar in Hovsgol, Central Siberia, and Alaska. (See Table 10.5, 10.6, and 10.7.)

In the Hovsgol and Hangai mountain tundra areas, between N48-18' and 51-43' and E99-02' to 106-08', 0.3-3% of the land flora and vegetation exist according to tribe Ericales's pollen analysis (Gunin 1999). This geographical location includes Hovsgol and its surrounding geographical area.

During the expedition in 2002 we recorded a new genus and species from the Ericaceae family for the Mongolian flora family collected around the Jamso River boundary, Phyllodoce coerullea (L) Bab. There are 3 species of Phyllodoce in Alaska, found mostly in the Arctic tundra. These species, which are characteristic of tundra are also found in Hovsgol's neighboring regions, Central Siberia, and western Baikal Lake. From Eric Hulten's (1974) circumpolar area map, we think there is a possibility of finding the following genera from the Ericaceae family in the Hovsgol region: Oxycoccus microcarpus, O.palustris, Andromeda polifolia L, Arctostaphylos uva-ursi, A.rubra, and

Table 10.5. Comparison of the genus Ericaceae in Hovsgol and Alaska by coefficient of similarity.

<table>
<thead>
<tr>
<th>Hovsgol</th>
<th>Alaska</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genera</td>
<td>Species</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Both Sites</td>
<td></td>
</tr>
<tr>
<td>Genus</td>
<td>Species</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Coefficient Similarity ($S_s$)</td>
<td>0.24</td>
</tr>
</tbody>
</table>

Names of the species in both areas: Ledum decumbens, L.caliculata, Vaccinium uliginosum, Rhododendron sp, Chameadephne sp, Vaccinium vidis-idaea

Table 10.6: Comparison of the genus Ericaceae in Hovsgol and Central Siberia by coefficient of similarity.

<table>
<thead>
<tr>
<th>Hovsgol</th>
<th>Central Siberia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genera</td>
<td>Species</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Both Sites</td>
<td></td>
</tr>
<tr>
<td>Genus</td>
<td>Species</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Coefficient Similarity ($S_s$)</td>
<td>0.40</td>
</tr>
</tbody>
</table>

Names of the species in both areas: Ledum decumbens, L.caliculata, Vaccinium uliginosum, Rhododendron adamsii, Rh. aureum, Rh. parvifolium, Arctous alpine, Chameadephne calcultata.
Table 10.7: Comparison of the genus Ericaceae in Alaska and Central Siberia by coefficient of similarity

<table>
<thead>
<tr>
<th></th>
<th>Alaska</th>
<th>Central Siberia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genus</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>Species</td>
<td>37</td>
<td>14</td>
</tr>
<tr>
<td>Both Sites</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genus</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coefficient Similarity (Ss)</td>
<td>0.41</td>
<td>0.26</td>
</tr>
</tbody>
</table>

Names of the species in both areas: 


Azalea procumbans. It is recommended that this be considered in future research.

By comparing the coefficient similarities of some of the Hovsgol and Alaskan flora elements, we conclude that the genera and species of the families in Hovsgol, Central Siberia, and Alaska are similar and that they became part of the tundra flora after the period of glaciation, even though many changes occurred within this circumpolar flora after this time.

A Preliminary Analysis of Reindeer Food Plants in the Hovsgol Tundra Region

In the tundra region, 10%-50% of the food plants eaten by reindeer consist of lichen. Amounts of lichen eaten by reindeer per day is shown in the Table 10.8.

Table 10.8. Average amount of lichen eaten by reindeer per day calculated by the Andreyev method (1956)

<table>
<thead>
<tr>
<th>Seasons</th>
<th>Beginning and finishing date in Hovsgol tundra</th>
<th>Lichen, kilogram/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>June 25-August 20</td>
<td>0.5-1.2</td>
</tr>
<tr>
<td>Autumn</td>
<td>August 20-October 25</td>
<td>2.4-3.6</td>
</tr>
<tr>
<td>Winter</td>
<td>October 25-April 20</td>
<td>3.7-4.6</td>
</tr>
<tr>
<td>Spring</td>
<td>April 20-June 25</td>
<td>2.7-3.6</td>
</tr>
</tbody>
</table>

Table 10.9. Plants grazed by Reindeer.

<table>
<thead>
<tr>
<th>Hovsgol Alpine Tundra</th>
<th>Summer time</th>
<th>Winter time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vascular plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>Genera</td>
<td>36</td>
<td>5</td>
</tr>
<tr>
<td>Species</td>
<td>56</td>
<td>8</td>
</tr>
<tr>
<td>Lichen (dominated by Cladonia, Cetraria, and Peltigera)</td>
<td>Genera</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Species</td>
<td>22</td>
</tr>
<tr>
<td>Mushroom</td>
<td>Genera</td>
<td>5</td>
</tr>
</tbody>
</table>
We strongly recommend further research on the pasture capacity of reindeer rangeland and the year-round diet selection of the reindeer. We also recommend the continued study of the effects of reindeer grazing on lichen community populations (DePriest 2003).

Table 10.10 Pasture Capacity of Reindeer Rangeland, ha/100 Reindeer.

<table>
<thead>
<tr>
<th>Season</th>
<th>Winter</th>
<th>Early spring</th>
<th>Late spring</th>
<th>Summer</th>
<th>Early autumn</th>
<th>Late autumn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tundra</td>
<td>10-20</td>
<td>10-20</td>
<td>30-50</td>
<td>18-40</td>
<td>20-40</td>
<td>14-20</td>
</tr>
<tr>
<td>Forest tundra</td>
<td>10-15</td>
<td>10-15</td>
<td>30-50</td>
<td>18-25</td>
<td>20-40</td>
<td>14-20</td>
</tr>
</tbody>
</table>

Table 10.11. Productivity of tundra plants widely grazed by reindeer in summer pastures (Hovsgol, Tsaatan summer camp, Menge Bulag, 2001) by V.B. Andrew.

<table>
<thead>
<tr>
<th>100kg/ha Pasture type</th>
<th>Willows</th>
<th>Birch</th>
<th>Herb</th>
<th>Sedge</th>
<th>Grass</th>
<th>Lichen</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birch-lichen-herb-moss</td>
<td>-</td>
<td>11.0</td>
<td>9.0</td>
<td>-</td>
<td>-</td>
<td>22.0</td>
<td>33.9</td>
</tr>
<tr>
<td>Herb-sedge-salix</td>
<td>2.2</td>
<td>-</td>
<td>7.6</td>
<td>7.5</td>
<td>0.7</td>
<td>-</td>
<td>18.0</td>
</tr>
<tr>
<td>Sedge-herb-heavily grazed</td>
<td>-</td>
<td>-</td>
<td>6.6</td>
<td>8.5</td>
<td>-</td>
<td>-</td>
<td>15.1</td>
</tr>
<tr>
<td>Sedge-grass-herb-salix</td>
<td>2.2</td>
<td>-</td>
<td>9.9</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>22.1</td>
</tr>
<tr>
<td>Birch-salix-lichen-herb</td>
<td>7.0</td>
<td>7.0</td>
<td>1.6</td>
<td>-</td>
<td>-</td>
<td>16.5</td>
<td>25.2</td>
</tr>
<tr>
<td>Lichen</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>19.0</td>
<td>19.0</td>
</tr>
</tbody>
</table>
Table 10.12. Diet selection of the reindeer in their summer pasture (Menge Bulag, summer camp), July 2001 (Note: + is degree of pasture selection).

<table>
<thead>
<tr>
<th>Lichens and Mosses</th>
<th>Cladonia</th>
<th>++++</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stereocaulon</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Leafy moss</td>
<td>0</td>
</tr>
<tr>
<td>Willows &amp; Birch</td>
<td>Salix</td>
<td>++++</td>
</tr>
<tr>
<td></td>
<td>Salix dwarf</td>
<td>++++</td>
</tr>
<tr>
<td></td>
<td>Betula rotundifolia</td>
<td>++++</td>
</tr>
<tr>
<td>Flowering plants</td>
<td>Caltha sp</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Polygonum sp</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Pedicularis sp</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Polygonum viviparum</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>Gentiana grandiflora</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>From Compositae</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Ranunculus sp</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Potentilla sp</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>From Apiaceae</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Trollius</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Myosetes</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Allium sphaenophragum</td>
<td>0</td>
</tr>
<tr>
<td>Sedge and Grass</td>
<td>Carex</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>Bromus/Festuca</td>
<td>+</td>
</tr>
</tbody>
</table>

Acknowledgments

I would like to thank following project members who collaborated in the expedition: William Fitzhugh, Director of the Deer Stone Project; Steve Young, Director of the Center of Northern Studies; Paula DePries and J. Oyunbileg, the lichen specialist. I would also like to than ARC/KFAS at the National University of Mongolia for support of our field research.

Contact address: Ts. Tsendeehuu, National University of Mongolia, Department of Botany Faculty of Biology, P.O.Box 767, Ulaanbaatar, 210646, Mongolia; e-mail: tsend_huu@yahoo.com.
Figure 10.1. Areas covered in the research study. Bordered areas in bold mark vegetation of alpine/tundra region.

Figure 10.2. Area where the Jamso River originates and where Phyllodoce coerulla grows.
Figure 10.3. Phyllodoce coerulla, the new species of Mongolian flora.

Figure 10.4. Saussurea dorogostaikii, relic vegetation from the period of glaciation, found beside the Jamso River, 2002.

Figure 10.5. Caragana jubata, relic vegetation from the period of glaciation, near the Evt Mountain pass, 2002.
Figure 10.6 (left). Allium altaicum L, relic vegetation from the period of glaciation.

Figure 10.7 (top). Ledum palustre, vegetation found in taiga while flowering.

Figure 10.8. Rhododendron aureum, a rare plant in the taiga, near Uhert Mountain pass, 2001.

Figure 10.9. Adonis mongolica, a rare plant species found in the forest taiga, near Toom Mountain pass, 2001.
Figure 10.10. Equisetum, a main diet plant eaten by reindeer, called by Tsaatan, jaad.

Figure 10.11. Bayandalai’s wife Tsetsgee, with her son, 2002.
Figure 10.12. Steven Young with Mongolian students at Tsaatan camp at Menge Bulag, 2001.

Figure 10.13. Summer tundra pasture at Menge Bulag, 2001.
References


Смитсоний Хүрээлэн, Ундэсний Байгалийн Музей, Туйл Судаллын Төвөөс Монголд явуулах бүй хамтарсан төөс Умард Монголын Хөвсгөл мужийн байгаль орчин, соёл, археология, уур амьтдын, ургамал сүүрэнгийн оңцөгийн түүхийн байдлын, ёрөнхийлөгдөж байна. Смитсоний хүрээлэн, Ундэсний Байгалийн Музей, Туйл Судаллын Төвөөс Монголд явуулах бүй хамтарсан төөс Умард Монголын Хөвсгөл мужийн байгаль орчин, соёл, археология, уур амьтдын, ургамал сүүрэнгийн оңцөгийн түүхийн байдлын, ёрөнхийлөгдөж байна.

Монголын ургамал газар зүүн 16 төрөгчийн нэг нь болох Хөвсгөл мужийн уул тайгийн ургамлын аймаг, ургамалжилтийг (flora and vegetation) орос монголын сүүрлэн нэгэн түүхийн судалсан болох Сибирь, Зүүн хойд Азий, Номхон далай умард хэсэгт түүхэн талаас нь холбог тархсаны, барууны эрдээмтээс хамтарсан ажил байхгүй байна. Ийм учраас Хөвсгөл орчмын ботаник, фитогеографын судалгаа ба түүхийн асуудлыг Умардны судалтууд холбож зээл санаа төрсөн юм.

Иймээс Хөвсгөл мужийн уул тайга түнд бирийн ботаникийн судалгааныг Сибирь ба Аляскин Арктикийн түнд рүү түүхийн түүхийн, аймгийн орноо ордондоос энэ орогоо тусганаас боловно. Харыцуулах анализын ёр дунд Хөвсгёл ба Аляскин гурвэр ургамлын овгийн тоо барыш адили рейтингт 90 ба 89, төсөөтэй коэффициент нь 0.42, эдгээрээ хос түрлүүлэн овоо ил нөлөөгүй. Монголын ургамал мужийн олон зүйл агуулаан 23 том орогоос 26% нь Аляскин мужийн төстэй байна.

Алты/Арктикийн түнд түрээлүүл тархдаг 22 овгий 41 терлээс Хөвсгөл ба Аляск 16 төрөл нь төстэй (SS = 0.3-0.5) эдгээрээ Equisetum, Dryoptris, Botrychum, Eriophorum, Azctous, Caltha (SS =0.5) хамгийн их төстэй, Монголын Eracaceae овоо нь барыш бүтээлэр Хөвсгөлний ургамал газар зүүн тойрог төхөөлд багаэд энэ орого нь Төв Сибирь ба Алясктай төсөөтэй байна. Экспедициянын явиат тус оргоос Phyloodoce сөргөлөө зүйлийн Монголын флор нь шингээр олж тэмдээгээс. Дээрх үзгүүлэлт нь плейстоцены хожуу местлегийн дараа Хөвсгөл, Сибирь, Аляскин тэр үйн хүү профилууд адилихан хээр түнд рүү хөв шингэлэн байсан харуул байна. Харин голоцооны үед ихээхэн ялгаа гарсан нь тодорхойлно.
Modern Vegetation of the Hovsgol Region of Mongolia: A Possible Key to the Demise of the Ice Age Mammoth Steppe of the Arctic

Steven B. Young
Center for Northern Studies
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Introduction

Beringia is the name given by paleoecologists to unglaciated Alaska, easternmost Siberia, and the emergent sea bed of the northern Bering Sea and Chukchi Sea during glacial ages. At the peak of the last glaciation, some 20,000 years ago, sea levels were lowered by as much as 125 meters, exposing a land connection between the continents that may have been as much as 1,300 kilometers wide at its narrowest. It is widely accepted that this land connection, which was closing for the last time some 12,000 to 10,000 years ago, was the route by which humans first entered the New World. The exact timing and location of the first human migrations to the Americas is still problematic, as is the identity of the people involved, and of their precursors on the Asian side. Whoever the first Americans were (even if they arrived by some route other than Beringia, as some workers have proposed) there were people in Beringia by the end of the Pleistocene at the latest, and there can be little doubt that they were important contributors to the early Holocene populations of the Americas.

The biotic environment of late Pleistocene Beringia was apparently largely based on an array of vegetation formations which have no modern counterpart. The ancient ecosystems of the area are often collectively known as the 'mammoth steppe.' This term is indicative both of the belief that the ancient Beringian landscape was dominated by some form of shortgrass prairie, and that at least one of the dominant large herbivores was the now extinct wooly mammoth. The mammoth steppe is, of course, interesting in its own right, but especially so because it must may have provided the basis for the livelihood of the hunter-gatherers who shortly thereafter spread southward through the Americas.

There are many questions about the nature of the mammoth steppe, and about its demise and replacement by a modern, array of mainly tundra ecosystems in the late Pleistocene/early Holocene. Two of the most important of these can be articulated as follows:

1. Was the mammoth steppe a highly productive environment, capable of supporting large populations of herbivores, or was it more like modern 'polar desert'?
2. What was the process of the breakdown of the mammoth steppe in the late Pleistocene?

These questions have been subject to much investigation (e.g., Hopkins, et al. 1982, West, 1996, Guthrie, 1990, Elias and Brigham-Grette, 2001.) While no definitive answers have emerged, the most plausible scenarios have resulted from a synthesis of paleontological data, especially pollen, insects, and large mammals, and by comparisons with modern ecosystems which are considered to be at least partially analogous to the ancient conditions.

In recent years there has been increasing recognition that Beringia, rather than being a centrally located refugium in the late Pleistocene Arctic, was actually more the extreme end of an ecological region that extended across Eurasia from Beringia to Eastern Europe. This entire area supported only local glaciation, in contrast to North America, whose northern half was almost totally covered with ice. One outgrowth of this awareness has been the recognition that modern ‘analogues’ to the ancient mammoth steppe might best be sought in interior Asia, rather than necessarily within Beringia itself. However, a search for relict mammoth steppe or steppe analogues in Siberia, the apparently logical place for it to occur, appears to be fruitless, since most of the lowlands of Siberia lie within the zone of extensive larch forest. It seems to be counter-intuitive to suggest that a mammoth steppe analogue might occur to the south of the Siberian forest. But I suggest that the closest modern equivalent of mammoth steppe lies in central Asia, and that the cold steppes and uplands of northern Mongolia may hold several keys to an increased understanding of the Pleistocene environment of Beringia. In the remainder of this paper, I shall explore several lines of evidence in support of this suggestion. I hope to show that some of the major questions regarding Beringia might be at least partially answered by research in Mongolia. This should be regarded as being a preliminary report and a suggestion for an array of investigations that might throw considerable light on the environment of the late Pleistocene high latitude unglaciated regions.

The Region

I shall be discussing primarily the Hovsgol region, which is the northernmost province of Mongolia. It lies at roughly 50 degrees North Latitude, immediately south of the border with Russia. This is a mountainous region, with peaks reaching over 3,000 meters. On the eastern side lies Lake Hovsgol, a large, deep, and ancient lake whose surface is at about 1,600 meters above sea level. Parallel to the Lake Hovsgol valley and lying to the west, the Darkhat Valley contains several smaller lakes but is currently mostly dry, with the valley floor at roughly 1,500 meters. The Darkhat Valley and the mountains to the west and south are the main locations of the observations discussed here.

Climatic data has been gathered for several decades in the Hovsgol area. The most representative of the study area are Rinchinilhumbe, in the Darkhat Valley, Hatgal, on the south shore of Lake Hovsgol, and Muren, some 150 km to the south of Lake Hovsgol. The temperature regimes of the northern stations are comparable to those found in northwestern
Alaska. Mean annual temperature is far below freezing, summers are short and cool, and winters intensely cold. Given the cold temperatures, it is not surprising that permafrost is widespread and generally continuous. However, frost soil features are relatively rare and subtle. The most conspicuous are open system pingos and related features, most of which are currently rapidly degrading. Although the temperature regime is comparable to that of some Arctic areas, the precipitation is radically different, not so much in overall amount, but in distribution throughout the year. Precipitation falls almost entirely during the summer. Annual snowfall is minimal; local drivers say that they can usually drive jeeps across the steppe throughout the winter. Grazing animals survive with only minimal supplemental feeding. Disastrous loss of stock, such as occurred in the winter of 2000-2001, is generally associated with unusually heavy snowfalls, which can bury foods sources too deeply for them to be utilized by steppe-adapted grazers such as horses and cattle. Summer rainfall can be heavy at times and usually causes high productivity of the steppe graminoids, assuring the availability of dried fodder in winter.

The Hovsgol climatic stations are all located in valley floors (1,000-1,500 m.) There is no data available from the nearby mountainous areas, whose peaks reach above 3,500 meters. Although there are areas that indicate former local glaciation (especially the mountains between the Darkhat and Hovsgol valleys,) most of the uplands are rolling, with fairly gentle slopes. They appear similar to the Tanana uplands of Central Alaska, and have obviously never supported extensive glaciers, at least in the later Pleistocene.

The current climatic regime of the upland steppes of northern Mongolia can plausibly be equated with the climate of late Pleistocene Beringia, or, at least, its southern portions. On an annual basis, the ancient Beringian climate would have been colder than that of Beringian remnants such as the Yukon Kuskokwim Delta today. It also would have been much more continental. Short, comparatively warm summers would have been followed by long, frigid winters with generally light precipitation. The aridity of the winters would have been exacerbated by the freezing of the adjacent sea, which would have provided a moisture source during the summer months.

The vegetation of the valley floor of the Darkhat Valley is mainly a shortgrass steppe composed of sedges (especially *Kobresia* species) grasses, and drought-tolerant forbs. River valleys and many north-facing slopes support stands of larch forest. The slopes of the surrounding mountains are generally forested, but with extensive areas of steppe on ridgetops and some valley floors. This mixed vegetation gives way to an alpine zone at about 2,200 to 2,400 meters elevation. The alpine zone is utilized as summer pasturage for reindeer, as well as horses, goats, and cattle. It is remarkably different in aspect from the nearby steppe. In many areas the soils appear to be saturated throughout the summer months, and much of the vegetation is similar to wet tundra in arctic regions. Better drained areas are dominated by extensive stands of dwarf birch (*Betula nana/glandulosa*). They appear similar to the extensive birch-dominated uplands of much of interior Alaska. Judging by the extensive snowbeds that remain through much of the summer, snowfall must be much higher in the alpine zone than on the nearby steppe. In addition, there is often extensive cloud cover during the summer, which obviously reduces evaporation and transpiration.
The question of the productivity of the mammoth steppe has been a source of controversy for several decades. Palynological data from Beringia can be interpreted as suggesting that the vegetation was sparse (e.g. Ritchie and Cwynar, 1982) and comparable to modern high Arctic situations. Mammalian paleontologists (e.g. Guthrie, 1982, 1990) claim that the evidence supports the presence of numerous large herbivores, such as bison, horses, and mammoth, in Beringia throughout the later Pleistocene.

If the climate of the Hovsgol region of Mongolia is at all comparable to that of Ice Age Beringia, it is clear that the area was capable of supporting a complex, productive, steppe vegetation. Currently, the Darkhat Valley supports domestic herds of sheep, goats, camels, yaks, cattle, and horses. Knowledgeable people have suggested that the total number of large herbivores in the valley may be on the order of 100,000, in a land area of roughly 10,000 square kilometers. While there is some supplemental feeding in the form of hay harvested during summer, most animals apparently derive most of their sustenance from grazing on the open steppe in both summer and winter. As I mentioned above, the weak point in the annual life cycle seems result from unusually heavy snowfall.

Domestic animals currently in the Darkhat Valley are roughly comparable to the large herbivores of the Beringian mammoth steppe. Horses are common to both ecosystems, and yaks and cattle of the Darkhat would be equivalent to bison in Beringia. Wild sheep would not have been as prominent in the mammoth steppe as sheep and goats are in the Darkhat, and mammoths, of course, are long gone. Reindeer, mostly domesticated, but with a few small wild herds, occur only in the uplands during summer. In winter the domestic reindeer are brought down to lower levels, where they feed on lichens in the forest.

We can expect that the biomass of wild herbivores that would occur in a ‘natural’ Darkhat Valley would be less than under the current animal husbandry regime. Even if the total biomass were reduced by an order of magnitude, the valley would provide a rich hunting ground for an advanced hunter-gatherer society. If the modern steppe of northern Mongolia is in any way comparable to the mammoth steppe, there is no question that the ancient environment of Beringia would be capable of supporting a significant population of humans who relied heavily on big game animals.

Virtually every palynological study conducted in Beringia whose time frame extends back into the late glacial shows a radical change in the pollen rain some 13,000 to 14,000 years ago. Previous to that time, the pollen rain is dominated by Gramineae (grasses) and Cyperaceae (sedges.) There is often a strong admixture of Artemisia (sagebrush and many related species) and willow pollen. Interestingly, a few groups not normally found in arctic tundra occur regularly, although in small quantities. The most important of these is Chenopodiaceae, the family that contains goosefoot, tumbleweed, and a number of other species often found in temperate, semi-arid, or saline conditions. In the late glacial, these
pollen sources are overwhelmed by a dramatic rise in birch pollen. The ‘birch high’ usually lasts for several thousand years, whereupon, in Alaska, it is often modified by a major rise in spruce pollen, signifying the reforestation of the lowlands beginning 11,000 to 8,000 years ago.

The birch rise is usually interpreted as a response to the warming of the climate in late glacial times. According to this view, the cold, unproductive ‘high arctic’ vegetation of full-glacial Beringia was replaced by a ‘low arctic’ tundra dominated by scrub birch as the climate warmed. In some areas, this was further modified, or became boreal forest, with the return of spruce. This view, of course, conforms with the ‘low productivity’ side of the productivity paradox.

We can hypothesize that the birch-dominated alpine zone in the mountains in northern Mongolia is a reasonable analogue to the vegetation of the birch zone of late glacial Beringia. Similarly, there is good reason to suggest that the cold steppe of areas such as the Darkhat Valley floor and slopes are analogous to the mammoth steppe. The problem, of course, is that the Mongolian steppe lies at a lower elevation, and thus, apparently, under a warmer climatic regime than does the alpine birch scrub. How can this be squared with the assumption that birch scrub replaced mammoth steppe in Beringia as the climate became warmer?

This is not as difficult a problem to reconcile as it first appears. It is easy to make the assumption that a wanning climate would result in longer, warmer summers, and that this would favor scrub growth over ‘tundra.’ However, we need to keep in mind that a warming climate, if it occurs during a time of major inundation of adjacent land areas by the rising seas, is also bound to become a more maritime climate. This would result in less difference between winter and summer climates. Thus, an overall warming trend may actually be reflected in cooler summers. This is not only a matter of ambient air temperatures, but also would reflect changes in precipitation and cloud cover. Warmer, more humid winters would result in increased snowfall. Deep drifts could be expected to lie long into the summer, inhibiting plant growth, decreasing depth of the active layer, and providing a source of excess surface soil moisture. This situation would be exacerbated by increased cloud cover, which would lower soil temperature and alter melt regimes.

According to this scenario, then, the birch rise may be due to an overall climatic amelioration which, nonetheless, results in the dissolution of a comparatively productive steppe into a colder (in the summer,) wetter ‘tundra’ environment. We can also note here that the transformation from steppe to birch scrub could be detrimental to many steppe animals, even if there were no net loss of productivity. Scrub birch is highly resinous and rich in compounds that reduce its attractiveness, and its nutritional value, to grazing herbivores. Furthermore, the increased snowfall might make such nutritious plants as remained unavailable during the winter months, which are obviously a critical time for grazing herbivores.

The hypothesis outline here accords well with a solution to the problem of the extirpation or extinction of the late glacial large herbivore fauna of Beringia. The loss of large and important herbivores such as bison and horses could be plausibly attributed to
the loss to steppe habitat to birch scrub and to the rising seas. A number of less dominant steppe species, such as saiga antelope, also vacated the area in the late Pleistocene. Many of these species currently occur wild in Mongolia or, like Prezwalski’s horse, were eliminated in historical times. This suggestion, does not, of course, remove the possibility that hunting pressure from humans was partially implicated in the demise of the mammals, especially if their populations were already under pressure from habitat loss.

The continued presence of reindeer in the Mongolian uplands also fits well with the above scenario. Caribou (which belong to the same species as reindeer) are the dominant herbivore in the birch scrub environment of interior Alaska. They have reached this status after having been a less important component of the large herbivore fauna of the later Pleistocene in Beringia. Reindeer in Mongolia appear to be confined to the birch scrub of the uplands, at least during the summer.

Suggestions for Further Research

The general scenario I have outlined here is a plausible fit for the information that has been developed regarding the nature of the late glacial Beringian environment. To provide support for or alternatives to this hypothesis, several lines of research immediately suggest themselves. A short, and by no means exhaustive, list of these follows. In some cases, work of this sort may have been initiated by Mongolian and Russian scientists, but the literature has not been available to me.

1. Compare the flora of the cold steppes and alpine regions of northern Mongolia with that of northern and western Alaska.

2. Begin genetic studies on plants common to Beringia and Northern Mongolia to determine the closeness of relationship.

3. Attempt to obtain and analyze pollen cores penetrating to late Pleistocene times in Mongolia.

4. Review the late Pleistocene and early Holocene fossil record for large herbivores in Mongolia.

5. Search for and analyze exposures of buried soils and peat for late Quaternary fossils of plant material and insect parts.

1. Comparing Floras

The taxonomic work on the alpine flora of Mongolia has mainly followed Russian methods and traditions. Considerable work needs to be done to begin to clarify the relationships between taxonomic groups that may have different names in the Mongolian literature, and which may have been defined by different species concepts.

2. Genetic Studies

Modern studies of plant DNA can often provide powerful data on the degree of
relationship between populations within a single, widespread species. This can provide insight into the migration patterns of populations of plants during and since the glacial periods and on migration pathways and refugia. It would be valuable to initiate studies of this type on species which are clearly common to the two areas of concern, and which are important members of the present or past ecosystem of each area. Examples are: several *Kobresia*, *Carex*, and *Eriophorum* species, *Betula* (dwarf birch,) several *Saxifraga* species, and *Rhododendron lapponicum/parvifolium*.

3. Pollen Studies

The late Quaternary pollen record of Beringia, especially eastern Beringia (Alaska-Yukon) is fairly well known. Comparison of the pollen history of northern Mongolia to these studies would yield information on the degree of similarity of the ecosystems of the two areas over long periods of time.

4. Mammalian Paleontological Records

I have been unable to review such literature as may be available in Mongolian and Russian regarding the late Pleistocene fossil fauna of northern Mongolia. It would be desirable to search the literature, as well as to continue to search for new fossil locations.

5. Buried Soils and Peat Deposits

Because permafrost is extensive and is rapidly degrading in northern Mongolia, there should be many recent exposures of ancient soils. These should provide opportunities to identify and date fossil material such as buried wood, other plant megafossils, insect parts, and other material, such as rodent teeth. The same material might be found in archaeological sites, and would be particularly important if sites of Upper Paleolithic or Mesolithic age should be found.

Research such as described above should, of course, be conducted in close consultation with similar continuing investigations in Alaska and eastern and Central Russia, as well as other parts of Mongolia and such relatively unknown regions such as Kazakhstan. Since much of Asia was relatively ice-free during the latest Pleistocene glaciations, the entire region has great potential for increasing our understanding of the late stages of the Pleistocene and the genesis of our modern, Holocene environment.

References


Монголын Хөвсгөл зүйгийн урсгалын төрөлхөөр: 
Арктик Хөлсөгийн сууны тэжээлт нутаглаж байдаг газрыг нууцгүй тайлалах боломжтой тулхуури

Стивин Б Яан
Хойд Судалын Төв

Монголын хойд ээсгийн Хөвсгөл зүйгийн хүйтэн хэсэг нь өндөр агаарын хувьд Беринг гэж нэрлэгдээг Берингийн Хөлсөгийн Плейстоцений хожуу Усийн зарим хэсэгтэй адилий тэстэй байдаг. Хөвсгөл зүйгийн бүсэд судалгааны хийхэд нь Хойд Америкийн баруун тийш чиглэээн хүмүүсийн анхны нуудэлтэй холбоотой Беринг орчмын байгаль экологияйн талаарх асуултуудад хариулт авах чухал ач холбогдолтой юм. Хөвсгөл зүйгийн хүйтэн хэсэг нь одоо угий бүсийн сууны тэжээт нутаглах байдаг Берингийн зүйгийн газартай адилий тэстэй жижигт агуулж болох бөгөөд сууны тэжээт нутаг нь их хэмжээгээр эмнэлээр байсан талын өвсөн тэжээт нутаг талаар эдхээ боломжийг олж болох юм. Далайн түвшнээс хөрөлдөг хэсэгт орших алыг тундын бутлаг хүсэн мод нь хөрөнгө хэмжээгээр тархсан нутаг нь сууны тэжээт нутаг нь эрхэн шим тэжээл мүүгүй бутлаг газраар солигдсон талаар тайлбар огих бас боломжтой юм. Плейстоцений хөгсөл өөрд угий болсон Берингийн аварга бигрээ сууны тэжээт нүүрлэлийн төрөл зүйлийн тайлгалдаагүй нууцгүй тайлбарлах чухал хэрэглүүр болох боломжтой.

Steven Young in upland steppe on the west side of Lake Hovsgol. (photo: Fitzhugh)
Part 2

Workshop Summaries
Museum studies workshop at the National Museum of Mongolian History. (photo: Hunt)
Introduction

The Joint Mongolian-American Deer Stone Project organized the first in what is hoped to be a series of annual symposia. Held 2-4 June 2004 in Ulaanbaatar, Mongolia, there were approximately 50 attendees, primarily Mongolian professionals from various research institutes and museums in Ulaanbaatar. The Smithsonian Institution was represented by nine professionals, representing the National Museum of Natural History’s Anthropology, Botany and Exhibits Departments, the Office of Exhibits Central, and the Center for Materials Research and Education.

Two days of professional papers were delivered by Smithsonian and Mongolian researchers carrying out various anthropological and botanical projects in Mongolia; these sessions were held in a large classroom at the National University. The third day (4 June 2004) was a more practical workshop day, with two concurrent sessions. One workshop introduced participants to GIS archaeological survey techniques. The other workshop, held at the National Museum of Mongolian History, focused on collections management and museum conservation issues, including the process of making molds and casts of objects.

Museum Conservation and Collections Management

A collection is a group of specimens or objects. It can represent the materials recovered from a specific expedition or can comprise an entire inventory held by an institution. At the heart of collections care is the recognition that the value of each individual item resides, first and foremost, in its material nature; it is a direct source of information about the cultural or natural heritage of which it is a part. Its value also includes the accompanying documentation and accumulated data records of our own creation, which places each item in a specific context and elucidate its aspects.

From the time of collection and thereafter, we are in a position to beneficially or detrimentally affect the objects’ material nature by the environments to which we expose it and by our actions or inactions. These include storage and display environments, and activities associated with handling, conservation and analysis. In practice, the challenge is
to reveal and preserve the objects’ meaningful material aspects by the least compromising or invasive methods and the most protective environments as possible.

Because the collecting process physically strips an item from its context, documentation at that point becomes the crucial tool for being able to reconstruct its original relationships to context. Aside from serving as the fundamental identification of individual objects, records of collecting, processing, and environmental conditions can add important indicators of potential alterations that, along with analytical records, enhance our understanding and thus the value of the objects themselves.

Collections care practices encompass actions intended to protect the collections value, both the material objects and the records associated with them, from the time of collection in the field to processing, preservation, research and educational uses while curated in a museum. The papers in this section bring together the perspectives of conservation, exhibit preparation, research and collections management to describe collections care practices as they apply to a wide range of materials, including archaeological materials in a field setting, and human skeletal collections and botanical specimens in a museum setting.
Монгол Америкийн хамтарсан “Буган чулуу хөшөө” төсөл нь эрдэм шинжилгээний аиндны хүрээлэн өгсөн бур уламжлал болгох зорилготойгоор зохион байгуулсан юм. 2004 оны 6 сарын 2 - 4 нийт хооронд Монгол Улсын Улаанбаатар хотоо болон Уулгүй бяцхан чулуу хөшөөнд байрлаган. 2004-2005 онд Монгол Улсын Улаанбаатар хотоо болон Смитсонийн Материал судлалын төвийг төлөөлөн нийт 9 мэрээд хүч өнгөрсөн. Монголын уулгүй эрдмийн түрүүлээ, материалын судлал болон Боловсролын Төвийг төлөөлөн нийт 9 мэрээд хүч өнгөрсөн. "Бугаи чулуу хөшөө" төгсөл нь эрдэм шинжилгээний анхны хурлаа жил бүр уламжлал болгох зорилготойгоор зохион байгуулсан юм. 2004 оны 6 сарын 2 - 4 нийт хооронд Монгол Улсын Улаанбаатар хотоо болон Уулгүй бяцхан чулуу хөшөөн дүүргэсэн 50 гаруй хүмүүс оролцосон. Смитсонийн Институт ээс Байгальын Түүхийн Ундсэн Музей Антропологи. Ургамал судалал, үзэмрийн танхим болон үзэмрийн төвийн хэлтэс. Материал судалал болон Боловсролын Төвийг төлөөлөн нийт 9 мэрээд хүч өнгөрсөн. 2004-2005 оны бардамжтайгаар бардамжтайгаар оролцсон. 2004-2005 оны бардамжтайгаар бардамжтайгаар оролцсон. Монголын уулгүй эрдмийн түрүүлээ, материалын судлал болон Боловсролын Төвийг төлөөлөн нийт 9 мэрээд хүч өнгөрсөн. Монголын уулгүй эрдмийн түрүүлээ, материалын судлал болон Боловсролын Төвийг төлөөлөн нийт 9 мэрээд хүч өнгөрсөн. Монголын уулгүй эрдмийн түрүүлээ, материалын судлал болон Боловсролын Төвийг төлөөлөн нийт 9 мэрээд хүч өнгөрсөн. Монголын уулгүй эрдмийн түрүүлээ, материалын судлал болон Боловсролын Төвийг төлөөлөн нийт 9 мэрээд хүч өнгөрсөн. Монголын уулгүй эрдмийн түрүүлээ, материалын судлал болон Боловсролын Төвийг төлөөлөн нийт 9 мэрээд хүч өнгөрсөн. Монголын уулгүй эрдмийн түрүүлээ, материалын судлал болон Боловсролын Төвийг төлөөлөн нийт 9 мэрээд хүч өнгөрсөн. Монголын уулгүй эрдмийн түрүүлээ, материалын судлал болон Боловсролын Төвийг төлөөлөн нийт 9 мэрээд хүч өнгөрсөн. Монголын уулгүй эрдмийн түрүүлээ, материалын судлал болон Боловсролын Төвийг төлөөлөн нийт 9 мэрээд хүч өнгөрсөн. Монголын уулгүй эрдмийн түрүүлээ, материалын судлал болон Боловсролын Төвийг төлөөлөн нийт 9 мэрээд хүч өнгөрсөн. Монголын уулгүй эрдмийн түрүүлээ, материалын судлал болон Боловсролын Төвийг төлөөлөн нийт 9 мэрээд хүч өнгөрсөн. Монголын уулгүй эрдмийн түрүүлээ, материалын судлал болон Боловсролын Төвийг төлөөлөн нийт 9 мэрээд хүч өнгөрсөн. Монголын уулгүй эрдмийн түрүүлээ, материалын судлал болон Боловсролын Төвийг төлөөлөн нийт 9 мэрээд хүч өнгөрсөн.
Цуглуулга хийх уйл ажиллагаа нь эд зуйлсийг орчин тойрон, бусад баримт сэлтэс нь биетээр салгаж авдаг учир анхны байдлаар нь орчиной нь уялдуулж дахин сэргээх нь хамгийн шийдвэрлэх чухал асуудал байдаг. Эд зүйлсийг цуглуулан буртгах, боловсруулах, орчин нөхлөг бүрдүүлэх зэрэг нь ул биет зуйлийн ерөйнхий суурийн төрхийг шинээрлэх үүрэг гүйцэтгэхээс гадна шинжилгээ судалгааны баримттай нэгэн адил нөөцөлтөөнөөс чадвар буихий чухал хэрэгсэл болж тухайн эд зүйлийн талаарх бидний ойлголтгыг эсгэн нэмэлтлүүлж улмаар уг зүйлийн үз нэгийн өндөрт үргэл боловж байх тухай ойлголтыг нэмээх нь хэрэгтэй. Цуглуулгыг нудлэн хамгаалах гэдэг нь цуглуулгын үз нэгийн хамгаалах зорилгоотой уйлын багш нь цуглуулгын газар нээрэн нь буртгэхээс эхлээд боловсруулах, музеидт хадгалах, сургалтын шинжлэхийн зорилгоо ашиглах гэх мэт буихий математик биет болон түнтэй дагалдах буртгэлийн аль аль нь хамаарна. Энэхүү багц багтсан илтгэлд нь хадгалах, усны бэлтгэх, судалгааны ажил хийх ба цуглуулах менежментийн хэсгийн төлөвлөгөөг хамтгаль хүртлэн оролцох багш нь цуглуулгын нудлэн хамгаалах аргуудаас хайгуулын ажлын үзэг археологийн материалаар хэрээн хадгалах, музей дотор хүний араг яснуудыг болон үргэлжийн зүйл нэрэлт зүйлийн цуглуулгыг хэрээн хадгалах зэрэг зишээнүүдийг дүрдсэн болно.
Introduction

What artifacts can tell us about past lifeways is derived from their intrinsic characteristics and from contextual relationships with other components of the archaeological record. Those artifacts that are exposed in the course of controlled excavation offer particular advantage, as the depositional contexts are known and the artifacts are as yet unaltered by a post-excavation history. Once they are removed, however, the contextual relationships are irrevocably disturbed and can only be accessed through indirect sources of information of our own making, notably written and graphic documentation of the excavation process. The material record, including collections of artifacts and samples, remains our only direct link to the past.

The irreplaceable nature of this resource is recognized by the archaeological profession, as sections in professional codes of ethics on preservation and responsible curation suggest (Rotroff 2001). But it is the conservation profession that has most fully articulated what the preservation of the material record entails in practice (AIC 1994). By addressing the deleterious effects of burial at the time of excavation and by thoughtfully managing how materials are subsequently processed and stored in museum settings, conservators play a significant role in maintaining the collection's value as an information resource about the past.

Preservation Goals

The preservation process starts with the recognition that each artifact possesses a life of ongoing change, from when it was first created to the present moment. The goals of preservation are to elucidate those aspects that are considered to carry the greatest information value, and to limit any further alterations that would interfere with or otherwise compromise the quality of information.

The aspects of primary interest to archaeological researchers are the earliest alterations in the continuum, notably traces of the manipulation of raw materials in an artifact's manufacture and evidence of use and re-use. Other alterations will have occurred
during this period of use as the materials "naturally age" in response to ever-present agents of change, including oxygen, humidity and temperature levels, and microorganisms. With its final discard or abandonment, the artifact experiences another more dramatic set of changes as it adjusts to a burial environment that possesses very different characteristics from the one in which it was initially created and used. For some materials, these changes result in disappearance from the archaeological record. For others, the changes may be more limited and the artifact eventually achieves a kind of equilibrium state.

This equilibrium state is unbalanced at the moment of excavation, a relatively rapid re-entry into the ambient environment. The changes that are set into motion may be tolerable to the artifact, or they may destabilize the materials sufficiently to threaten the artifact's continued survival. Some of these changes are immediately apparent, necessitating immediate action; others are more deceptive, taking years to manifest themselves, but no less destructive. Items that were always exposed (such as the deer stones), may not go through the extremes of re-entry experienced by buried items, but they will have undergone alterations from prolonged exposure to weather, pollutants and biological agents, as well as vandalism and looting.

Significantly, excavation marks the beginning of the period in which we have the potential for some control over the process of change. How artifacts are excavated and handled, the treatment they receive during laboratory processing, and the conditions of storage and display, also produce alterations, some for the worse, but these too can be controlled with thoughtful effort (Cronyn 1990, Sease 1992, Pye 2001, NPS 2002). In this way, the conservation attention that artifacts receive, beginning at the time of their excavation, is critical in supporting their research value and their future as an information resource.

Archaeological Conservation Strategies

In most moderate terrestrial burial contexts, sufficient moisture and oxygen percolate through the soil matrix to sustain bioactivity, accelerating the deterioration of organic constituents of the material record. Evidence of these materials is often indirect, such as matting imprints in soil, textile impressions on ceramics created before the material was fired, and corrosion "pseudomorphs" of cordage, formed where it had been in contact with a metal surface. Some environments may favor the preservation of organics, particularly woods with sufficient density or resinous qualities, but they will still have been undermined by certain kinds of biodeterioration.

The materials that dominate the archaeological collections are typically inorganic, including a wide variety of metals, fired ceramics, stone, as well as primary structural components of shell, bone and ivory. During burial, these materials have been altered to varying degrees, both chemically by moisture, oxygen, and salt constituents of the burial matrix, and physically by overburden pressure and other weathering effects.

Exposure during excavation may be sufficient to induce damages, particularly for sensitive materials or in harsh conditions, so an important conservation strategy at the outset is to moderate the sudden changes induced by entry into the ambient environment.
Examples include providing shade or protection from rain, maintaining ample burial soil around objects or covering them to slow down evaporation of moisture. Once artifacts are exposed, the conservation strategies must always be adjusted to meet the needs of particular artifact materials and site or museum conditions. Some approaches that have been found to be particularly useful are summarized below.

![Figure 13.1. Blocklift sequence:](image)

(a) beads partially exposed on a pedestal of soil; (b) the beads and soil block covered in thin plastic wrap, secured with a strip of masking tape, and then with aluminum foil as a barrier; (c) the block jacketed with plaster; (d) the pedestal cut at the base and the block inverted for transport and laboratory excavation (Photo: E. Robertson, SCMRE).

### Addressing the Physical Effects of Burial

Common physical effects of burial include fragmentation and displacement of artifact components. Often, pieces can be exposed, documented, gathered, bagged by material, and brought to the laboratory for further processing with minimal risk of losing important information. In some cases, however, original placement is much harder to reconstruct and fragile fragments are further damaged if they are collected individually.

**Blocklifting:** A variety of blocklifting techniques have been developed to maintain original placement of components and keep them intact to the lab, where they can be treated in a systematic and less pressured manner. A common method is to minimally expose the components on a pedestal of matrix, with a protective margin left around the sides and below. This is then removed as a block, sometimes reinforced at the sides, such as with plaster-dipped cloth strips. If reinforcing support materials are potentially in contact with artifact surfaces, it is critical to cover them first with an inert, closely conforming barrier layer; this is a protective measure and facilitates later removal of the reinforcement materials. A necklace of terracotta beads was blocklifted to preserve their orientation using barrier layers of thin plastic wrap, aluminum foil and then a plaster jacket (Figure 13.1); they could then be excavated under more controlled conditions in the laboratory. Note that
Surface consolidation: As the surrounding dirt is being cleared from a buried artifact, some artifact surfaces are found to be particularly fragile and therefore vulnerable to any handling that they will get during excavation and subsequent processing. These may benefit from consolidation, a process in which a strengthening material is administered in a liquid form so that it penetrates before drying (Figure 13.2). Because this procedure entails adding a modern material to an ancient one, conservators weigh the decision to consolidate carefully, giving serious consideration to the effect it may have on the artifact itself, and its potential interference with analysis and subsequent treatment. The selection of the consolidant is also critical; only those materials which have been thoroughly tested and shown to possess excellent aging properties are considered, that is remaining stable and removable over time. For example, consolidation has been used to secure flaking
slip decoration on ceramic vessels, to improve the coherence of crumbling materials, and to strengthen fragile surfaces before impressions are taken. In general, this approach gives preservation priority to macro-characteristics such as form or component organization; disadvantages to consider in advance are possible inhibition or contamination of some technical analyses.

Facing or backing: Along with consolidation, extra support can be carefully attached to front or back surfaces to reinforce fragile areas or to hold pieces in alignment. Closely conforming tissues held in place with adhesive solutions are often used. The same criteria apply for the choice of both tissue and adhesive as for consolidants: these must be appropriate to the task, stable, but also easily removable without causing damage to the original materials, and compatible with subsequent conservation materials and treatment steps. Such techniques were used to hold shattered animal bones together in order to lift them successfully (Figure 13.3).

Reconstruction: Rejoining pieces often improves the physical stability of an object and reduces abrasive damage to edges and surfaces caused by loose storage of fragments. It also gives fuller information about the form of the object. Because losses are sometimes in awkward places, filling these to complete the form can be both stylistically informative and structurally helpful. As with any conservation material, adhesives and gap-filling materials are selected carefully on the basis of their known stability over time and their ability to be removed. Artifacts, such as ceramics from important contexts, are routinely
reconstructed in field conservation laboratories, but because of time constraints on-site, gap-filling is generally undertaken only if stability demands it (Figure 13.4).

**Addressing the chemical effects of burial**

Chemical alteration from burial is well illustrated by metal artifacts, which develop corrosion products beyond what would ordinarily be formed in our ambient environment. While these may be disfiguring, some are quite stable. Others, however, are inherently destructive, and exposure to ambient environmental conditions activates them. Copper alloy objects, for example, may exhibit spots of pale green powder erupting from beneath a stable compact green corrosion crust, evidence of a threatening internal condition commonly called “bronze disease.”

**Chemical treatment:** Metal objects can, with limited success, be treated chemically to clean and stabilize them, but it is important to recognize that chemical treatments introduce permanent alterations to the metallic chemical composition and may further weaken the structure of the object. This is particularly an issue with techniques such as electrolytic
or electrochemical reduction, which assume a sound metallic core beneath a thin skin of corrosion. It is not unusual to find archaeological metals that have been completely converted to corrosion products, and as a result some of these chemical treatments could literally disintegrate the object. In general, less invasive methods of corrosion product removal are favored, such as mechanical methods, although they do not necessarily stabilize aggressive corrosion processes.

**Environmental stabilization:** The most effective and least invasive treatment for stabilizing metals is the careful control of the environment in which they are stored (Figure 13.5). Since oxygen and humidity together keep the corrosion process active, providing a sealed and dry micro-environment has proved to be the best protection for archaeological metals. A common approach is to clean metal objects with fine tools under the microscope, then coat them with a protective coating that can be removed if necessary, and store them in sealed bags. From that point on, they are often kept in tightly lidded storage containers, the internal humidity of which is controlled with desiccated silica gel. Periodically the silica gel needs to be removed and desiccated again. This regular maintenance of dry conditions is extremely important. If the container is not well-sealed or if the silica gel is not periodically changed the gel can absorb atmospheric moisture, creating humid storage conditions and inviting further corrosion activity.

**Addressing Salt Impregnation**

One of the most severe preservation issues for some archaeological materials stems from the salt content of the soil in which they were buried. The salts can occur as the result of geological soil formation as well as from long-term agricultural use of fertilizers to complement irrigation. Their water-solubility results in distribution throughout the soil by ground water capillary rise as well as percolation from the surface by rain. In the process, salts permeate the physical structure of porous materials buried in the soil, forming chemical species available for reaction (such as with metal artifacts). Their water solubility also describes a readiness to go into solution and then to crystallize with water evaporation, which happens upon emergence from a cool moist burial matrix into dry hot air. White powdery salts may crystallize on the surfaces of ceramic materials, for example, but this process may also take place on a microscopic scale as the salts react to diurnal humidity fluctuations and cycles of rainy and dry seasons over the course of the year. In the long term, the physical disruption caused by salts in porous materials can be severe, often causing surfaces to powder and delaminate.

**Desalination:** The initial entry into ambient conditions during excavation can be buffered by providing shade or covering for particularly sensitive materials to slow the evaporation of moisture, but this is only a “holding pattern.” For the majority of porous materials, the most effective response on site is the expeditious removal of soluble salts through a desalination process (Figure 13.6). This process can require up to two weeks of daily changes of distilled (or at least low-salt) water baths, each monitored until the salts are purged or reduced to safe levels. It is important to recognize in advance that some materials may not be robust enough to tolerate this immersion process without the help
of some preliminary consolidation. Other materials may be extremely water sensitive themselves, and these are best stabilized by storage in dry stable environments so that the salts are not activated.

**Preventing Further Damage**

As all collection materials leave the laboratory, their preservation will be further affected by how they are packaged, how they are handled during study, and the conditions in which they are stored. For many objects, storage in archivally stable sealed plastic bags within rigid containers provides sufficient physical protection as well as visibility for easy access during study. Others benefit from more customized housing, utilizing supports and cushioning to minimize movement, compensate for weakness and prevent undue handling (Figure 13.7). For objects transported to other locations, containers may need to be customized for the particular material, cushioning each object to withstand the stresses of transit handling. For those that are displayed, the exhibit conditions and mount materials to be used are specified so further damage is not inadvertently introduced. Most collection materials, however, will remain in storage, and it is the provision of stable, protective housing that has, in the long run, the most significant impact on preservation (Rose and Torres 1992). With carefully chosen materials and basic training, non-conservation personnel can carry out these activities, making it not only the most cost-efficient but also the most effective conservation strategy of any that can be carried out on-site or in a museum setting.

**Documentation**

Field documentation is what allows each item in an archaeological collection to be specifically identified and its contextual meaning to be recreated, but other types of documentation also contribute significantly to its research value. These include all records of processing, conservation, and subsequent analysis. Conservation records, both graphic and written, supply critical observations about original state, document new aspects revealed...
during treatment, and describe treatment methods and materials that have been applied to original materials. It is especially important that all of this information be accessible for any artifact that may be the subject of subsequent scientific study.

Another type of documentation with useful application in the field is to make good quality molds from original materials (Figure 13.8). These can be used to generate casts, which can be used for research or display, particularly when originals can not be transported for these purposes. Molds can also serve as a primary document of materials that had decayed but left impressions in a surrounding matrix.

One compelling application for such documentation is provided by Mongolia’s deer stone monuments. These have experienced long exposure in the outdoor environment and, depending on the inherent qualities of the stone from which each is made, show various degrees of deterioration. Just as with moveable collections, provision of a protective environment for these would also be a significant strategy for enhancing their long-term survival, but may pose practical challenges. There may also be issues of practicality in undertaking more aggressive conservation treatments for particularly deteriorated stones. In cases like these, the documentary evidence takes on additional importance when there is no guarantee that such protection or stabilization can be achieved. As with portable artifacts, good quality molds taken from the stones could be cast for study or display, and even for in situ placement if a long-term preservation strategy called for removal of endangered monuments to a safer environment.

If the moldmaking procedures, whether for deer stones or portable artifacts, do not take the condition of the original into careful consideration, and materials are not carefully selected, the process has the potential to introduce unfortunate alterations. An isolating layer or barrier material, always used to protect original surfaces from moldmaking materials, must be removable. If surfaces are fragile or actively deteriorating, the moldmaking process will cause irreparable physical damage unless specialized consolidants are first applied.
Summary

From a museum standpoint, the value of original collections is derived from the extent, state of preservation, and accessibility of both original material and its documentary record, and the responsibility for these is in the hands of the collections management and conservation professions. Conservation measures in particular, address material preservation issues and, in the case of archaeological collection materials, can be undertaken at potentially their most vulnerable moment — excavation — or after many years in storage or on display. Actions intended to enhance preservation may, however, produce unnecessary or irreversible damage with the choice of inappropriate materials or methods. The implications of their use must therefore be carefully weighed; it is particularly a concern whenever new materials are introduced into archaeological items, especially those that are likely to be the subject of scientific study. Preservation strategies that emphasize protective storage and minimal intervention present the least risk and are considered to serve us and the archaeological materials the best in the long run. In conjunction with procedures that allow the collections to be easily located and studied with minimal handling, these approaches constitute the most cost-effective and significant preservation action of all.

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References


Танилуулга

Туухээн баримт сэлт нь өөрийн үг мэн чанар болон өөр бусад археологийн одлортой зэрэг эхлэх холбогдох байгаагаасаа хамааран болж өнгөрсөн үе хугацааны талаар бидэнд огүүлэх байдаг билээ. Нарийн хянамгай үйлдлээр ухаж мэт талаар хамгийн талаар археологийн олдворуудыг худалдан авахад бидэнд хэрэгтэй байдаг. Эдгээр нэрүүдийг нэрлэхээр өөрчлөн мэдээлэлээр хангаж байгаа болохыг бидэнд тодорхойлав. 

Загварын хувьд, одорхой оруулахад археологийн судлаач шинжээчдийн хамгийн их сонирхолыг татаж байдаг. Археологийн судлаач шинжээчдийн өөрчлөлдөгж байдаг. Уг нь хамгийн эхлэгдээ хэрэглэгдэж байдаг. Уг нь археологийн зорилго нь археологийн олдворуудыг худалдан авагдахад бидэнд хэрэгтэй байдаг. Яа археологийн судлаач шинжээч нь хамгийн эхлэгдээ хэрэглэгдэж байдаг. Эдгээр нэр нь хамгийн эхлэгдээ хэрэглэгдэж байдаг. Уг нь археологийн олдворуудыг худалдан авагдахад бидэнд хэрэгтэй байдаг. Яа археологийн судлаач шинжээч нь хамгийн эхлэгдээ хэрэглэгдэж байдаг. Эдгээр нэр нь хамгийн эхлэгдээ хэрэглэгдэж байдаг. Уг нь археологийн олдворуудыг худалдан авагдахад бидэнд хэрэгтэй байдаг. Яа археологийн судлаач шинжээч нь хамгийн эхлэгдээ хэрэглэгдэж байдаг. Эдгээр нэр нь хамгийн эхлэгдээ хэрэглэгдэж байдаг. Уг нь археологийн олдворуудыг худалдан авагдахад бидэнд хэрэгтэй байдаг. Яа археологийн судлаач шинжээч нь хамгийн эхлэгдээ хэрэглэгдэж байдаг. Эдгээр нэр нь хамгийн эхлэгдээ хэрэглэгдэж байдаг. Уг нь археологийн олдворуудыг худалдан авагдахад бидэнд хэрэгтэй байдаг. Яа археологийн судлаач шинжээч нь хамгийн эхлэгдээ хэрэглэгдэж байдаг. Эдгээр нэр нь хамгийн эхлэгдээ хэрэглэгдэж байдаг.
Ундын шинж чанарууд нь олдвор хамгийн анх гардаг цар хүрээнээр өөрчлөлтүүд ялангуяа ашиглах үед болон ашиглах үед үндсэн өөрчлөлтүүд юм. Хүчиллөрөгч, чийгшилт, температурын тувшин, бичил бистүүд эмэг бийн хөгжилд байдаг хүчний зүйлдүүдийн нөлөөгөөр өөрчлөлтүүд нь байгалийн жамаар элээдэл хоргоддог орпо үед өөр бусад өөрчлөлтүүд бас гарч байдаг. Цаашлаа, олдворын байгуулга нь төлөөлөөлөөлөөр байсан өөрчлөлтүүд дээр хөгжил бичил биетүүд гэх мэт байнга тохиолдож байдаг хучин зүйлүүдийн нөлөөгөөр байна. Хучилтэрэгч, чийгшилт, температурын тувшин, бичил биетүүд гэх мэт байнга тохиолдож байдаг хучин зүйлүүдийн нөлөөгөөр байна. Цаашлаа, олдворын байгуулга нь төлөөлөөлөөр байсан өөрчлөлтүүд дээр бий эсвэл энэ нь олдворын материалын тэнцүрий гадаадуулж үргэлжлүүлэн оршин тогтноо чадвар нь аюул шуулахд байна. Эрдээн өөрчлөлтүүдийн зарим нь тухайн үедээ шудуу мэдээж их тодорхой бололтой байхад, зарим нь дадл чанартай байж удаан хүч комплексын дараа багагүй хор нөлөөгийн байсан нь мэдээж болдог. Байсан газраа угсэн олдвор байсан бол өөр тийшээ шилжүүлэн эсвэл үзүүлэн буюу агуулахад хадгалагдсан олдворуудад өөр төрийн өөрчлөлтүүд үргэлдэг бололтой аль аль нь шинэ өөрийн мэдээлгийг ажилладаг болдог. Дандая али байдал байсан олдворуудын (бугну булгу өстээ эмэг мэдээллээр) хувийн цаг дахь түүн уйл ажиллагааг тэнцэж болдог. Эдгээр олдворуудын нэг нь тухайн шудуу үедээ орγ нөлөөгийн нүд нин шудуу мэдээж болно зүйл болно зүйл болно. Яагаад энэ нь али бохирдох болно биологийн хүчний харвар буюу аймгийн хүчний хоргоо гэх мэт дээр зүйл болно зүйл болно зүйл болно. Яагаад энэ нь али бохирдох болно биологийн хүчний хоргоо гэх мэт дээр зүйл болно зүйл болно зүйл болно. Яагаад энэ нь али бохирдох болно биологийн хүчний хоргоо гэх мэт дээр зүйл болно зүйл болно зүйл болно. Яагаад энэ нь али бохирдох болно биологийн хүчний хоргоо гэх мэт дээр зүйл болно зүйл болно зүйл болно. Яагаад энэ нь али бохирдох болно биологийн хүчний хоргоо гэх мэт дээр зүйл болно зүйл болно зүйл болно. Яагаад энэ нь али бохирдох болно биологийн хүчний хоргоо гэх мэт дээр зүйл болно зүйл болно зүйл болно.
Археологийн олдвор цуглуулганд дийлэнхдээ тааралддаг материал нь органик бус байдаг ба ууид төрөл бүрийн метал ээлэн, шавар ваанар ээлэн, чуллу, яс, хүүг яссаа болон заана ясаар хийсэн ээлэн гэх мэт багтана. Газарт булаастай байх явдлаа ээлэн ээлэн материалын нь химийн найрлагын гүнд хөрөнгөн дэлхийг, шавар вааран ээлэн, мөрөн, эрэг, даваны орчны нөлөө болон бүтцийн хэлээн ээлэн дээр эхчээл хүчтэй дараах даралт мөн бусад цаг агаарын нөлөөний алын алын алын нөлөө нь шалтгаалаал ээлэн ээлэн ээлэн ээлэн ээлэн өрж байдаг.

Малтальны үзээр материальд нь гаргасан эмзгэл материальд харьцах байгаа болон хүнд нөхцөлддог юм байгаа тохийн тогтмолд эртээ магазддлын ихэнх гөөчлөтэй байдаг. Ийм учраас материал орчны ёнгийн ээлэн ээлэн ээлэн ээлэн ээлэн ээлэн ээлэн ээлэн ээлэн зорилгоо нөлөөллөө хүчтэй хөрөн болдог. Малтар байсан газраасаа хөрөн болдог цагаас нь мөндөө болон хөрөн болдог болох өгөгдөл бий болно. Олдвор байсан газраасаа хөрөн болдог цагаас нь мөндөө болон хөрөн болдог болох өгөгдөл бий болно. Малтар байсан газраасаа хөрөн болдог цагаас нь мөндөө болон хөрөн болдог болоо өгөгдөл бий болно. Олдвор байсан газраасаа хөрөн болдог цагаас нь мөндөө болон хөрөн болдог болоо өгөгдөл бий болно. Малтар байсан газраасаа хөрөн болдог цагаас нь мөндөө болон хөрөн болдог болоо өгөгдөл бий болно. Олдвор байсан газраасаа хөрөн болдог цагаас нь мөндөө болон хөрөн болдог болоо өгөгдөл бий болно. Олдвор байсан газраасаа хөрөн болдог цагаас нь мөндөө болон хөрөн болдог болоо өгөгдөл бий болно.
олдовторой харьцахтай маш болгоомжтой байх էрэгтэй болдог. Ийм үед ҳатууруулах үйл ывч буую ҳатуу болгох ҷадвар  allowNull
бухий материалиыг шингэн ҳэлбээр хатахаас ыч эмне олдовтор шинғээҳ арғыҳ ҳэрэглых ыч ашгитай байх болох талтай. Эээ үйл явааар эртиий материалаас бүрдээ эд үйлсийг орчын үеийн материалиыт нийлуулуу шаарлагатай болдог учир ҳолдортуу мууғааар нолөөлөө уылмаа судалгаа шинжилгэээнд болон дарара дараагийн арчилаағаа бас нолөөлөө байдлыг ыч ҳаргалаан уездээ эээ арғыҳ ҳэрэглых ыч ашгитай эээ дээр ултой болож ынтволор гарах ҽстэн. Бэхжууулууғий ҽңбөг ыч бас ярвигтав асулдаг бөөгөө эвхөөн ннийрийн түширлтэн явчда батлаагдан шаалгартан, өөрөөр хэвлөө хатуужиж чдадаг дарара ыч ҳуулуу болдоо материалиыг ҽңбөг нь ыч. Җинэнэлээъ: Җавар ваааран сааан дээрх ҽسلэн гөөлнэн шитгөөг батжулалын тулд ҳатууруулагч ашиглагас бөөгөө ҽң ээ ыч ьйрээлтиий материалиыг бат бий болож, эмээ ҳагарамттайн ғадаргүүг ғөөтээс ыч эмнебатжулалых зарилготой байсан [Зураг 11.2]. Гөөнхийдөө ҽң арга ыч эд үйлсийн ҳөлбөр бүтэн ҽрэг ҽл шинж чанаарын ҳамгаалаал эн эрэггүүний зарилготой байдаа болоо ҽң эрэг ганаа тоооч үзүүүстэн ҽул ны техникийн судалгаа шинжилгээний үеср учирч болоо мүүдэл болон саатгууд ёстой.

Хоёр талаас ыч тишээх: Ҳатууруулаахас гадна эмээл болгож хагарч ҽмтээк болоооооуу ҽх ситий ирд үол ҳолдор талаас ыч тишээх ҽсвэл ҳэззүүдуудийг хамтд тый баарьж ҳамгаалж болно. Нымээн цаас ьбуую дававууг наадалмэтгээ бодис ашиглан тааруулаах арғыҳ ҽрэглээдээ. Дававу болон наадалмэтгээ бодисын алы алийн ашиглэн ҽз элрээн зарьчыг ҳатууруулах зорилгор бас ҳэрэглых болно. Хатунгий ҽл эд эдгэрээр ыч даалгуурварт ээ эдгэрээ эм түүнээс гадна суюур материалаа ҽмтээхүүйгээр ардманааар хуулу ахв боломжтой байх ҽрэгтэй. Мен дараагийн алыхамд ҳадғалалт болгон ашиглэн гээий ҳайгаа материал болон қарш ҽнелөө үзүүлэкхүү байх шаарлагатай. Иймэрхуу арга техникыйн салангат байрлалт амбтын яснууды ҳамтд ыч ҽмтээхүүйгээр ҽрэг үед ҳэрэглэг байсан [Зураг 11.3].

Сэрээн засварлээх: Ҳэззүүдуудийг хоороонд ны ҽвэлүүлэн нийлуулууңэээр эд ҽүллиийн тогтворий байдлыг ымээдүүлж, ҽхсг бүрийн сул ҳадғалсаанас үүдэн гадаргүүд болон булуун toList ны ущээ ҽмтээл хөллөөбөр буурруулагд. Ҭүүнээс гадна эд ҽүллиийн талаар бүрэн ҕүйцдэд мэдээлээл аваах боломжтой болодог. Эд эулысын элд энэл элээн ны ээсг дутаа ны ярвиитэй болдогдоо учир ҽхсэбээн ҽлбөр бүрэн буцаалдууңээр аты дулаа ны мэдээлээл өөгөө байдалдараа ч ҽксэн бүтэичийн хүнд ч гэээн илүү イト нымээлтэй байдаг. Нааалт хийх ба зай неэхөө материалаалычны алы алыгий ыч ҳадғалалт хийх явиндаа ғогтоорий байх ҷадвар болон хуулуулах ардманх ҽйх ҹанаарын үзүү ҽлдээш мүү болгоомжтойғо оног ымызор ҽй зүйтэй. Ҽхал агууалд бүхий шавар эдэлл ҽх мэт ҽлдэврүүд ны ҽддэдгаллын лабораторий байнгага дахин сэрээдэлдэж байдаа. Ҽвч ҽаст хуугаааны хүчинг эд Уйлсээ шалтгаалан зохөөн үнохэр тогтворий бай байгалд шаарлагатай тохиолдолд л зой завсарыг неэхөө ажиллагааг ҕүйчэтээ ны зүйтэй [Зураг 11.4].

Булын (газарт булаадсан эд ҽүлсээ) даа ҽхийн нөлөөнүүдээс бөрдүү ны Булыны хөөн оөрчлөлтөөд металд олдворулд ҽрдэг бөөгөөд ахнын байсан орчын ыч солигдоод шинж ҹанаар ыч хуурича исэлдээ ҽх мэтээр оөрчлөлдөө. Заримд ны оөрчлөт хөртөйғо оног нөлөөл байхад заримд ны ҽрчынчүүйтгээар

180 Beaubien
История археологии: Металл употребляется в археологии в качестве материала для создания орудий и оружия. Металлы, такие как железо, бронза и медные сплавы, были важными материалами для работы археологов. Металлы также играют важную роль в процессе охранивания и сохранения археологических объектов.

Орхон 1: Металл в археологии используется для создания орудий и оружия, что делает его важным материалом для археологических исследований. Металлы также играют важную роль в процессе охранивания и сохранения археологических объектов.

Дависаас: Археологический отчет о металлах в археологии: Металл в археологии используется для создания орудий и оружия. Металлы также играют важную роль в процессе охранивания и сохранения археологических объектов.
Давсыг шингээж уусах уул яц: Материалы, курортные и объекты, находящиеся в здании, служат для молельных и медитативных упражнений. Посещение молельной залы позволяет проводить медитацию на умблингах демонстрированных нунтаг илэрэх боломжтой. Урт хугацаанд давс энд байдлаар сийрэг материалы бие төхөөрөө узуулыг аюултай бөгөөд ихэнхдээ гадаргуу нь нунтаг бурхэн зээлэн болж гэмдэг.

Гэмтлээс үрдчилан сэргийлэх нь

Цуглуулгын бүх материалыүүд лабораторийн шинжилгээг дууссаны дараах хамгаалалт нь хэрэгцээ бодалгаар, судалгааны ажил явцад, чухал, ямар, төхөөрөө хагас хамаардаг. Энэ нь бүгдийн төрсөн бийтгэх ёсийнхэн нэгэн хуванцар нутагдсан хамгаалын нэг нэгэн нь зөвчөөсөөр ажиллаж байна. Энэ нь хоёр нэртэй усаар (двунадар нээлттэй) тусгай маань үүсэл (дагвал жишээ арга, ямар нэгэн нээлттэй) гадна болон шинжилгээ нэгэн нээлттэй боломжтой байдаг.

Баримт хотолох: Хайгуулын газар дээр баримт хотелд гэдэг нь археологийн одорын цуглуулганд багтсан энэ зүйлын бүрэлдэх бүтцийг агуулгыг зохицуулах болдог бол бусад төрөлдийн баримт хотелд нь судалгааны шинжилгээний ажлын үнэлгээ нэмэлт нээлмийг мөн нэг нээлттэй чухал болсон юм. Унин дотор явцын дунд, хадгалалтын зүд болон судалгааны ажлын үед хийсэн бүх.
буруутгэлүүд багтана. График аргаар болон гар бичмэлэр хийсэн хадгалалтын бүртгэл нь анх оддог одсон байдлын талаарх нарийвчилсан жижиглээний ерг, оддогтой харьццаа үед илэрсэн шинэлэг шинж чанаруудыг нунуулж, мен түүнчлэн оддогтой анх ямар аргаа хэрэгсэн харьццаа, ямар материалуудыг ашиглана талаар дүрслэн хуруулдаг биээ. Одсон оддогны алийг үн ч өрөв шинжлээний ажилд шаардлагатай болоход одгээр мэдээлэлүүд нь бэлэн байдаг урир баримт хөтөлбөр нь ялангуаа чухал зүйлүүий нэг юм.

Оддогны эх хувийт адишхан биетийн чанарын өндөр түвшинд хувильан бүтээх нь бас нэг терлээний баримт хөтөлбөр болох бөгөөд энэ нь наш ашиглагдсан сайтай юм. Энэ төрөлд судалгааны ажлын зорилголд ташуу зүүлэнгийн зорилгоороо хэв цугтагаар арга нь багтаж болно, ялангуу эх оддог дээрх зорилгоороо байрснаасаа хөдөөлдөөд тээвэрлэдэг боломжтой өрөв арга нь хамгийн хэрэглэсэн арга юм [Зураг 11.8]. Ингээд хувильсан баримтыг элэгдэж хуучирсан материалын үндсэн эх баримт болон бага болтой талтай.

Баримт хөтөлбөр энэхүү аргыг амдыраалд хэрэглүүлэсэн нөг төхөөлдөө Монголын бүлгүүлэн чүлүүн хөшөө юм. Элдээр нь удаан хугацааны туура хэрэгцээ гадаа орноор байсахаар ирээдөө түүхийн хөшөөг ямар чүлүутаа (чанар сайтай эсвэл чанар муутай) бостоноснос шалтгаалаан элэгдэхээр үйлдлүүдийн түвшин нь өөр өөр байсан. Байрнаас нь хөдөөлж болдог оддогтойн нэгэн адилгаар уг хөшөөнүүдийг хамгаалалттай орноор хангах нь тэдгээр эн нүүрээр арга хугацаанд оршин тогтохуулах нэгэн урд хугацаанд байсан болын ардын өнгөтөө болдог өрөв болон чөлөөгийн зорилгоороо эрүүлдлүүд бол энд хөлдөж болно. Энэ нь байтугай урд хугацааны зорилгой талбайд тэнцвээгүй байсан бол энэ нь мэдээллүүд болон хамгаалаттай орчноор хангах нь тэдгээр эн нүүрээр арга хугацааны тул хэв цугтагаар өрөв болох ёстой. Энэ нь байтугай урд хугацааны хөшөөгийн зорилгоороо эрүүлдлүүд бол энд хөлдөж болно. Энэ нь байтугай урд хугацааны зорилгоороо эрүүлдлүүд бол энд хөлдөж болно. Энэ нь байтугай урд хугацааны зорилгоороо эрүүлдлүүд бол энд хөлдөж болно. Энэ нь байтугай урд хугацааны зорилгоороо эрүүлдлүүд бол энд хөлдөж болно.
тулд материалыг зөв хамгаалалтын талаар хэндээддөг. Археологийн олдворын материалын хувьд хамгийн эмзэг үе буюу малтагтын явцас эхлэн тууний дараа олон жилийн түрш хадгалах зөвшөөрт тавих хүртэл тооцож ўзэх шаардлагатай болдог. Зарим тохиолдолд хамгаалалт хийх зорилгоо явуулах ўйл ажиллагаа нь төхөромжтой материал буюу арга зам сонгож хэрэглэсэнээс болоод шаардлагатай буюу дараа нь нийхэж болшгүй гаргах хохирол уруулуу болно. Тийм учраас эдгээр эрсдэл хэрэглэсэн уйл ажиллагаа нь төвөөс болоод узэх шаардлагагүй буюу дараа нь нийхэж болшгүй багаар харьцахад тулгуурласан хамгаалалтын бодлого нь хамгийн бага эрсдэлтэй бөгөөд археологийн материалыг урт хугацаанд хамгийн сайн аргаар авч улдэх боллогод хамаардаг. Цуглуулгыг амархан байрлуулах аль болох бага харьцах судалгаандаа хамруулах ўйл явцтай хамтруулах хадгалвал энэ хэлбэр нь хамгийн зардал зөөвөөр бөгөөд хамгийн ач холбогдож болон хамгаалалтын ўйл ажиллагаа болох юм.

14

Model-Making and Casting

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The main goal of the Model-Making and Casting workshop was to demonstrate and teach Mongolians the different processes and materials used to replicate the Ushkiin Uver deer stone which the Smithsonian cast with the National Museum of Mongolian History in 2002. It was hoped that in demonstrating these different techniques in a hands-on workshop, Mongolians would be able to apply these skills to reproduce artifacts for their museum display and research purposes.

In preparation for the workshop, information packets with photographs of the deer stone’s molding and casting process were given to participants. Images and text explaining model-making processes for other types of projects were handed out as well. Molds and samples of casts were brought along in hopes that these examples would help explain the processes if the translated technical terms fell short. A picture is, after all, worth a thousand words.

Once we arrived in Mongolia we searched for any local materials that could be purchased. Success was mixed. Since there are so many artists in Mongolia it was easy to find paints and clay, as well as auto-body putty for casting. Other materials such as plaster and fiberglass (which are good, reasonably priced, and simple to use for a very wide variety of projects) couldn’t be found, even after several days of searching. The words for these materials were not easily translated which most likely exacerbated the problem. It is probable that some of these materials can be found in Ulaanbaatar, but others would have to be imported along with necessary materials such as molding rubber.

To start off the workshop we provided an explanation of the deer stone’s reproduction. The images of the process were helpful in explaining techniques used. Having available the mold and finished cast of the deer stone also helped reinforce and clarify our points. This informal seminar was often referred to during the workshop to answer questions participants had about different processes and how to approach other projects.

After the descriptions of molding, casting, and the basics of model-making, some time was spent doing hands-on projects with the materials. All participants, from such
diverse backgrounds as museum preparators, artists, and scholars, seemed eager to jump in and mixed resins and paint on molding rubbers with enthusiasm. Many tried their hand at casting rocks with body putty and plaster. Dry pigments bought at the local market were used to color them. Participants experimented with different molding rubbers like silicone, silicone putty, and latex.

All in all, the workshop was a great success. Participants were enthusiastic, and many were eager to tell us how they would use what they learned in their work. Their major concern was access to materials, and how local materials or substitutes might differ from the ones used in the demonstrations.

As a follow-up after the workshop, we did an informal session with the preparators and taxidermists at the Mongolian Natural History Museum. After a morning tour of the museum and their production area, the rest of the afternoon was spent in the field collecting small birds for a demonstration of bird taxidermy to be given the following day. The taxidermy process that is currently used in Mongolia is quite antiquated and access to materials and modern taxidermy products hampers progress in their technique. One day wasn’t adequate to significantly train their staff, but it afforded a unique opportunity for the introduction of our staff to theirs, which is sure to yield future benefits for both parties.

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**Figure 14.1. Cast of the Ushkiin Uver deer stone in the Mongolian History Museum**
Figure 14.2. Shopping at UB market for model-making materials for the workshop.

Figure 14.3. Workshop participants examining the deer stone mold at the National Museum of Mongolian History.
Загвар – Хэв үйлдэх ажлын хэсгүүд

Паул Раймер, Музейн мэргэжилтэн
Смитсонийн Институтын Байгалын Түүхийн Ундэсний Музейн үзмэрийн Тэнхим

Karolin Tom, Хэв үйлдэгч
Смитсонийн Институтын үзмэрийн Төв газар

Загвар - Хэв үйлдэх ажлын хэсгийн гол зорилго нь 2002 онд Смитсонийн Институтээс Монголын Ундэсний Түүхийн музейтэй хамтран хийсэн буган чулууны хэвийг үйлдэхэд ашиглаганаас материал болон уйл явлыг Монголчуудад үзүүлэх мөн зааж сургах байсан. Эдгээр өөр өөр арга техникийг бодит байдлаар нь харсанаар Монголччдээ өөрөөн музейдээ үзүүлэгчийн зорнолтлаар хэв загваруудыг үйлдэхэд ашиглал боломжтой болно өөр бид найдал байсан юм.

Ажлын хэсгийн үеэр буган чулууны хэвийг үйл явцыг харуулен мэдээлэл болон фото зураг бүр бүхийн гаралд оролцовдоо тараан өгсөн. Өөр бусад терлийн тесэлд хэрэглэсэн хэвийг арьсыг тайлбарланаас зураг болон материалуудыг мөн тараан өгсөн. Техникийн үг хэллээг орногүүлсэн болон өйлгөж буйг айл сүлдээгийн байлгыг бие бие болсон бас авчирсан. Энэ юм нь зэвсгээс илүү сайн тайлбар болно өөр хэлбэр гарчмид баримталаан юм.

Бид Монголд иргэнтутээ Монголд худалдлагдад зарим нэг материалуудын худалдаан авахаар хайж эхлэн бага зэргийг бага зэргийг амжилттай бүтээл болох боломжтой болсон нь төдийлөн амжилттай байсангүй. Монголд нэлээн олон тооны уран бүтэцээд байдаг учир бага, шавар болон хэвийн их биенд ашиглал шавас зэрэг уралдлах болсон оршлага өчүү арьсыг чадлаа. Гэвч нэлээн хэлэн эдрийн түрүү хайсан болоч шохой, фибър шил гэх мэт бусад материалуудыг (сайн чанарын, боломжийн үнэтэй, бага хэмээд ашигладаг үеэр хэрэглэгчдөө ажиллагаа олгон) сүлдээгийн замыг чухал байсан. Эдгээр үгсийг орчуулахад тийм ч халдлах баагаа нь хүндэлтэй асуудал усны шалтгаан бол байдаг байх. Эдгээр гарчмид нэг материалуудыг Улаанбаатарын оролцогчдын зээгээд бусад боломжтой байдаг болч бусад нь резинзэн хэв гэх мэт хэрэглэжтэй материалуудыг хамт гаднаас импортогдор сүлдээгээр байсан байх.

Ажлын хэсгийг бид буган чулууны хэв цутгах үеийг ажиллагааг тайлбарласан бага зэргийг эхлээн ба энэ ажиллагааг хэрэглэсэн арга техникийг зургаа үзүүлэн нь их ойлгомжтой болгож байдлаа. Хэв болон буган чулууны цутгамлыг харуулах нь бидний заасан зүйлөг илүү тодорхой болгохдоо тус нэмэгдээ байлын. Энэ үеэр оролцогчдны үеийг явцын талаар болон өөр бусад асуусан асуултан хариж байсан.

Хэв авах, цутгах мөн загвар анхан шатны явлыг үзүүлсний дараа огдолсон материалууд загвар бүтээлээд эхлэгч цаг зарцуулагдаж, Музейн ажилтан, уран бүтэцээ, зэргээсэн судлаачид гэх мэт төрөл бүрийн мэргэжлийн хүмүүсээс бүрдбэл оролцогчдын манай хэвийн резинээд зэрээг бүтгийг ашиглах хэвийн зүйлээг тээв.
ядан хүнээсэн хараагдаж байлаа. Ихэнх нь хэв болгох чулууг шаваас, шохойтой нь хамт гарцаа барин хэв хийж ёрзэхээр оролдож байлаа. Хурай будагнуудыг хэвээ будаж энгэ оруулах зорилгоор Улаанбаатардаас худалдаж авсан. Энд оролцогчид маань силикон, силикон шаваас, шохой гэх мэт ёр ёр төрлийн резинэн хэвэнүүлээр туршлт хийж ёрзээлэнээ.

Ийнхүү тус ёрл ажиллагаа маань маш амжилттай болж оңгөрсөн. Оролцогчид маань бүгд маш идэвхтэй оролцож юу сурсанаа хэрээн ёрсийнхэнээ ажилд хэрэгжүүлэхээ бидэнтэй хуввалцаахар эрэг нөхдийг байлав. Тэдний гол санааг нь зовоож байсан ёрл нь хэрэглэгдэх материалд олб байсан бөгөөд монголд худалдаалагддаг материал болон орлуулж хэрэглээн хөрсөн ёрл ажиллагааны үзр хэрэглэнээг ёр байж болох талаар байлаа.

Энэ ажлын хэсгийн дараа бид Монголын үндэсний Түүхийн Музейн ажилтанууд болон чихмэл хийдгэ хүмүүстэй албанд ёсын уулзат зохион байгуулах. Музейг эглэн узэж сонирхсоны дараа үдээс хойш материалыг оролцогчдын хэрэгжүүлэхдээ болон бөгөөд монголд хэрэглэдэг материалд олб байсан нь тэдний чихмэл хийх техникдээ дэвшилт гаргах явдалд саад болж байсан байна. Ганцхан эдрийн дотор тэгээр хүмүүсийн сургах нь хангалттайн биш байсан болоч энэ нь тэдэнд бидний ёрсийн бүтээлийг танилуулсэн ховорхон аз завахад байсан бөгөөд улмаар энэ нь хоёр талын альнд нь ирээдүүн ашиг тусаа огсоо ёрл байсан нь дамжигтгүй.
Workshop participants at the National Museum of Mongolian History. (photo: Hunt)
15
Integrated Pest Management in Museums

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Agents of deterioration of museum collections include: direct physical forces, thieves and vandals, fire, water, contaminants, radiation, incorrect temperature, incorrect relative humidity, and pests. Pests will be the topic of this presentation, and more specifically, ‘integrated pest management,’ referred to as IPM. Integrated pest management is a systematic approach to preventing and combating pest infestations, and is as integral to a museum as the budget, security, exhibition design, safety and health of the employees and the emergency preparedness plan.

Museum pests are generally insects or rodents damaging to the collections, or birds which may foul the outdoor premises and can attract insect pests. An IPM plan should include methods to maintain a constant awareness to avoid, block, detect, identify and evaluate, respond, and recover (if an infestation occurs).

Avoid - Reduce the risk of pests being attracted to the building.

Block:
- Door seals at threshold
- Window screens
- Quarantine incoming specimens/Routine prophylactic treatment for some
- Proper storage of specimens

Detect, Identify and Evaluate:
- Visual inspection
- Monitoring (sticky traps)
- Record keeping
- Knowledge of the insect (habits, lifecycle, etc.)
Respond: (Balance available resources)
- Building alterations
- Environmental conditions
- Temperature
- Humidity

Sanitation
Monitoring and inspection
Treatment
- Chemical
- Freezing
- Anoxic methods

Recover: Clean up the infestation
- Clean the specimen
- Note specimen damage
- Repair specimen

**Monitoring and inspection**

Periodically inspect specimens and artifacts for pest damage. Insects or droppings are more easily visible on a light-colored surface. Lining dark-colored drawers with white paper can help in distinguishing evidence of pests.

Insect traps are a key element in an integrated pest management plan. Sticky traps are used to capture wandering adults, to provide evidence of resident populations and fluctuations. Monitoring with traps can alert museum personnel to a potential problem which otherwise may go unchecked until significant damage to specimens is observed. Pheromone traps should only be used if the building is air-conditioned. If windows are open, pheromone traps could attract insects into the building.

**Treatment**

Treatment is the most difficult element to define. The unique characteristics of the artifact or biological specimen and the consequences of the treatment must be considered. A conservator should be consulted before treating objects or specimens.

Chemical treatments can have long-term deleterious effects on the object, which may not be obvious at the time of treatment. For example, a colorless mercuric chloride (corrosive sublimate) solution, in water or alcohol, had been applied to many natural history specimens since the 18th century as a pesticide and fungicide. Active application has ended in most countries, however, specimens in collections retain mercuric chloride residue. This residue may sublimate at ambient temperature to produce elemental mercury vapor, and accumulate in closed storage cabinets, creating a potential health hazard and contaminating untreated specimens. Additionally, over time, the mercuric chloride may undergo a series of reactions that result in gray-black stains that can darken the specimen and/or completely obscure the data on specimen labels (Hawks and Bell 1999).
Some chemicals have been used successfully when carefully applied to the floor along the perimeter of a room, to control crawling insects.

**Cryofumigation** (freezing) can safely be used on dried plant specimens (herbarium specimens) as a method to kill all stages of common herbarium insect pests. T.J.K. Strang (1997) mentions that insects that tolerate freezing, control ice formation in their bodies by producing a special protein and introducing it into their body fluids. These insects can remain frozen for months and still recover on thawing. So, one would think that cryofumigation of specimens in Mongolia would be ineffective. However, Strang states that insects generally do not maintain these cold protective systems when their environment remains relatively warm, because there is a metabolic cost involved. *He suggests as a rough guide to allow one month quarantine at room temperature to induce insects to flush protective substances from their bodies.* His major guideline is that the temperature should drop as low as possible, as quickly as possible, for as long as possible. The amount of time to freeze is dependent upon the temperature. He suggests that a practical recommended treatment is -20 degrees C for one week (Strang 1997), or -30 degrees C for 4 days (Strang 1992.) Keep in mind that it could take 16 hours for the contents of a box to reach the desired temperature because of the insulating properties of the packing, so add an additional day to the freezing time (Shchepanek 1996).

**Anoxic treatments** (oxygen deprivation, or controlled atmosphere treatments) to eradicate insect pests, is an alternative when either chemical treatments or temperature controlled treatments would be detrimental to the objects involved. Chemical treatments as stated above can cause color changes, protein changes or other alterations to the object. Some anthropological specimens can not withstand significant changes in temperature. When these treatments are unacceptable due to the nature of the object, anoxic treatments can be incorporated into the IPM plan. Anoxic treatments are quite effective over a large range of insect species. The theory is quite simple, if you remove breathable air (oxygen) from the pest it will die. By removing the oxygen from around the pest you form an atmosphere that is not compatible with life. Three gasses are employed in anoxic treatments, CO₂, argon or nitrogen. Both argon and nitrogen are inert, unreactive gasses. By sealing an infested object in an air tight container (usually a bag made of either Teflon or Mylar) and replacing the “air” with one of the three gasses you can “suffocate” the pest involved. When done correctly this technique is very efficient and will have no harmful effects on your specimens. In a warm environment, about 30 degrees C, and atmosphere of 99.7% argon, the treatment will take 5 to 8 days, a little longer with the same conditions using nitrogen (about 7 to 10 days) and much longer, 15 days using CO₂. CO₂ acts in a different way than the two inert gasses. You need only maintain a 60% CO₂ atmosphere in your enclosure but you must also keep the RH below 40%. With CO2 the pest insects tend to open their spiracles in order to receive more oxygen, and die due to dehydration. CO₂ is preferred by some users in that it is easier to maintain a 60% atmosphere of CO₂ than it is to maintain a 99.7 % atmosphere with argon and nitrogen. It is also cheaper and easier to procure CO₂.
One of the more versatile aspects of anoxic treatments is that with the proper equipment almost any size object or objects can be treated. The basic equipment needed is plastic sheeting of Mylar or Teflon (or any other non-permeable plastic), heat sealers, tubing, atmosphere concentration monitors, humidity monitors, and cylinders of gas. With the plastic sheeting (or plastic bags and a heat sealer) it is possible to create an enclosure of any size: treating a single book or as has been done in Europe, treating an entire building (a church in Germany). Once the object or objects have been enclosed in plastic the basic set up is the same for any sized object. Create a small hole at either end of the enclosure, introduce your gas from one side and let it run through the “bag” out the other side. As the gas leaves the bag it will pass through a monitor which will record the percentage of gas being expelled. In this way when the proper levels are reached both ends can be sealed and the bag (with it’s proper concentration of inert gas) can sit for the required amount of time. Many other innovations can be added to this system. If the gas is too “dry” then a humidifying device can be added. To decrease the amount of oxygen in the bag, oxygen scavengers can be used (Ageless by Mitsubishi is preferred). Many different adaptations to this procedure exist and are discussed in great detail in Selwitz and Maekawa. The costs involved with these techniques are dependant on the types of gas monitors and size of the objects being treated. In some instances, a setup for small objects can be very inexpensive when “home made”. A large reusable enclosure (about 3.5 cubic meters) with an automatic dispenser can be purchased for about $20,000 US.

The disadvantages to anoxic treatments are few, but cost and time involved to set up can be great. Anoxic treatment, as well as temperature treatments, is purely prophylactic. Once the item is treated and removed from it’s enclosure it is just as vulnerable to infestation as it was before treatment.

The Fate of the Collections is in Our Hands

As curators of the collections, we are responsible for all aspects of proper care, to assure that the museum’s acquisitions will be available for posterity. We must maintain constant vigilance against pests, which can quickly destroy irreplaceable biological and historical artifacts. Developing and following an integrated pest management plan is integral to the survival of the specimens and objects under our care.

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References


Mongolian Translation

Музей дэх хортон шавъжийг устгах нэгдсэн ажиллагаа

Жереми Жакобс
Смитсонийн Институтын Байгалын Түүхийн үндэсний Музей
Амьтан сүдлэлэлэн Тэнхим

Дэбора Белл
Смитсонийн Институтын Байгалын Түүхийн Үндэсний Музей
Ургамал сүдлэлэлэн Тэнхим

Музейн үзмэрт хохирол учруулагч хортойгоор нөлөөлдөг хучин зүйл уулдагаа биет гээгэл учруулагч, хулгай дээрээ хиций, гал усны аюул, боехирдлэг, хорт утга, өрөөний дулааныг хэл халахаа зөвлөх хэрэг хэрэг, чийгшүүлэнт гээгэл аладгаан болон хортон шавъжээр багтдаг. Энэ доторх хортон шавъжтайн гэрээн тэмцээг устах талаар энэ нийт тэгээд онцгойлон тусгасан юм. Хортон шавъжийг зайлшлуулах нь шавъж үржүүлэх учраас умаар музейн зэд хөрөнгө, аюулгүй ажиллаж, үзмэрт гэнэ тэрэх, ажилтнуудын үрээл мэнд аюулгүй орчигд нөлөөлөхөс хамгаалж сөрөгийн тэмцээн системөөз арга хэмжээ юм.

Музей дэх хортон шавъжийг музейн үзмэр цуглуулагчийн гээгэл тэндээг хохирол учруулагч төрөл бүрийн шавъжнууд, эмээг амьтад болон музейн гадна талын бохирдуулах шавъж үржүүлэн нөлөөлдөг бурдлуулгын нэг шувуу зээлээр амьтад багтана. Ийм музейн хортон шавъжтай тэмцээг нэг нөлөөлгөн хохирол гарахаас зайлсхаа, хаалт хийсэн, эрж хайл, илрүүлэн устах, харин үйлдлээ хийсэн, сөрөгийн засварлал (хэрэв зам худал хохирол уншиж) гэх мэт байгны урьдчилан сөрөгийн хамгаалаах ажиллагаанууд хийдээ хөөртөө зүйтэй.
Зайлсхийх – Шавьж амьтнад байшиний дотор орох зөрчлийг багасгах
Хаалт хийх:
Хаалгануудыг лав хаах
Цонхонд торнууд байрлуулах
Шинээр авчирсан дээжийг сайн шалгах
(Заримыг нь тогтмөл узэж шалгаах)
Дээж болгон авчирсан үзүлээнг зөв хадгалах

Эрж хайн илрүүлэн устгах:
Нудэр шалгах
Илрүүлэх (нааддаг хавхаар)
Бүртгэл хөтлөх
Шавьжны талаар сайн мэддэг байх (хаана амьдарч хийдэг
зүйлүүд, амьдрах хугацаа гэх мэт)

Хариу үйлдэл хийх: (Нөөц боломжтой тэнцвэртэйгээр ашиглах)
Байшиний өргөлттөг
Орчин нөхцөлүүд
Агаарын температур
Чийгшилт
Ариун цэвэр
Хянаж шалганаариуттаах
Хамгаалал арчлах
Химийн
Хөлдөөх
Аноксин аргууд

Сэргээн засварлах:
Бохирдлыг цэвэрлэх
Дээжийг цэвэрлэх
Дээж бохирдсон эсвэл гэмтсэн байвал тэмдэглэх
Дээжийг аль болох сэргээн засварлах

Хянаж шалгах
Хортон шавьж амьтнаас үрдчилан сэргийлж тогтмөл хугацаанд узмэр дээжист шалгагүй нь зүйтэй. Гээсээний нэнгээ гадаргуу дээр үлдээсэн шавьжны толбо мөр нь энгийн нудэр харахад амархан байдаг учир баян өндөр үнэлгээ шигаан цаасан бүрэх нь шавьжны нутгийг ялгаж танихад хаялбар бөгөлт болгодог.
Хортон шавьжтай тэмцэх үйл ажиллагаанда хавхийг хэрэлгэх нь хамгийн гол түлхүүр элемент болдог. Наалддаг хавхийг тавьснаар музейд олонроо үүлдээсэн амьтдын байршилд илрүүлэх тааралдсан үед нь барж авах давуу талтай. Хавхийг хэрэлгээн музей хортон шавьж амьтдаас сэргийлсэнээр үзмэрт ноцой хохирол учруулж болошогүй айулдгүй музейн ажилнуудад дохио болгон сэргээж боломжтой болдог. Феромин хавхийг зөвхөн музейн барилга дотор агааржууллагч ажиллагааг тохиолдолд хэрэлгэх нь зүйтэй байдаг.
Хэрэвээ цохих нүдлэн огортой байвал энэ төрлийн хавхнуудыг болоод гаднаас шавьж болон амьтад путлах хандлагатай байдаг.
Хамгаалаан арчлах

Арчилгаа бол хамгийн тодорхойлоход хэцүү элемент юм. Олдвор эсвэл биологийн үзмэрүү бүрэн шинж чанар болон арчилгааны цаашид ыр дагаврын нэртоо сөлөөгөө ачаалатай болдог. Музейн хадгалагч нь эл зүйлсийг буюу үзмэрүү арчлах үйл ажиллагааны үйл ажиллагаа ээлхэний омно зоавал урьдчилан давлаж зөвлөлдсөн байдж ёстой.

Химийн бодис хэрэглэн арчлах нь тухайн цаг уедээ нэлэлт нь мэдэгдэхгүй боловч урт хугацааны дараа илрэх сүрэг ур дагавартай магадлалтай. Жишээ бол, 18-р зуунд эхлэн мээр хошуулчны тушаал болон уур тушуулыг хэрэглэн арчилгааны хамгийн тодорхой хэцүү болно. Музейн хадгалагч нь эд зүйлсийг буюу үзмэрүү арчлах үйл ажиллагааны үйл ажиллагаа ээлхэний зөвлөлдсөн байдаг.

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Туулээс гардан хэрэглэн арчлах нь химийн бодис сүрэг ур дагавартай магадлалтай. Жишээ бол, 18-р зуунд эхлэн мээр хошуулчны тушаал болон уур тушуулыг хэрэглэн арчилгааны хамгийн тодорхой хэцүү болно. Музейн хадгалагч нь эд зүйлсийг буюу үзмэрүү арчлах үйл ажиллагааны үйл ажиллагаа ээлхэний зөвлөлдсөн байдаг.
В температуре для хранения баллонов в больших помещениях важно обеспечить правильное хранение. Эксперты говорят, что баллоны с газом должны храниться в специальных камерах с контролируемой температурой. Эти камеры обеспечивают стабильность температуры, что важно для безопасности и сохранности газа.

Безопасное хранение баллонов требует соблюдения специальных мер. Например, баллоны со сжатым газом не должны храниться вблизи открытого огня, так как это может привести к взрыву. Также важно соблюдать правила хранения баллонов в жилых помещениях, так как они могут быть источником опасности.

Важно также обеспечить надежную защиту от воздействия температуры на баллоны. Например, при хранении баллонов в холодных условиях их нужно упаковать в теплоизоляционные материалы, чтобы предотвратить повреждение от холода. Это может быть важно при хранении баллонов в сибирских условиях, где температура может достигать -70 °С.

В заключение, соблюдение правил хранения баллонов с газом важна для обеспечения безопасности и сохранности газа. Важно придерживаться правил хранения баллонов в разных условиях, чтобы не создавать опасность для людей и окружающей среды.
терлийн хий хянагч ашиглахас мен устгалаа хамрагдаж байгаа 3д зууны
төм жижгээс шалганаан яын бүр байдаг. Жишээ нь, жижг оврын уздгээийг
гар аргаар устгалаа хамруулбал түн бага зардлаар хийж болно. Том оврын
битүүмжлсэн савыг (3.5 куб метр эрэг) автомат машины нь хамт худалдан
авбал $20000 ам.доллараар АНУ –ас худалдан авах болжмжой.

Энэ аргын хэрэглэлээсэйн сул тал барраг байхгүй гэж хэлж болох боловч энэ
аргыг хэрэглэхэд зарцуулдах зардал эндрэд бөгөөд цаг их шаардлаг. Анонций
устгалаа төм температурын өөрчлөлтөөр устгалаа төмхөр аргатай адиллар нэгэнт уздгэр
устгалаа хамрагдаж дуусад битүүмжлэлээс гарсан бол өмнө байсан баталгаа нэгэн
адиллар шавъж үржих нөхцөлд хамгаалалтгүйгээр оршиж байдаг.

Уздгэр цуглуулгын үрээдүй бидний гарт байдаг

Цуглуулгийг нудлэн хамгаалагчийн хувьд музейн баалаг өв нь бидний хойч
үрээдүйд дамжин очихын тулд зөөгийн журамын дагуу өөрчлөлтөөр арчлах хамгаалах
нү бидний эрхэм чухал үүргө юм. Музейн орлуулж боломгуй биологийн болон
төмхөр үзмэрүүдийг, бөгөө хугацааны дотор хөөгөл учруулж болзоошгүй
хортон шавъж амьдлалын худалдан авч бидний сонор сэрэмжтэй байх
нү зүйтэй. Бидний нудлэн хамгаалах үзмэр болон 3д зуынсийг бүрэн бутнэр
нү баалгахад хортон шавъжын устгалаа 3длээг төлөвлөөн мөрдөх нү чухал ач
хөлбөгдөлтөй.
David Hunt demonstrating processing of human remains. (photo: Neighbors)
The following pages will be a summarization and a re-emphasis of most of the salient points presented at the workshop during the symposium of June 2004, and Chapter 17 is the condensed outline handed out at the workshop. The information found in Chapter 17 is predominantly derived and often paraphrased from Bass (1995:329-338, Appendix 2). Additional information was also derived from Ubelaker (1999) and incorporated into the handout. This specific presentation was intended to overview the excavation and removal of human remains in the field and review procedures for field tracking, containment and transport of the excavated materials to the laboratory. The presentation was also designed to overview laboratory procedures and provide suggestions for storage procedures. And although this particular presentation was focused on human remains, the storage and preservation procedures discussed are also applicable for use with archaeological materials that are planned for long-term curation.

The field and laboratory procedures that were presented are what most Smithsonian archaeologists have practiced for the past several decades. The systematic format of these procedures has influenced the particular way our collections are cataloged and stored. They come from the field to the museum in a systematic method and organizational format. However, we also receive materials from fieldwork carried out by other institutions and universities. These, of course, are often excavated, organized, labeled and preserved in a different manner. It is imperative that the museum laboratory staff be able to adapt the other tracking and recording formats so as to retain the associative and research integrity of the objects. In conjunction with this though, the information must be processed so as to align with the Smithsonian registration format so that it can be integrated into the Smithsonian’s collections and records management procedures. This integration requires adaptation.

Adaptation

Adaptation is the key to any work in archaeology and anthropology. Adaptation is not only necessary to be able to generate the information from other institution’s work (as discussed above), but should be a mantra for fieldwork as a whole. Conditions beyond an expedition’s control will dictate how materials are excavated, recorded and tracked. Time
allowed for the fieldwork (dictated by permit or social/religious restrictions), experience of the field crew, environmental/weather factors (rainy conditions, extreme cold), access to equipment and packing materials (few storage boxes or paper or bags), and transportation restrictions (jeep, camel) all have an effect on the trajectory of the fieldwork and the expectations of the results from the work must be altered to fit these modifiers.

Record Keeping

If there is any paramount advice in field and laboratory work it is always keep records, including journals, photographs clear and redundant labeling. Do not rely on memory! And in addition, do not rely on only one (1) set of records. Inevitably a set of records or labels will be damaged or lost. Keep journals and record books in plastic bags and make double labels for bags, an exterior label on the bag, as well as an interior slip label. It is also common practice to number the bags and keep this inventory in a record book. This bag number inventory can be used as the exit inventory when leaving the site as well. A photographic record can be very helpful backup, especially given the ease with which photographic images can be made with digital cameras.

Preservation of Objects and Provenience

The key reason for recording and labeling and packing is preservation. It is necessary to accurately identify the provenience of the objects and specimens. Artifacts become essentially worthless as research materials for site reconstruction if the information about its origin is lost. It is the written and photographic records that preserve provenience. Copious records should be kept at all times, during the excavation is in progress as well as at the completion of the excavation and while processing and analyzing the artifacts in the laboratory. An accurate and understandable map presenting all the features, prominent artifacts and their orientation and association should be mapped for the site.

Preservation of the objects is implemented at various stages in their excavation. The stability of the object must be assessed even before its removal from the matrix. Then the stability of the object has to be determined for field cleaning as well as its transport from the site to the laboratory or institution. As was presented above, much of this decision is based on many factors. For example, the time available to remove the objects may be contingent on weather conditions, time of day, whether or not the excavator can return to the site again. Preservation is particularly important in the case of fragile objects (particularly if they may fall apart if removed from the matrix, or damaged by long term exposure during the excavation).

Transportation of materials from the field can be detrimental to the ultimate survivorship of the object. It is impossible to guarantee an object will not be damaged in transport, especially in remote areas where little packing or protective equipment may be available. But if the most rigorous efforts available are employed to protect the objects, their migration from the field to the laboratory may occur without a problem.

Labeling of objects and bags is primary for keeping the provenience intact for objects in the field, during transport and in the laboratory. Once the label and/or association
is lost, the object is no longer truly usable for analysis. Labels can become damaged, so a label inside the bag, or inside the object will ensure preservation of vital information. Photographing the object in situ before removal (with a label included in the photograph) is an additional mode for preservation of this information.

An exit inventory of all bags should be done before materials are sent off site. A similar list should be made of the bags on the entry to the laboratory for tracking purposes. All field notes and other records that will be used for processing the objects in the laboratory should be copied to be a working copy for the laboratory. Do not use the original field notes as the working copy. This will surely lead to damage and possible loss of the records.

Objects need to be identified by some easily and comprehensible labeling as tracking in the laboratory during cleaning and cataloging. The objects should be cataloged as soon as possible to reduce the possibility of mix-up. This cataloging includes: entry into a registration or ledger book, the making of a permanent catalog card, computer database entry and of course, a permanent label on the object. Do not rely on the computer database as the only source or record keeping. Databases are notorious for corruption and computers and software will always become outdated. Paper records (catalog cards and registration books and paper copies of the database) as well as print photographs (or negatives) are the most reliable.

**Storage and Collection Tracking**

In the storage of collections, there are two major points to be stressed – 1) protection for preservation, and 2) an accurate tracking of its location (i.e., where is the artifact stored). For protection and preservation, enclosed cabinets are the best protection for objects. Cabinets allow easy access and protective covering and buffering from the external environment. Containers (such as wood boxes) are certainly protective, but require much additional effort for access. Open shelving storage is less desirable, but if shelving is the only storage mode available, then the objects should be housed on the shelves in protective boxes, preferably made of non-reactive (chemically inert, buffered or acid-free) materials and with similar padding support for the object inside. It is desirable to have storage rooms that have some environmental controls to moderate humidity and temperature.

Different objects require specific levels of humidity for best preservation. These need to be assessed by conservators for the most appropriate method of storage. What is the most basic however is controlling large fluctuations in both humidity and temperature to occur over a short period of time. There is also the problem of chemical interaction between object material types. Undesirable interactions such as such as corrosive between brass and leather should be considered before housing objects in close association with one another.

Undeniably, collections require large amounts of storage space. And we all are well aware that space costs money, especially if it is to be environmentally controlled, secure, and good protective storage. Inventive ways to utilize the available resources that can be afforded is the adaptive key. Find the best possible storage location that can provide as good a climactically controlled surrounding building as possible to protect and allow for
long-term preservation of valuable collections.

Properly tracking objects in storage requires diligent record-keeping done by competent staff that continuously review the storage areas and update changes. This is the only way to ensure an accurate inventory of the collections. Today, computerized databases are essential in object tracking and should be employed whenever possible. These databases allow for easy updating, but also provide the ability to do object searches by storage locations, object type or materials, by provenience or any other field grouping that is available in the database. However, do not design over-elaborate database formats. The more complicated a database, the greater the confusion of data fields and interrelationships of data occur, and the less “user friendly” the data becomes. Frustration is the ultimate outcome of this endeavor, not utility.

Storage units and their locality label must be easy for everyone to recognize. There needs to be an organized sequence to the storage units and their location in the building so that it is logical to other staff people, not just the curatorial staff. Maps of the storage layout in the building are certainly helpful to orient people to the storage facility. Records keeping and care-taking of collections requires staff. Well-trained, conscientious and honest employees cost money. Adaptation and having the best people in key positions to keep this inventory and organization functioning is the key.

**Research and Exhibition vs. Conservation of Artifacts**

There is an inherent conflict between protecting and ensuring a conservationally stable collection versus having collections open and accessible for research and exhibition. This is, and will be an on-going dichotomy in museum collections management. To completely protect a collection it should be fully isolated from the effects of air, light, and handling. In contrast, research and analysis of collections certainly requires handling, exposure to light, environmental fluctuations and may even require destructive sampling. Display of objects may not have a handling element, but light exposure and mechanical stress of the display, no matter how slight, causes degradation in the integrity of the object over time. It requires hard decisions by the curatorial staff, conservators, and administrative staff of the museum to determine the point at which research access or exhibition use should give way to considerations of conservation.

A pitfall in many institutions is the tracking and storage for borrows, loans and exhibitions. Often when the research/museum staff borrows objects, tracking is not done. Thus, the location of where the object is in the museum/institution is only based on someone’s memory, and we do not rely on memory. Location codes should be identified for offices, laboratories and for exhibit cases when an object goes on exhibit. A form or label should be placed in the permanent storage location, not only to identify where that object has gone, but also to identify the location to be left open for the eventual return of that object to permanent storage at a later date.
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References


Mongolian Abstract

Хүний шарылыг хайгуулын ажлын үед болон лабораторит цуглуулах менежментийн үйл ажиллагаа

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Уг илтгэл нь дурдлагад бүй хайгуулын болон лабораторийн үйл явц нь Смитсонийн археологикдийн илгээрээний үйл явц нь арван жилийн турш хэрэглэсэн цуглуулгаа хадгалах каталогжуулахад мэдрэх нэмэлтэй байсаар ирээд бөгөөд эдгээр олдовултуулд нь хайгуулын талбар зохион бүтээсний музей хүрээл тодорхой эрэмбэ дараатай зохион байгуулалттайгаар зөөлөрөлж авчирдаг. Өөдөө зарим тохиолдолд бид бусад институт болон их сургуулуудын архивсанд хайгуулын материалуудыг бас хулиа авдаа. Энэ нь мэдрэмдээс дартаа бөгөөд эрдх дурдаг, эхэл тайлбар наалттай болж, хадгалагдаас байдаг. Ийм учраас музейн болон лабораторийн мэргэжилт нь болон ажиллнууд нь ээр

Collections Management
аргаар бүртгэдсэн материалуудыг зөвлөө ялган дүрэмтэй бүтэн үйл явцтай нэгэн хэлбэрээр бүртгэлд орно. Хийсэн систем болон үйл явцтай нэгэн хэлбэрээр бүртгэлд орно.
хөтгөл байх ёстой. Хайгуул шингэлээний ажлын бухий явц, гол гэл олдворууд, тэдгээрийн байрлал болон бусад холбоотой зуйлдүүдийг ойлгож байгаа тодорхой схем зурагийг үйлдэх хэрэгтэй.

Эд зүйлсийн хамгаалалтын горим нь малтаалын янз бүрээн үе ёштей болдог. Хайгуул шинжилгээний ажлын бухуй явц, гол гол олдворууд, тэдгээрийн байрлал болон бусад зуйлуудийг ойлгомжтойгоор харуулсан тодорхой схем зурагийг үйлдэх хэрэгтэй.

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дээрх буртгэл (каталогны карт, буртгэлнүүд дэвтэр, болон буртгэлний цаасан дээрх хуулбарууд) болон хэвлэсэн фото зурагнууд (звэл фото хальс) нь хамгийн найдвартай юм.

Хадгалалт бэ Цуглуулга хотлох

Цуглуулгыг хадгалах явцд өөр голь зүйлийг анхаарах нь зүйтэй-1) хамгаалалтын аюулгүй байдал болон 2) байрлалыг зохих жүрүүн дагуу тоогоо (өөрөөр хэвлэл, олдвор хаана хадгаладаг байгаа) байна. Олдворыг хамгийн өөрөөр хадгалж хамгийн байхад бүтөөлж байгаа нь хамгийн найдвартай хамгаалалыг хэрэгцээл юм. Олдворыг гадаад орчны нөлөөние тусгаарлан, хамгаалж улмаар хэвлэл байхад зүйтэй харуулж болох нь зүйтэй.

Модон хайрцаг гэх мэт сав нь хамгаалалтын хэрэгсэл болж чадах болович зүйлсийг авах нь хамгийн найдвартай.

Цуглуулгыг хадгалах явцад журналд шалагддаг нь бүх хувьд зүйтэй—1) хамгаалалтын гана билээ. Том зайтай байр нь илуу их унэтэй байдаг.

Цуглуулгыг хадгалах явцад журналд шалагддаг нь бүх хувьд зүйтэй—2) хамгаалж улмаар хэвлэл байхад зүйтэй. Хадгалж агуулахын өөрчлөгч нь тохирох болдог буюу температур чийгшлэл зүйтэй хайрцаг нь хаягч тохироо болдог байнаар сонгож байгаа.

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ангиллаар нь гэх мэтчилэн боловж бүх л хэлбэрэн хайлт хийх нэгдүгээр хамрахлаа үнэлдэг. Гэхдээ бүртгэлдийг хэлбэрүүс энэ хэлбэрээр хайлт хийх нэхцлийг бурдуулдаг. Гэхдээ буртгэлдийн хэлбэрээр гэх мэт заншлагдаж буй нэхцлийг зохиож байна. Бүртгэлдийн хэлбэрээр гэх мэт заншлагдаж буй нэхцлийг зохиож байна.
William Fitzhugh opening the 2004 U.S.-Mongolian Deer Stone conference at Mongolian National University lecture hall. (photo: Marsh)
Excavation and Treatment of Skeletal Remains

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Field Excavation

Exposing and Recording the Remains

When removing soil from around a skeleton, use sweeping motions with the trowel. As soil removal progresses, use a brush to remove the loose soil to see the progress of exposing the bone. Pick away soil from around the bones with bamboo picks or other nonmetal type instruments so as not to damage the bone.

Leave all the bones in place until the entire skeleton or skeletons are exposed for complete recording of location and position of every associated bone.

Keep as complete records as possible. Do not rely on memory. It is best to photographically record the excavation in progress.

It is necessary to photograph the skeleton in place at the end of the excavation, before removal of the bones.

When photographing the in-progress and completed excavation, place markers in the photograph. Information should include: site name and number, feature identification number, pointer for North, metric scale, and date of photograph.

Gather the specific data concerning the skeleton, position and associated materials by not only photographs but also written records. Develop and use standardized recording forms to systematically record pertinent information.

Removal of the Remains

Once all records have been made, the bones can be removed. Do not pry the bones

out of the ground, or try to remove the bone from the soil if it is not fully uncovered. This leads to breakage and more need for reconstruction in the laboratory.

Try to remove most all the soil from the cranium at the site before the soil dries inside. The soil can split the cranium by expansion / contraction when it dries, or can fracture the bone if the hard soil rolls around inside the cranium.

It is best to let the bones air dry before placing them in containers to reduce the possibility of mold and fungal growth. It is best not to have the bone or other objects dry in direct sunlight. This will lead to cracking and fracture to the outer surface or to the artifact. Try to keep them shaded in excavation and in drying.

**Bagging the Remains**

Place the bones in labeled bags or containers. Labels should include inventory of bones, site number and name, feature number and level number, date excavated, excavator and any other specific information related to this excavation.

When removing the hands and feet from the burial, keep the association of these bones by bagging each hand and foot separately. This helps to identify the correct side for the elements in the laboratory (especially phalanges). If some elements are found still in articulation, it facilitates laboratory identification by bagging the elements together to keep their association.

Retrieve all bones and fragments possible as they may be crucial for reconstruction in the lab, or for identification purposes.

Use several containers or bags, do not over-pack the containers. Over-packing leads to damage of the materials.

Pack the larger, or heavier bones on the bottom of containers to reduce damage by crushing.

Mark the bags or containers with pencil or waterproof ink. Lost information on the bags makes the excavated materials in the bag worthless for later analysis in the lab.

When packaging for transport, make sure the elements and artifacts will not rub together and damage one another. Individually wrap materials if possible, or try to reduce the amount of shaking the artifacts will sustain in transport.

A list must be made of all bags removed from the site to the laboratory. This tracking is important to reduce the possibility of lost excavated materials and for hopefully identifying mixed bags in the event that this might occur.
Preserving Field Records

Keep all records organized in a file system by site, grid, feature and level. These include the paper files, copies of photographs, negatives (all labeled with pertinent identifying data in permanent ink) and copies of permits and permissions.

Laboratory Practice

All incoming bags and containers from the site should be inventoried to confirm that the bags tracked by the site list coincide with the incoming bags.

Cleaning

When removing bones or artifacts from their bags or containers, always keep the labels in association with the bones, or make more labels to identify the materials so as not to lose their identification. Do not rely on memory.

It is best to keep materials in trays or boxes, to support and protect the objects, assist in transporting the objects from one part of the lab to another, and to keep their association if there are several objects that belong together.

Handle the bones and/or object carefully, supporting them with your hands and holding them at the areas of greatest mass, or keeping them in a container or tray for support.

Bones need to be cleaned before analysis or storage. Methods for cleaning depend on the condition of the object. Usually a soft brush and softer (non-metallic) type picks made of wood or bamboo are best to use to remove soils or other adhering materials.

If the object or bone is in good stable condition (not brittle, flaking or granular), washing with water can be done to clean off the soil. Have a conservator help with assessing the stability of the bone before soaking or washing.

Always wash on a screen, or in a tray or container so as not to lose small bones (such as earbones, teeth, finger or toe phalanges or fragments).

Labeling and Cataloging

Once the bone or object is dry and properly cleaned, label every bone clearly with some sort of discrete number to be able to accurately track and identify the bone or object. This can be the site, feature and burial number or museum catalog number or other assigned tracking number. This becomes especially important if the elements become disassociated.
Labeling of the bone should be done with permanent, waterproof ink. It is most permanent applied directly to the bone. Some institutions require a base of PVA or other coating before the label is applied, but there is the possibility of this pealing off.

A catalog ledger book must be made to organize catalog numbers for the objects. Each catalog number must have recorded with it all provenience information for the object and an object description. Catalog cards should be made for reference.

A computerized database of the cataloging should be made to help in tracking and searches. This computerized database will also be used for inventory and storage location recording purposes.

**Reconstruction for analysis**

In re-assembly of fragmentary bones, use adhesives that are as stable as possible, so that they will last a long time. Adhesives that are transparent are best since they will not obscure the area around the repaired join. Use adhesives that can be reversed with solvents, such as those that are acetone based.

When repairing bone, try not to fill in cracks or holes. These may be important for analysis or identification of pathology, culture modification or perimortem injury.

Do not cover bone with shellac or paint. This obscures the morphology of the bone or surface of the object. Expansion and contraction of the covering layer and the object or bone will be different and will cause damage and cracking of its surface.

**Storage**

All materials should be stored in appropriately protective boxes or containers that are large enough so that there is enough room around the object to be able to get one’s hands well around it for support when removing it from the container.

These boxes should be able to support the weight of the object, and have adequate space or rigidity to buffer the object from blows to the sides. Support and padding in the box will aid in this protection. The box or container should act as a buffer from the external environment. However, the container should not be impermeable, for moisture and condensation may build up in it if there is severe temperature of humidity changes. A sealed container should be used only in cases where a damp environment in the container is needed for the preservation of the object.

A cranium should be stored in a separate box or separated from the other bones by a wall in the box to protect the fragile facial bones and teeth from damage from other bones shifting and hitting the cranium. The mandible can be stored with the cranium if the container has adequate space, but the mandible should be wrapped in tissue to avoid damage to the cranium.
It is best to have the postcrania laid out in a single layer. This is generally not possible due to space restrictions. Layering of bones should have the larger, heavier bones on bottom and the lighter, more fragile bones on top, protected in separate bags.

Containers and bags used to hold the bone elements must be labeled with at least the museum catalog number for identification and tracking. It would be additionally helpful to include the site name, site number, feature number, and burial number.

The exterior of the storage boxes should have all the label information with additional brief description of the contents for ease in identification in storage.

**Storage Modes**

Storage modes are dependent on the type of objects, space requirements, storage configuration, and of course funds and access to equipment.

Enclosed and locking cabinets are the best form of protection and security for storage. These are the most expensive and require large storage areas.

Open shelving necessitates that objects should be in containers to cover and protect the objects.

Objects should be left open on shelving only in cases where restricted access is enforced.

When stacking storage containers, heavier boxes should be on the bottom, to eliminate collapse of the box.

Stacking of containers should be avoided if at all possible. If necessary however, boxes must be very strong-sided, well-formed and resistant to humidity or water damages, especially those on the bottom. The bottom box should not be sitting on the ground or floor, but on a frame to allow for air circulation under the box bottom and to protect from flooding and pests. The heaviest boxes should be on the bottom, the lighter boxes on the top. Do not exceed 4 or 5 boxes high, as this becomes a safety hazard and also makes getting to the lower boxes a struggle.

**Storage Location Inventory**

Divide the storage area into quadrants or some sort of location organization. Discrete locations need to be identified to be able to make an inventory of the materials placed in a particular area. This will greatly aid in finding stored materials later. Label the cabinets or shelves numerically and number the shelves in the cabinets or shelves from the top down.

Each cataloged object must have a storage location, including: a quadrant identifier,
cabinet number, shelf number, and box number. This information is best applied in a computerized database, either as part of the catalog and inventory database or linked by the catalog number.

**Suggested Fields for Computerized Database:**

- Catalog Number
- Accession Number
- Accession Date
- Site Location
  - Country
  - Province or State
  - County or geographical grid
  - City or Locality
  - Site Name
  - GPS Coordinates
  - Site Number
  - Feature Number
  - Level Number
  - Burial Number
  - Excavation Date
  - Excavator
  - Object Description
  - Storage Location

(For natural history or zoo-archeology specimens)
- Genus
- Order
- Species
- Subspecies

**References**


Монголийн Abstract

Шарилд малталь хийх ба шарилтай харьцах нь

Доктор Давид Р. Хант (Шинжлэх ухааны доктор) Смитсоний Институтын Антропологийн тээхийн Физикал Антропологийн Салбар

Хайгуулын талбар дээр малталь хийн

Шарылыг ил гаргах ба бүртгэх ажиллагаа

Араг ясны эргэн тойрноос газрын хэрсийг цэвэрлэхдээ жижиг хүрэ шөнөгийнээр тойрог хэделгөөнийг хийн. Ясныг ил гаргах ясныг сайн харж мэдрэхийн тулд гадна наалдан шороо гөгөн ашиглан цэвэрлэ. Ясанд гэмтэл уруулахгүй тулд эргэн тойрноос нь наалдан шороо хуулсан буюу еер ямар нэг төмөр биш материалар цэвэрлэ.

Араг ясны бух яснуудыг гүйцэд малтаж дуустал бух ясны хамгийн сүүдд нь бүрэн бүртгэл хөгжлийн тулд холбоотой ястай нь хамт байр байранд нь улдз.

Аль болох бүрэн гүйцэд бүртгэл хөгчөө. Ой санамжинд аа найдаж болохгүй.

Малтальнуултоон хэднийг авахгүй бусад малтальнуултыг зөвлөж буйг ясныг хамгийн шилдэг арга мен.

Малтальнуулт хийх байх үеийн фото зургийг авч бүртгэл хөгчөө нь хамгийн шилдэг арга мен.

Малтальнуулт зурагч арван талаар шаардлагатай.

Малтальнуултын ясны дундаах болон дарах зурагдээ харг тавь. Дорог мэдрэллүүлд багтсан байх шаардлагатай: газрын нэр болон дугаар, ошшоо шинж дугаар, хойд зураг зохсан тал, нөгөө жижиг эсэс, зураг авсан ол сан доймор.

Араг ясныг холбоотой тодорхой мэдрэл баримтууд, түүний байрлал болон бусад материалдуудыг зөвлөж буйг ясныг хамгийн шилдэг арга мен. Системчилсэн бүртгэл хөгчөө мэдрэллүүлээд эмх замбараттай байлагын тулд стандарт хөгчөөгүй хэлбэр зохиож түүнийг ээс хэрэглэ.

Шарылыг газраас холдуулаан авах

Бух бүртгэлээд хөгчөө дуусаны дараа ясыг газраас холдуулаан авч болно. Хэрээс ясны эргэн тойрноос газрын хэрсийг дуусган бол яснуудыг газраас хөгчөө буюу шорооноос хүчээр салгах гэж оролдсон хэрэглэгүй. Энэ нь ясны зөвлөх нэмэлт болон болгоо арван талаар шаардлагатай.

Басс (1995)–ийн бүтэн нэлээ болгоо арван талаар шаардлагатай

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shaardagdaa bolno.

Шороог гавлын ясны дотор талд хатахаас омне газар дээр нь ясгы шорооноос цэвэрлэж салтахыг хичээх хэрэгтэй. Шороо хэрэв гавлын ясны дотор талд хатвал агшилт буюу тэлэлэгийн нөлөөгөөр араг яс цуурхаа аюултай эсвэл хатуу хэрээр шороо гавлын ясан дотор энхсэвлээ ясгы цуулж хагалагд болно.

Ясанд хөгч, мөнгөнцөр уусээ боломжийг нь буруулаахын тулд тэдэнээрэйг саванд байрлуулахын омне агаарт хатаах нь хамгийн зөв арга юм. Мөн яс болон бусад эд зүйлсийг нэрэн өрөөл шууд тусахаар газар байрлуулахгүй байх нь шилдэг арга юм. Нарны түүх нь олдвор болон гадаргууд нь цууралт хагаралт уусээ шалтгаан болж эгдэг. Малталтын ёзэр болон хатаах үедээ олдворуудыг суудерт байлгаахыг эмрийх хэрэгтэй.

Шарилыг савлах хураах

Яснуудыг хааг тайлбартай уут буюу саванд байрлуул. Хааг тайлбар ясны бүртгэл, олдсон газрын дугаар болон нэр, шинж зэмдэгийн дугаар болон тувшин дугаар, малталт хийсэн олс дээр, малтагч хэрэгсэл болон малгалттай холбоотой бусад нь малтаж машинд эмээллүүд тусгасан байх ёстой. Мөн яс болон бусад эд зүйлсийг нэрэн өрөөл цуулж хагалах нь хамгийн зөв арга юм. Мөн яс болон бусад эд зүйлсийг нэрэн өрөөл цуулж хагалах нь хамгийн зөв арга юм. Мөн яс болон бусад эд зүйлсийг нэрэн өрөөл цуулж хагалах нь хамгийн зөв арга юм. Мөн яс болон бусад эд зүйлсийг нэрэн өрөөл цуулж хагалах нь хамгийн зөв арга юм.
байдлаар хоорондоо холигдож солигдвол ялгаж танихад дехэемээ байх болно.

**Хайгуулын талбарын хийлэссэн тэмдээгээний хамгаалалт**

Бүх тэмдээгээ бүртгэлээ эмх замбарычтай хөтлөх хэрэгтэй, үүнд дараах зүйлүүдээр ангилал хэрэгтэй: газраар нь, хсэгээр нь, онцлоо шинжээр нь, тувшинээр нь ээрэг багтана. Эдгээр бүртгэлэд цаасан дээр хөтөлсөн баримт, фото зургийн хуулбар болон халь (бугд арилдагт балаар онцлон ялгах тоо баримтыг агуулан хаягладсан), зөвшөөрлөн бичигтэй хуулбар гэх мэт зүйлсүүд орно.

**Лабораторийн хийлэв**

Хайгуулын талбарын лабораторийн ирсэн бүх уут савнуудыг бүртгэж аваад дагалдах ирсэн жагсаалттай нь ирсэн бүх уут савыг чөт улгагаа үзэж тааруулах хэрэгтэй.

**Цэвэрлэх**

Яс болон олдворуудыг уут савнаас нь салгаа явцааа ястай дагалдах ирсэн хаяг тайлбарыг байгаа хамт байлгаж байх хэрэгтэй. Сэвэл материалын дээр ялагдах онцлогийг нь алдрагдуулахгүй тулд нэмэлт тайлбар зүүлт хийхөөрөө хэрэгтэй. Он санжинд айлдаж болохуйг хэрэгтэй.

Цэвэрлэхийг хамгаалах, лабораторийны нэг хсэгээс нэг нэгүүл нуулагэн шилжүүлээх хялбар байдалгүй, хэрвээ эд хэдэн нь зүйлц хамтдаа байгаа төхөөрөө хамтруулсан нэг нэгүүл нуулагэн шилжүүлээхийг ялгаж дагаараар ялгаж дагаарлаад яс болон эд тавсийн хэрэгтэй.

Яс нь хэлбэр буюу нөгөөр баярлаж хатаасны дараа, яс туе бурийг хоорондоо давхцах гүй дугаарр ялгаж дугаарлаад яс болон эд 2

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зүйлсийг ялгаж хяналтад бэлэн байлгах ёстой. Эдгээр дуугаар уудааг нь олдсон газар, онцлох шинж тэмдэг, булш, музейн каталог, болон бусад мөрдөх ёстой дуугаар зэрэгтэй илэрхийлэн дуугаар байж болно. Хэрээн элемент эмх замбар аагүй болох тохиролдодийг ынхүү дуугаарлах нь маш хүчтэй байх болно.

Ясыг хаяглаахдаа арилдагтуу, усны хамгаалалттай бэх үзгүйг хэрэглэх зэргийг шаардлагатай. Ясан дээр шууд хаяг тавих нь хамгийн үлдээгээй байж болно. Зарим институутууд хаяг тавихийн эмнэлэг ясанд дээр PVA гэх мэт суурь наалгат хийхийг шардлагдаг гэдээ энэ нь хуулаар унах сул талтай.

Эд зүйл бүрт каталогны дуугаар олж замбар аагүй болгох үүдэнээс каталогын дэвтэр болон тухайн эд зүйлийн талаарх дэлгэрэнгүй мэдээлээ бол эд зүйлийн дүрслэлийг агуулан бүртгэж дээдийг байх шаардлагатай. Каталогны картыг лавлагааанд зориулж хийхээрээ болно.

Шинжилгээ хийхээрээ зэрэг засварлах

Олон бутархай хэсгээс бүрдсэн ясыг буцааж эвлүүлэх явцад аль болох удаан хуггацааны турын тогтвортой байлгахын тулд цавуулал тухайн талбайд үзүүлэх зүйлсийг хэрэглэх. Нэвт гэрлэлдэг наадамд тухайн эд зүйлийг хэрэглэх нь хамгийн үлдээгээй арга учир нь засагдаж байгаа үүнд дэлгээгийн тойрыг булагдаж болохгүй. Мөн ацетонөөс бүтэн ууслаг наадамд тухайн эд зүйлийг хэрэглэх зүйлсийг хэрэглэх нь зүйтэй.

Ясыг засварлах явцдад цуурсан хэсэг болон үнээс дээрх хэрэг оролддог нь зүйтэй болно. Эдгээр нь судалгаа шинжилгээний ажлын усны хэвийн хөгжил, түүний эөрчлөлт, гэмтэл авсан шалтгааны үзээгээ танихад чухал байх болох талтай.

Ясыг буцаах гадна буйроо гадна буцаах нь зүйтэй болохгүй. Энэ нь ясны хэлбэр буцаж байгаахаа зорилгоор үүнд дэлгээгийн тойрыг булагдаж болохгүй. Эд зүйл болон ясны гадна буцаах нь зүйтэй болох нь зүйтэй болохгүй. Эд зүйл болон ясны гадна буцаах нь зүйтэй болохгүй. Энэ нь ясны хэлбэр буцаах нь зүйтэй болох гадна буцаах нь зүйтэй болохгүй.
орчны нөхөн үүргээс хамгаалах давхар үүргээтэй байх ёстой. Гэвч сав нь агаар буюу ус үл нэвтруулагдаж битүү байх шаардлагагүй учир нь ямар нэг байдлаар дулааны болон чийг шилгээг гарвал чийг болон ашгил үүсэх магадлалтай. Битүүмжилсэн савыг эд үзүүлсийг хадгалахад чийглэг орчин шаардлагатай тохиолдолд л зөвхөн хэрэглэх нь зөв.

Гавлын ясыг нэгдүгээр нь байрлуулах нь хамгийн зөв арга гэхдээ эн нь зайны боломж өсгөчтөөш байрлаа шалтгаалан хэрэгжүүлэх боломжчих байдаг. Яншуудыг устгахыг хамгийн хүнд жинтэй ясны хамгийн доор нь байрлуулж, арай хөнөөл, хэрэглэгчийг нь дээр нь тусдаа хамгаалахгүй уутанд хийж байрлуулах нь зөв.

Гавлын ясыг нэгдүгээр нь байрлуулах нь хамгийн зөв арга гэхдээ эн нь зайны боломж өсгөчтөөш байрлаа шалтгаалан хэрэгжүүлэх боломжчих байдаг. Яншуудыг устгахыг хамгийн хүнд жинтэй ясны хамгийн доор нь байрлуулж, арай хөнөөл, хэрэглэгчийг нь дээр нь тусдаа хамгаалахгүй уутанд хийж байрлуулах нь зөв.

Ясын хэсгийг агуулах нутав цэцүүд дээр хүн хайрагчийн музейийн каталогны дугаарыг хаялга дээд йүжих гэдээгийг хаяж байгаа боловсوردог. Ондоо газрын нэр дугаар, онцоол шинж чимэгийн дугаар, булины дугаар эрэгүүлэгчийн хаялгаход нэмэлт тэмдэглэл нь илүү нэмэр тус тустай.

Хадгалж буй савны гаднах хаяг дээр бүх тайлбарыг оруулаахас гадна нэмэлт хадгаласан зүйлүүлгийн тулд дотроо агуулгыг нь төвч тайлбарлан бичих нь зөв байна.

**Ха́дгалах арга**

Эд зүйлсийн терэл, шаардлагдаж буй зай хэмжээ, хадгалалтын өрөөц, бас мэдээлэлээр тоног төхөөрөмжийн ашиглал болон олдоцоос шалтгаалан хадгалалтын арга хэлбэр нь 16 нь бар байна.

Битүү цоожтой шүүгэээнүүд нь хадгалалтын хамгийн найдвартай аюулгүй хэлбэр юм. Энэ нь хамгийн үнэлэг бөгөөд хамгийн их зайнаас шалтгааны хэлбэр юм.

Онгорхой тавиуураа дээр хадгалах үед эд зүйлсийг хамгаалахын тулд бүгдийг нь хайрцагт савласан байх шаардлагатай байдаг. Зөвхөн зөв дөрөвдөөрүү чимэгүү ёс агууллага гадна нэвтрэлтийг тохиолдолд эд зүйлсийг онгорхойгоо тавиураа дээр байрлуулах болно. Хайрцаг савыг тавиураа дээр байрлуулах үед дээр дээрэнэ нь унагах эвдлэхгүй тулд өмнөх хайрцагийг хамгийн доор нь байрлуулах хэрэгтэй.

Хэрвээ боломжтой бол хайрцагнуудыг аль болоо дээр дээрэнэ нь давхарлахгүй байх нь зөв. Хэрвээ зайлшгүй шаардлагатай бол хайрцагнуудын ирмэг нь бат бий байх ёстой ба ялангуу даад хэсгээээх сайд түлдөг мөн чийг болон усны нэвтрэлтгийг даадаг байх ёстой. Хамгийн даад талын хайрцаг шууд

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газарт наацдсан байдалтай байрлах болохгүй. Харин хайрцагын доод зээгийг хүрээлсэн биет дээр хайрцаг байрлах агаар чөлөөгийг солилцож менүүгээс холбогдоо болон хорхой шаврын гээ мэд аюуллаж хамгаалагдсан байх ёстой. Хамгийн хүнд жигитгээ хайрцаг хамгийн дор нь байрлаж хөнгөн хайрцаг дээр нь байрлах ёстой. 4 буюу 5 хайрцагнаас оныг эд зээ байрлаж агаар чөлөөтэй болсон зэрэгчийн хуульд эрдээтэй байхгас гадна хамгийн доод байгаваа хайрцагт хорогоо ачаалалыг ихээгээдгээр.

**Хадгалалтын байршилтыг тэмдээлэж хөлбөө**

Агуулахын дөрөөлжин хэсгүүдэд хувалас буюу байршил тодорхойлоо ямар нэг арга өлгөрөөгийг ашигла. Материалын бүртгэлийг тодорхой хэсгээг тодорхойлоо, ялгаж тэмдээлэл хөлөөд болок буюу хүндгээ хайршилтуд нь өөр хоорондоо ялгаж дагаж ёстой. Ингэснээр хадгалсан материалыг хожим эргүүлэн хайхад тусгаарласан болно. Шуугээ буюу тавируудыг тоон системдээ дугаарлаж хэсэгт бүгдээ шууғээ буюу тавирууудыг дээрээс нь доош дүгээрлэв.

**Каталогжуулалт** эд зүйлс болон хадгалалтын байршилгээ олондоо байх ёстой. Уу́д: дөрөөлжин хэсгийн дугаар, шуугээний дугаар, тавирууны дугаар, хайрцагны дугаар. Эдгээр мэдээллүүд нь компьютер дээр бүртгээ хөлөөд түйлэн хохирмоох бөгөөд нэг байрлах өгүүлэх нэг бол каталог ба бүртгэлийн нэг хэсгээг майгагаар эсвэл каталогны дугаар өлгөрөөр орсон байдал.

**Компьютер дээр бүртгээ хөлбөөг зөвлөжүү**

Каталогиний дугаар
Бүртгэлýйн дугаар
Бүртгэлýйн он, сар, одор
Олдсон газрын байрлал:
Улс
Муж буюу аймаг
Сум
Хот
Газрын нэр
Газарзуйн Байршилтын Системийн координатууд
Газрын дугаар
Шинж тэмдэглэл дугаар
Тувшин дугаар
Булшны дугаар
Малтагт хийсэн он сар одор
Малтагт хийсэн төхөөрөмж
Олдворын тодорхойлолт
Хадгалалтын байршилт

(Байлгальын түүх болон археологи, амьтны судлалын олдворуудын хувьд)

Тёрөл
Өөгөг
Зүйл
Уулдэр

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Part 3
Archaeological Field Reports

(illustr.: Andrea Neighbors)
Fitzhugh, Odbaatar, students, and Tsaatan at Menge Bulag in June 2004 (photo: DePriest).
Archaeological Reports from the 2004 Deer Stone Project

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Smithsonian Institution

Introduction

The joint project between the Smithsonian Institution's National Museum of Natural History and the National Museum of Mongolian History has been engaged in research on the archaeology, anthropology, and environment of the Hovsgol/Darkhat areas in Mongolia's Hovsgol province. In the two years of field research reported here, project participants gained knowledge of the research area and determined the need for further research on this region's archaeology, geology and botany (Fitzhugh 2002). For this reason, our organizations agreed to undertake additional archaeological and ethnographical projects in accordance with the laws protecting Mongolian cultural heritage (Protection Law 11.3, 11.4, and 12.1) and its regulations on historical and cultural monument research and excavation. This progress report is presented in the following sections:

Introduction
Soyo Tolgoi Neolithic site
Looted mound at Chodoriin Daraa
Looted mound near Namnan Togos Mountain
Excavation of a deer stone at Tsatstain Hoshuu
Research at Menge Bulag in Ulaan Taiga
Finds from the Tsagaan Nuur Aum Area
Research at Ulaan Tolgoi deer stone site west of Erkhel Lake

Purpose of the Research

The Deer Stone Project field program consisted of three different groups (archaeology, botany, and geography) that had separate goals and responsibilities. The primary purpose of the archaeological group was to identify cultural materials dating from the Neolithic, Bronze, and Iron Ages in this area. An additional purpose was to study the
traditional cultures and artistic and intellectual heritage of the peoples of the region which would allow comparative analysis with those in other areas of Mongolia.

The archaeological records found in the northern Mongolian taiga zone may be somehow related to those found outside Mongolia in northeast Asia and Bering Strait (Schuster 1951), the Arctic and north Pacific zones, and to the ancient cultures of southwest Asia, including the Scythian culture of Central Asia (see Fitzhugh, this volume). Our purpose was to study the possibility that these cultures originating in the Altai-Sayan Mountains may have influenced the cultures of the North Pacific. We focused on the importance of Mongolian monuments, particularly deer stones, in relation to early animal style art. We are generally seeking answers to the questions of the origin and development of the cultures in the areas next to steppe and taiga zones. We are also interested in learning more about their uniqueness and the processes by which they domesticated and herded reindeer.

During our 2003 field research, we closely studied the remains found at the Soyo Tolgoi site discovered in 2002 and dated to the Stone Age. It is important also to study the history and development of reindeer herding. However, we did not collect a sufficient amount of data and samples and therefore needed to continue our excavations on this topic. We also excavated around Tsatstain Hoshuu in Renchinlhumbe sum, where we found deer stones. Tsatstain Hoshuu is a big rocky mountain located 30km North of Soyo Tolgoi. Our other primary target area was the Ulaan Tolgoi deer stone site in the Erkhel Lake area where our project has worked since 2002.

**Methods and Logistics**

We used methods common to archaeological field research and excavation. In order to identify and record spots where khirigsuur and monuments were located, we used modern technology, such as GPS mapping. In order to determine the exact dates of activities at the site we submitted biological samples to laboratories for radiocarbon analysis.

Mongolian team members included: J. Bayarsaikhan, (archaeologist) National Museum of Mongolian History; Ts. Odbaatar, (archaeologist) National Museum of Mongolian History; Oi. Sukhbaatar, (geographer) Head of the Reindeer Foundation; O. Sanjmyatav, (archaeologist) Secretary of Center for Chinggis Khaan Studies; Amgalantugs, (archaeologist) Mongolian Academy of Science, Department of Archaeology; Bazargur, (archeologist) Mongolian Academy of Science, Department of Archaeology. Mongolian assistants included: L. Manlaibaatar, sophomore student at Mongolian National University, Department of Archaeology; Oyunbileg, student at the Mongolian National University, Department of Botany; Undarmaa, student at the Mongolian National University, Department of Botany; Adyabold Namkai, translator and project expediter; the following drivers: Nyambayar, Zagdaa, Narangerel, and Khadbaatar; and Amaraa, cook.
American participants included: William W. Fitzhugh, (archaeologist), Director, Arctic Studies Center, National Museum of Natural History, Smithsonian Institution (project leader); Bruno Frohlich (physical anthropologist) Smithsonian Institution, National Museum of Natural History; Andrea Neighbors, (student) Washington College, Chestertown Maryland.

Our field route followed the itinerary: Soyo Tolgoi, Ulaan Uul sum (county); Tsatstain Hoshuu, Ryenchinlhumbe sum; Menge Bulag, Tsagaan Nuur sum; Khogorgo River, Tsagaannuur sum; Erkhel Lake, Alag Erdene sum.

Field Reports of Deer Stone Project in Hovsgol on 2003 (English and Mongolian) are on file at the Arctic Studies Center, National Museum of Natural History. See Fitzhugh and Bayarsaikhan (this vol.) for other relevant references, such as Askarov et al. 1992; Bokovenko 1994; Sementsov et al. 1998; Mon-Sol Project 1999/2000; Jacobson 1993, 2001; Jacobson et al. 2001, 2002; National Museum of Korea 2002.

References


Work was conducted at Soyo on June 11-14, 2004. This year we expanded the excavations begun in 2002-3 and selected a rectangular excavation area measuring 8 meters along the west-east axis and 2 meters along the north-south axis. This site was located on the eastern part of sand terrace on the south side of the Khug River in Ulaan Uul sum, Hovsgol province. Its GPS location was N50°59,719 E099°09, 738. This terrace extends north from the base of Soyo hill, located where the Khug River exits the Sayan Mountains. The steep south face of this hill consists of cliffs and detritus while the north-facing slope adjacent to the site was covered with larch and brush. The local people call this Soyo Tolgoi, meaning “Fang Hill” in Mongolian.

Beginning in 2003 we divided the Soyo 1 site into three features, each of which represented hearths or small settlement concentrations, designated from west to east: Feature 1, Feature 2, and Feature 3. Our 2004 work was directed at Feature 3 because the previous year we had found important archaeological artifacts here, including small ceramic fragments and burned animal bones. The rectangular area (8m x 2m) was divided into four 2m x 2m excavation units which we designated Squares 1 through 5 (Figure 18.1).

During excavation we noticed that the site consisted of 4 layers: (1) a surface layer with grey colored sand; (2) a second layer of burned and dark brown sand; (3) a third level of orange-colored sand; and (4) a light yellow-colored sand level (Figure 18.2). The soils of the site area consisted of soft, sandy river bank deposits. The third and fourth layers contained gray and yellow colored sand spots where rodent burrows had refilled with sand from the upper two levels. Artifacts were found between the second and third layers but not in the fourth layer. Our 2003 and 2004 finds indicate that these levels date to the Early Neolithic. A 2003 radiocarbon sample of burned bone from one of the F3 hearths produced a date of cal. 6510-5940 BP. Well-preserved wood logs eroding from the riverbank 100 m east of the site produced a date of cal. 7180-6750 BP, but this wood has not been linked to the site and is probably a natural deposit.

The archaeological artifacts found in 2004 are similar to those found in other Mongolian sites dated to the Early Neolithic. Specifically, two stone arrowheads found in the third layer of Square 3 at Soyo 1/F3 (Figure 18.10) are similar to points from sites in eastern Mongolia, including Monkh Tolgoi of Dornod province, Baruun Shorvog Lake and Huiten Bulag Lake of Khalkha Gol sum, Baruun Els of Ongon sum, Ovoon Els of Dariganga sum, and Ehen Usnii Ereg of Naran sum, among others. These artifacts have been dated to the Neolithic, while similar artifacts were dated to 4000-3000 BC, the late Neolithic, which matched the results of our radiocarbon date.

The small, poorly-fired, sand-tempered yellow-orange ceramic fragments (Figures 18.12, 18.18) which were excavated from the lower levels of Feature 3 in 2003-2004 are similar to ceramics found at other Neolithic era sites in Mongolia and southern Siberia.
Figure 18.1. Soyo 1, Feature 3 excavation. View north.

Figure 18.2. South wall soil profile in Square 3-4.
Figure 18.3. West wall of Square 4 at Soyo 1 (Feature 3).

Figure 18.4. South wall profile of Square 5, Soyo 1/F3.

Figure 18.5. East wall profile of Square 5, Soyo 1/F3.
Grey mixed upper sand
2. Grey sand lewd
3. Burnt dark brown sand
4. Light orange sand level

Grey sand spot

| 1  | Scraper | 1PC | surface area | 18.8.1 |
| 2  | Microblade | 1PC | surface area | 18.8.2 |
| 3  | Microblade | 1PC | 119cm | 18.8.3 |
| 4  | Scraper | 1PC | 113cm | 18.8.4 |
| 5  | Billet | 1PC | 119cm | 18.8.5 |
| 6  | Microblade | 1PC | 121cm | 18.8.6 |
| 7  | Microblade | 1PC | 121cm | 18.8.7 |
| 8  | Microblade | 1PC | 124cm | 18.8.8 |
| 9  | Scraper | 1PC | 125cm | 18.8.9 |
| 10 | Microblade | 1PC | 125cm | 18.8.10 |
| 11 | Utilized flake | 1PC | 128cm | 18.8.11 |
| 12 | Waste | 1PC | 129cm | 18.8.12 |
| 13 | Microblade | 1PC | Surface area | 18.9.13 |
| 14 | Preparation | 1PC | Surface area | 18.9.14 |
| 15 | Microblade | 1PC | Surface area | 18.9.15 |
| 16 | Microblade | 1PC | Surface area | 18.9.16 |
| 17 | Waste | 1PC | 121cm | 18.9.17 |
| 18 | Microblade | 1PC | 122cm | 18.9.18 |
| 19 | Small piece of bone | 1PC | 123cm | -- |
| 20 | Small piece of bone | 1PC | 109cm | -- |
| 21 | Stone arrowhead | 1PC | 124cm | 18.10.21 |
| 22 | Stone arrowhead | 1PC | 131cm | 18.10.22 |
Figure 18.7. Soyo-1/F3 excavation plan map of Layers 2,3.

Figure 18.8. Soyo-1/F3 Square 3 artifacts 1-12.
Figure 18.9. Soyo-1/F3, Square 3 artifacts 13-18.

Figure 18.10. Soyo-1/F3, Square 3 artifacts no. 21, 22.
Table 18.2. Artifacts from Soyo-1/F3, Square 4.

<table>
<thead>
<tr>
<th>Name of object</th>
<th>Qty</th>
<th>Depth</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Microblade</td>
<td>1PC</td>
<td>139cm</td>
<td>18.11.1</td>
</tr>
<tr>
<td>2 Microblade</td>
<td>1PC</td>
<td>128cm</td>
<td>18.11.2</td>
</tr>
<tr>
<td>3 Microblade</td>
<td>1PC</td>
<td>130cm</td>
<td>18.11.3</td>
</tr>
<tr>
<td>4 Scraper</td>
<td>1PC</td>
<td>131cm</td>
<td>18.11.4</td>
</tr>
<tr>
<td>5 Microblade</td>
<td>1PC</td>
<td>131cm</td>
<td>18.11.5</td>
</tr>
<tr>
<td>6 Microblade</td>
<td>1PC</td>
<td>122cm</td>
<td>18.11.6</td>
</tr>
<tr>
<td>7 Microblade</td>
<td>1PC</td>
<td>122cm</td>
<td>18.11.7</td>
</tr>
<tr>
<td>8 Microblade</td>
<td>1PC</td>
<td>116cm</td>
<td>18.11.8</td>
</tr>
<tr>
<td>9 Microblade</td>
<td>1PC</td>
<td>122cm</td>
<td>18.11.9</td>
</tr>
<tr>
<td>10 Microblade</td>
<td>1PC</td>
<td>121cm</td>
<td>18.11.10</td>
</tr>
<tr>
<td>11 Scraper</td>
<td>1PC</td>
<td>121cm</td>
<td>18.11.11</td>
</tr>
<tr>
<td>12 Microblade</td>
<td>1PC</td>
<td>118cm</td>
<td>18.11.12</td>
</tr>
<tr>
<td>13 Microblade</td>
<td>1PC</td>
<td>129cm</td>
<td>18.11.13</td>
</tr>
<tr>
<td>14 Microblade</td>
<td>1PC</td>
<td>126cm</td>
<td>18.11.14</td>
</tr>
<tr>
<td>15 Microblade</td>
<td>1PC</td>
<td>131cm</td>
<td>18.11.15</td>
</tr>
<tr>
<td>16 Microblade</td>
<td>1PC</td>
<td>125cm</td>
<td>18.11.16</td>
</tr>
<tr>
<td>17 Microblade</td>
<td>1PC</td>
<td>128cm</td>
<td>18.11.17</td>
</tr>
<tr>
<td>18 Microblade</td>
<td>1PC</td>
<td>126cm</td>
<td>18.11.18</td>
</tr>
<tr>
<td>19 Small piece of bone</td>
<td>1PC</td>
<td>Surface area</td>
<td>--</td>
</tr>
</tbody>
</table>

Figure 18.11. Flint artifacts from Soyo-1/F3, Square 4.
Table 18.3. Artifacts from Soyo-1/F3, Square 5.

<table>
<thead>
<tr>
<th>Name of specimen</th>
<th>Qty</th>
<th>Depth</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Microblade</td>
<td>1PC</td>
<td>103cm</td>
<td>18.14.8</td>
</tr>
<tr>
<td>2. Biface fragment</td>
<td>1PC</td>
<td>104cm</td>
<td>18.14.9</td>
</tr>
<tr>
<td>3. Microblade</td>
<td>1PC</td>
<td>109cm</td>
<td>18.14.10</td>
</tr>
<tr>
<td>4. Microblade</td>
<td>1PC</td>
<td>114cm</td>
<td>18.14.11</td>
</tr>
<tr>
<td>5. Waste</td>
<td>1PC</td>
<td>111cm</td>
<td>18.13.6</td>
</tr>
<tr>
<td>6. Scraper</td>
<td>1PC</td>
<td>115cm</td>
<td>18.14.16</td>
</tr>
<tr>
<td>7. Scraper</td>
<td>1PC</td>
<td>111cm</td>
<td>18.14.14</td>
</tr>
<tr>
<td>8. Microblade</td>
<td>1PC</td>
<td>114cm</td>
<td>18.14.15a</td>
</tr>
<tr>
<td>10. Microblade</td>
<td>1PC</td>
<td>116cm</td>
<td>18.14.15b</td>
</tr>
<tr>
<td>11. Ceramic</td>
<td>1PC</td>
<td>117cm</td>
<td>18.12.1</td>
</tr>
<tr>
<td>12. Ceramic</td>
<td>1PC</td>
<td>122cm</td>
<td>18.12.2</td>
</tr>
<tr>
<td>13. Ceramic</td>
<td>1PC</td>
<td>123cm</td>
<td>18.12.4</td>
</tr>
<tr>
<td>14. Ceramic</td>
<td>1PC</td>
<td>125cm</td>
<td>18.12.3</td>
</tr>
<tr>
<td>15. Waste</td>
<td>2PC</td>
<td>---</td>
<td>18.13.5</td>
</tr>
<tr>
<td>16. Waste</td>
<td>1PC</td>
<td>---</td>
<td>18.13.7</td>
</tr>
<tr>
<td>17. Bone fragment of large mammal</td>
<td>1PC</td>
<td>---</td>
<td>18.15.17</td>
</tr>
<tr>
<td>18. Burnt bone fragments</td>
<td>3PC</td>
<td>under sod</td>
<td>18.15.18</td>
</tr>
<tr>
<td>19. Mammal marrow bone</td>
<td>1PC</td>
<td>surface level</td>
<td>18.15.19</td>
</tr>
<tr>
<td>20. Mammal marrow bone</td>
<td>1PC</td>
<td>surface level</td>
<td>18.15.20</td>
</tr>
<tr>
<td>21. Bone fragment</td>
<td>1PC</td>
<td>surface level</td>
<td>18.15.21</td>
</tr>
<tr>
<td>22. Bone fragment</td>
<td>1PC</td>
<td>surface level</td>
<td>18.15.22</td>
</tr>
<tr>
<td>23. Horse tooth fragment</td>
<td>1PC</td>
<td>surface level</td>
<td>18.15.23</td>
</tr>
<tr>
<td>24. Bone fragment</td>
<td>1PC</td>
<td>surface level</td>
<td>18.15.24</td>
</tr>
<tr>
<td>25. Bone fragment</td>
<td>1PC</td>
<td>surface level</td>
<td>18.15.25</td>
</tr>
<tr>
<td>26. Bone fragment</td>
<td>1PC</td>
<td>surface level</td>
<td>13.15.26</td>
</tr>
<tr>
<td>27. Bone fragment</td>
<td>1PC</td>
<td>surface level</td>
<td>18.15.27</td>
</tr>
<tr>
<td>28. Bone fragment</td>
<td>1PC</td>
<td>surface level</td>
<td>18.15.28</td>
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</table>

Figure 18.12. Ceramics from Soyo-1/F3, Square 5.
Figure 18.13. Lithics from Soyo-1/F3, Square 5.
Figure 18.14. Lithics from Soyo-1/F3 Square 5

Figure 18.15. Bone fragments from Soyo-1/F3 Square 5.
Figure 18.16. Soyo-1/F3, Square 5, Level 1 map.

Figure 18.17. Soyo-1/F3, Square 5, Level 2 map.
### Table 18.4. Archaeological artifacts found in Soyo 1/F3, Square 5

<table>
<thead>
<tr>
<th>No.</th>
<th>Specimen</th>
<th>Depth</th>
<th>Qty</th>
<th>Description</th>
<th>Fig. 18.18</th>
<th>length, width, thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ceramic fragment</td>
<td>8 cm</td>
<td>1</td>
<td>With pattern, thin</td>
<td>1</td>
<td>2 x 1,3 x 0,4</td>
</tr>
<tr>
<td>2</td>
<td>Bone</td>
<td>10 cm</td>
<td>1</td>
<td>White colored</td>
<td>1</td>
<td>1,7 x 1,4 x 1</td>
</tr>
<tr>
<td>3</td>
<td>Bone</td>
<td>15 cm</td>
<td>1</td>
<td></td>
<td>1</td>
<td>4,9 x 0,8 x 0,5</td>
</tr>
<tr>
<td>4</td>
<td>Flint waste</td>
<td>10 cm</td>
<td>1</td>
<td>Small, thin</td>
<td>1</td>
<td>1,2 x 0,9 x 0,1</td>
</tr>
<tr>
<td>5</td>
<td>Waste</td>
<td>11 cm</td>
<td>1</td>
<td>Thin flat</td>
<td>1</td>
<td>2,7 x 2 x 0,6</td>
</tr>
<tr>
<td>6</td>
<td>Microblade</td>
<td>13 cm</td>
<td>3</td>
<td>Small</td>
<td>1</td>
<td>2,1 x 0,6 x 0,2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1,1 x 0,5 x 0,1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1,1 x 0,4 x 0,1</td>
</tr>
<tr>
<td>7</td>
<td>Ceramic fragment</td>
<td>16 cm</td>
<td>1</td>
<td>Bad condition</td>
<td>2</td>
<td>3 x 2 x 0,9</td>
</tr>
<tr>
<td>8</td>
<td>Ceramic fragment</td>
<td>21 cm</td>
<td>1</td>
<td>Body sherd</td>
<td>3</td>
<td>4,1 x 3,2 x 0,9</td>
</tr>
<tr>
<td>9</td>
<td>Ceramic fragment</td>
<td>15 cm</td>
<td>1</td>
<td>Body sherd</td>
<td>4</td>
<td>2,2 x 2 x 1 x 0,1</td>
</tr>
<tr>
<td>10</td>
<td>Ceramic fragment</td>
<td>16 cm</td>
<td>1</td>
<td>Body sherd</td>
<td>5</td>
<td>3,3 x 3,1 x 0,9</td>
</tr>
<tr>
<td>11</td>
<td>Ceramic fragment</td>
<td>15 cm</td>
<td>1</td>
<td>Body sherd</td>
<td>6</td>
<td>3,3 x 2,9 x 0,9</td>
</tr>
<tr>
<td>12</td>
<td>Ceramic fragment</td>
<td>21 cm</td>
<td>1</td>
<td>Body sherd</td>
<td>7</td>
<td>2,2 x 2 x 0,9</td>
</tr>
<tr>
<td>13</td>
<td>Ceramic fragment</td>
<td>18 cm</td>
<td>1</td>
<td>Body sherd</td>
<td>8</td>
<td>2,3 x 1,2 x 0,8</td>
</tr>
<tr>
<td>14</td>
<td>Ceramic fragment</td>
<td>16 cm</td>
<td>1</td>
<td>Surf. missing</td>
<td>9</td>
<td>5,1 x 3,6 x 0,9</td>
</tr>
<tr>
<td>15</td>
<td>Ceramic fragment</td>
<td>17 cm</td>
<td>1</td>
<td>Body sherd</td>
<td>10</td>
<td>3,1 x 2,7 x 0,8</td>
</tr>
<tr>
<td>16</td>
<td>Ceramic fragment</td>
<td>24 cm</td>
<td>1</td>
<td>Body sherd</td>
<td>11</td>
<td>3 x 2,9 x 0,8</td>
</tr>
<tr>
<td>17</td>
<td>Ceramic fragment</td>
<td>14 cm</td>
<td>1</td>
<td>Body sherd</td>
<td>12</td>
<td>2,3 x 2,2 x 0,9</td>
</tr>
<tr>
<td>18</td>
<td>Ceramic fragment</td>
<td>14 cm</td>
<td>1</td>
<td>Body sherd</td>
<td>13</td>
<td>3,2 x 2,2 x 1,1</td>
</tr>
<tr>
<td>19</td>
<td>Bone</td>
<td>20 cm</td>
<td>2</td>
<td>Marrow, neck area?</td>
<td></td>
<td>4,7 x 1,6 x 0,3</td>
</tr>
<tr>
<td>20</td>
<td>Bone</td>
<td>15 cm</td>
<td>2</td>
<td>Marrow?</td>
<td></td>
<td>3,2 x 1,5 x 0,9</td>
</tr>
</tbody>
</table>

**Figure 18.18. Soyo-1/F3, Square 5 ceramics.**

Bayarsaikhan et. al.
A Looted Mound at Chodoriin Daraa

On June 13, 2004, while the crew continued work at Soyo Tolgoi, we decided to look into a rumor we heard from local people that some thieves had illegally excavated a mound located at the center of the Hondiin bag (administrative district), in Renchinlhumbe sum, revealing an unusual-looking stone or monument which we thought might be a deer stone. The police caught the looters and provincial officers preserved and transferred the stone to the provincial administration center. Following this information, we found the site with the help of a local guide named Mishig. The mound was located near the Khug River, 1km west of the center of Hondiin bag, and had a GPS location of N51°09.1338 and E99°22.548, ALT. 1558m.

When we arrived at the site, we noticed that several places had been recently excavated and back-filled. Local people told us that skulls and human bones were found at one of these excavated places and had been reburied. Because this interested the physical anthropologists on our team, we decided to study the site more closely.

We worked in this area on June 13-14, 2004. We found only a single piece of red-colored pottery and a few small pieces of human bone; but it was interesting to find a very roughly-formed human-shaped stone monument but without any diagnostic deer stone features (Figure 18.19a,b). It took all day to excavate the mound to the depth the theives had reached, which was about 175cm.

Figure 18.19a-b. The stone slab associated with the looted mound at Chodoriin Daraa.
In the morning of the June 14, we tested a one-meter diameter boulder cluster 100 meters west of the looted mound. We excavated a square area with the dimension of 150cm x 150cm to a depth of 70cm (Figure 18.20), finding a red-painted ceramic fragment, three small pieces of animal bone (Figure 18.21) 30cm below the ground surface. We also found burned charcoal at 40cm.

Figure 18.20. Chuduriin Daraa west feature excavation map.

Figure 18.21. Bone finds from Chudriin Daraa
A Looted Mound near Namnan Togos Mountain

Our group worked together at the Soyo Tolgoi site until June 14 and then we divided into two groups. The first group consisted of J. Bayarsaikhan, T. Sanjmyatav, and student L. Manlaibaatar, who went off to study a hidden mound located at Namnan Togos Mountain in Renchinlhumbe sum. Dr. William Fitzhugh, Ts. Odbaatar and others in the second group went to join the Tsaatan camp at the Menge Bulag.

Our guide Mishig was the one who gave us information about this looted mound at Namnan Togos Mountain, and he led us across the Khugiin Gol River bridge to the Namnan Togos Mountain forest. Because it was impossible to drive up to the mountain by car, we left it at a winter camp near the mountain and walked on. We reached the summit and, to the left of the mountain forest (on the north side), found what looked like a looted mound.

It appeared to us that the thieves had restored the mound after looting it. Therefore, we had to excavate what they had buried if we hoped to find any archaeological artifacts. We excavated the mound with the help of our guide Mishig and found a few artifacts, including:

a) a small iron knife or blade (Figure 18.22)
b) a small bone object decorated with a triangle pattern on one side (Figure 18.23)
c) a piece of birch-bark that has pattern of fish scales (Figure 18.24)
d) a broken pelvic bone of small child (Figure 18.25)
e) pieces of bone from a young child (Figure 18.26-13.28)

We were unable to determine the inside and outside parts of the mound structure due to the damage. However, by examining the artifacts and the mound dimensions, it is possible that the mound dated to the period of the Mongol Empire period or the end of Mongolian feudalism.

Upon finding this mound, Mishig told us a local legend about the site that he heard from his ancestors. According to this legend, the Lord Chingunjav, who lived from 1710 to 1757 and was of the Hotgoid people, led a rebellion against the Manchu Dynasty, which was fighting to establish control over the Mongol people in that time. The rebellion failed and he and his soldiers were forced to flee from Manchu troops to the north. On their journey, they climbed up the top of the Namnan Togos Mountain and took a short break to watch for the Manchu troops. The local people say that at that time Lord Chingunjav’s soldiers hid their valuables and treasures in this mountain. Chingunjav might have lost one his soldiers while fleeing and buried him in this mountain. It is probable that this legend of the leader and his treasure was told and retold by local people for many years.

Figure 18.22 A small iron knife or blade.
Figure 18.23 A small bone object decorated with a triangle pattern on one side.
Figure 18.24. A piece of birch-bark with fish-scale decoration.

Figure 18.25. A broken pelvic bone of a small child.

Figure 18.26. Bones from a small child.
Figure 18.27. Bones from a small child.

Figure 18.28. Bones from a small child.
Excavation of a Deer Stone at Tsatstain Hoshuu

We started our three-day excavation of a deer stone at the Tsatstain Hoshuu site in Renchinlhumbe sum on the morning of June 16 (Figure 18.29). The excavation was done by J. Bayarsaikhan, T. Sanjmyatav, and L. Manlaibaatar. This deer stone had dimensions of 108cm x 33cm x 38cm and was located at GPS location N51°10’1428, E099°22’554, ALT.1557m. The deer stone did not bear any design except for a circular figure near the top of the east side. We excavated 5m to the east of the stone and 5.5m along a north-south axis. While cleaning the excavation area we found a broken piece of antler, probably that of a deer (Figure 18.30).

The stones that covered the offering deposits were heavily smashed and broken, which made it difficult to identify the structure of the offering features and to distinguish between soil types. Thus, without lifting and removing the stones, it would have been impossible to identify the area where the offerings were placed. When we removed the upper stones and continued excavating, we discovered that the offering consisted of three horseheads (Figure 18.31). The depths beneath the soil surface at which the horse heads were found were not the same. The first horse head was 10-15cm beneath the soil surface; the second was at 40-50cm; and the third was at 65cm. The first horse head was located near the east side of the deer stone, buried under a thin layer of soil. It was not complete, but rather consisted of only small pieces of broken occiput and mandible. The second horse head was located to the southeast of the deer stone with its head facing east. The neck vertebrae were placed to the south of the head and the four hooves were placed under the chin. The third horsehead was located east of the stone. Its head also faced east and the neck was placed along the north side of the head.

During the excavation we found a large flat rock buried to the north of the deer stone, in the northwest part of the excavation (Figure 18.32). We had hoped to find some significant archaeological artifacts under this rock, but unfortunately, we found nothing. During the field excavation we collected samples of the horse heads for radiocarbon dating. The one sample analyzed (Feature 1, B-207208) produced a date of cal. B.P. 3160-2920), the earliest of any deer stone horse head we have dated so far.

Figure 18.29. Tsatstain Hoshuu site cleared to the top of the rock deposit.
Figure 18.30. Tsatstain Hoshuu upper level finds with two horseheads and an antler fragment.

Figure 18.31. Tsatstain Hoshuu rock layer showing locations and orientation of horse head offerings. View to north.
In June 14, 2004, some of our group traveled to Menge Bulag, a Tsaatan summer camp, to conduct botanical and archeological studies of the tundra area. The crew members included William Fitzhugh, Paula DePriest, Gregory McKee, Andrea Neighbors, Ts. Odbaatar, translator Adyabold, and students Oyunbileg and Undarmaa. We left Soyo Tolgoi at noon and crossed the bridge over the Khugiin Gol River before heading north towards the Evdein River. (The name is derived from the Uigur word “ivd” and “ivtsaa,” and is translated as “reindeer” or “river with reindeer” in Mongolian.) We went up until it became too difficult to drive jeeps and then stopped to wait for reindeer herders who were supposed to give us a ride. Around two o’clock that afternoon, Tsaatans arrived and began loading our equipment after letting their horses rest a little. They came with a total of 25 horses. About an hour later we headed to Menge Bulag.

The weather was very chilly, windy, and cloudy. It took us four hours to go up along the Evdein River. We continued our journey through the Evdein Mountain pass and then down to the Menge Bulag River. We walked on foot in some areas. When we asked the Tsaatans about the meaning of Menge Bulag, there were two kinds of explanations. Monh Bulag means “forever river” and Myangan Bulag means “a thousand rivers.”

We arrived at the Tsaatan summer camp at Menge Bulag around 8:30 that evening. There were a total of ten families at the camp and we stayed next to the family tents of Bayandalai, Zolzaya and Batzaya. Menge Bulag is located within a high mountain zone of the Red Taiga Mountain and it was one of main summer camping areas for the Tsaatan.

The next morning, we rode by horse to do field research with local people. We questioned them about any archeological artifacts they had or had seen that could have been made by human beings. One of our Tsaatan helpers, Bayandalai, showed us a small cylindrical microblade core he had found in the area – clearly a Neolithic period implement – but he could not remember exactly where he had found it.

We also went up and down along the Menge Bulag River in hopes of spotting any monuments or mounds, but found nothing. However, we did find some microblades and...
waste flakes at the old camp where the team had excavated in 2002 (then called Baran gol; see Fitzhugh, this volume, Figure 1.20). Despite our limited finds, we decided that it was necessary to continue research here in the future.

We prepared to go return to the steppe on the morning of June 16. The botany crew members decided to do some field research on their own, thus we separated into two groups. Before we left, Paula DePriest created a competition among the Tsaatans, offering 5,000 tugrugs to the owner of the largest reindeer and horse. The largest reindeer was owned by Mandakh, whereas the largest horse was owned by Baasankhuu (whose nickname was Tartag). At eleven o’clock in the morning, we headed to Soyo Tolgoi and by 3:30 pm arrived at the vehicles that were waiting for us. On the way back, we stopped by Tsatstain Hoshuu, where we excavated around this deer stone, before heading back to Soyo Tolgoi.

Finds from Tsagaan Nuur and Angarkhai sum areas

On the morning of June 18, we left Soyo Tolgoi for field research in the Tsagaan Nuur sum area for one day. Besides the research, we also hoped to find archeological

Figure 18.33. Site of shaman’s cache at Angarkhai Mountain, Arbulag sum. Shamanic paraphernalia was found scattered about this hilltop cleft where it had been placed, probably decades ago, inside a wooden box found nearby.
artifacts preserved in the museum of Tsagaan Nuur sum. However, we ultimately could not visit the museum and so moved on to do our field research.

From Tsagaan Nuur sum our team divided into two groups, one of which went to do field work in the northwestern part of the sum, while the other went to the eastern part. The group that went to the northwest did field research on Gurvan Saihan Mountain and found several mounds and khirigsuurs and recorded their GPS locations. Among them were two looted mounds.

The second group headed north to cross the Shishin Gol by raft. We arrived on the east side and continued our research around Khogorgo River area. During our work around the Khogorgo River side we located some artifacts that may date to the Stone Age.

While we headed back to Erkhel Lake, in Alag Erdene sum, from Soyo Tolgoi, we re-visited the site where some old shamanic artifacts we had found at Angarkhai Mountain in Arbulag sum in 2001. Because many items had been removed from the cache, we collected the remainder to preserve them (Figure 18.33-34).

Figure 18.34. A selection of shaman's equipment recovered from the Angarkhai hill cache. Illustrated are a drum handle with rattles, a drum beater with rattlers, rattles for a shaman's robe or belt, mouth harps, and a small offering cup. (see also Figure 1.28)
Research on the Deer Stones at Ulaan Tolgoi

During June 21-24, 2004 we continued excavations at Ulaan Tolgoi hill west of Erkhel Lake in Alag Erden sum. This isolated conical hill has a large mound complex with five deer stones on its southeastern side. In 2003, we had excavated around Deer Stone 4 and found four offering features. We began excavating a 4x4m area west of DS4 (Figure 18.35), because we noticed an exterior boulder structure. We also needed to excavate as much as possible around the deer stone to reveal evidence of ceremonial activity. After removing the surface layer we discovered a circular rock structure (Figure 18.36), within which we found charcoal stains and small pieces of broken bone extending to sterile soil at a depth of 30cm, but no artifacts or recognizable horse remains were found (Figure 18.37, 38).

We then turned our attention to excavating five squares north and east of Deer Stone 4, finding two horse head offerings beneath small rock mounds. Feature 5 in the western part of Square 4N/0E (Figure 18.39, 40), contained an east-facing horse skull and mandible lying upside-down with six articulated cervical vertebrae and a single hoof lying aligned 101 degr. mag. along the north side of the skull, which was oriented 110 degrees and was -103 to -117 cm below datum. A small fragment of Bronze Age ceramic was recovered at -109 in the lower brown soil above the sterile zone south of the burial. Feature 6 was in the northeast corner of Square 4N/2E and also contained an east-facing horse head burial beneath a rock mound (Figure 18.41) accompanied by six cervical vertebrae and two hooves along the south side of the skull (Figure 18.42), which was aligned 120 degrees (mag) and like Feature 5 was also up-side-down, but in this case the vertebrae and hooves were along the south side of the skull and were oriented 110 degrees.

While clearing excavating the area between F1 and F4 we discovered a poorly-preserved horse head burial beneath large rocks forming the west wall of Feature 1 (Figure 18.43, 18.44). This horse head, designated Feature 7, probably pre-dates Feature 1 and seems to have been crushed during its construction.
Figure 18.36. Ulaan Tolgoi (Erkhel) DS4, Feature 4 upper level rock structure.

Figure 18.37. Ulaan Tolgoi DS4, Feature 4 lower level bone (B) and charcoal (CH) finds.
I- Brown surface soil
II- Grey sandy soil
III- Dark soil level
IV- Soil with grindstones level

Figure 18.38. Ulaan Tolgoi (Erkhe) soil profile of north wall of DS4, Feature 4 from OS 8W to OS 4W.

1. Bronze age ceramic fragment in lower brown soil above sterile gravel
2. Horse head bone fragment
3. Horse head burial

Figure 18.39. Ulaan Tolgoi (Erkhe) Deer Stone 4, Feature 5, Square 4N 0E upper level rocks and finds with insert showing east-facing horse head burial in lower level.
Figure 18.40. Ulaan Tolgoi (Erkhel) Deer Stone 4, Feature 5 west wall soil profile 0N 2W to 4N 2W.

Figure 18.41. Ulaan Tolgoi (Erkhel) Deer Stone 4, Feature 6 upper level rocks and finds in Square 4N 2E.

1. Bone fragment (Metacarpal?) at -102, at ledge of a large rock in lower brown soil.
Figure 18.42. Ulaan Tolgoi (Erkhel) Deer Stone 4, Feature 6, lower level rocks and horse head burial in Square 4N 2E.

1. Charcoal sample starting at -130 to -135 in upper tan soil without gravel.
2. Horse vertebra - only one at -142 cm. On top of sterile gravel.

Figure 18.43. Ulaan Tolgoi (Erkhel) Deer Stone 4 upper level map of Feature 7.
I- Brown surface soil
II- Grey sandy soil
III- Dark soil
IV- Soil with grindstones level

Figure 18.44. Ulaan Tolgoi (Erkhel) Deer Stone 4 wall profile from 2S/4W to 2S/1W.

Figure 18.45. Calibrated plot of radiocarbon dates from deer stone sites (Stuiver and Reimers Calib 5.02) (reference Table 1.1 in this volume)
2004 Expedition with Tsaatan

National Museum of Mongolian History
Ulaanbaatar, Mongolia

Arctic Studies Center
National Museum of Natural History
Smithsonian Institution
Washington, D.C.