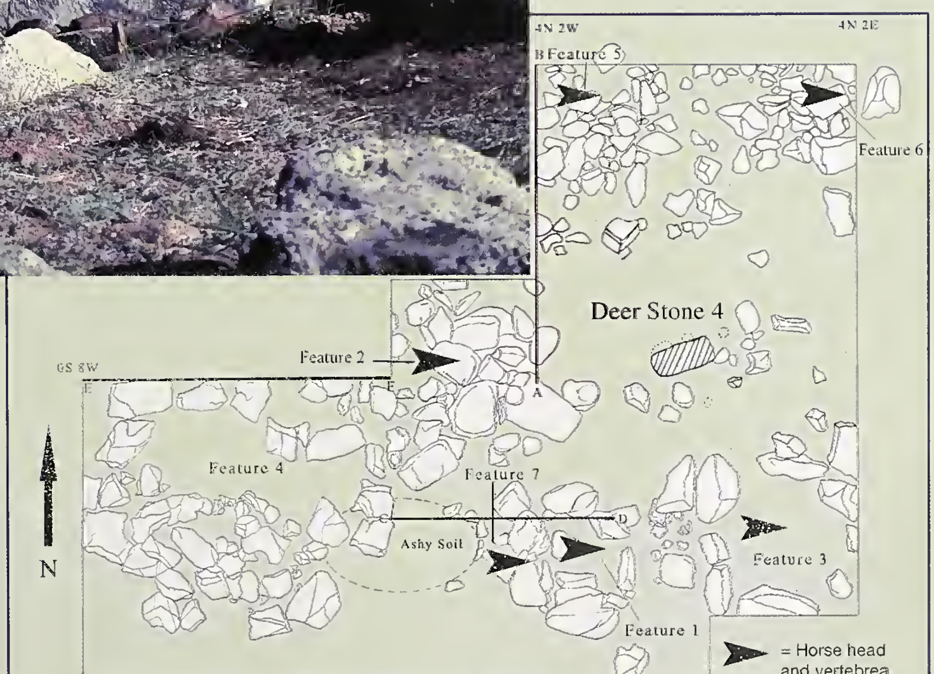
The Deer Stone Project

Anthropological Studies in Mongolia 2002-2004

Arctic Studies Center



Erkhel Deer Stone 4 Complex

William Fitzhugh, Editor,
Jamsranjav Bayarsaikhan
and Peter K. Marsh,
Assistant Editors

The Deer Stone Project
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Front cover: Ulaan Tolgoi Deer Stone Site, Hovsgol Aimag, Mongolia, and excavation map for Deer Stone 4 excavation. (photo: W. Fitzhugh; illustration: H. Sharp); Back cover: 2004 Mongolian-American expedition with West Taiga Tsaatan (Dukha) at head of Evdt valley, 19 June, 2004. (photo: W. Fitzhugh)

Contents

Part II: Museum Workshop Reports

Part III: Archaeological Field Reports

Acknowledgments

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.

List of Figures

List of Tables

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 transfered 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

Өмнөх Үг

АНУ-ын эрдэмтэд Монгол орныг судлах ажлыг бүр XX зууны эхээр анх эхэлсэн юм. Алдарт эрдэмтэн Р.Ч.Эндрюс нарын судалгааны баг 1910-аад оноос эхлэн Монгол орны говь нутагт эртний судлалын хайгуул шинжилгээ хийж, эрт галавын амьтадын яс, чулуун зэвсгийн үлдцүүд зэрэг нэн ховор чухал дурсгалуудыг анх нээн олсон билээ. Энэ нь зөвхөн Монголын төдийгүй дэлхийн шинжлэх ухаанд гарсан шинэ ололт болсон юм.

Монгол Амеркийн шинжлэх ухааны харилцаа холбоо хэдийгээр зуугаад жилийн өмнө эхэлсэн боловч хэсэг хугацаанд зогсонги байдалтай байв. Харин 1990-ээд оноос Монгол улс ардчилал зах зээлийн харилцааны замыг сонгон замнах болсноос хойш Монгол-АНУ-ын улс төр, эдийн засаг, соёлын харилцаа өргөжин хөгжиж байна. Манай хоёр орны энэхүү харилцаанд эртний улбаатай шинжлэх ухааны хамтын ажиллагаа өөрийн байр суурийг эзэлж байгааг тэмдэглэхэд таатай байна.

АНУ-ын Смитсоны Байгалийн түүхийн үндэсний музей, Монголын үндэсний түүхийн музей хамтран "Буган чулуун хөшөө" эрдэм шинжилгээний төслийг 2003 оноос хэрэгжүүлж байна. Энэ төслийн хүрээнд Хөвсгөл нуурын орчны археологийн дурсгалууд, оршин суугчдын угсаатны бүрэлдэхүүн, тэдний соёл, амьдралын хэв маяг, байгаль- экологийн асуудлыг хамарсан өргөн хүрээтэй иж судалгаа хийж байна.

Өнгөрсөн хугацаанд явуулсан хээрийн судалгааны явцад Хөвсгөл аймгийн Улаан-Уул сумын Соёо толгой хэмээх газарт шинэ чулуун зэвсгийн үеийн суурин нээн илрүүлж, анхны туршилтын малтлага хийсэн байна. Мөн Алаг- эрдэнэ сумын Улаан толгой, Ринченлхүмбэ сумын Цацтайн хошуу зэрэг газарт буй буган чулуун хөшөө, түүний тахилын байгууламжуудыг судлан, илэрч олдсон хэрэглэгдэхүүнүүдийн он цагийг лабориторит шинжлүүлж байна. Мөн Хөвсгөл нуурын орчны ургамалжилт, түүний төрөл онцлог байгаль-экологийн зохицол хийгээд, тэндэхийн цаатан ардын аж амьдралыг шинжлэн судалж байна.

Тус төслийн судалгааны үр дүн нь зөвхөн Монголчуудын төдийгүй Төв Азийн эртний нүүдэлчдийн түүх соёлын болон Хөвсгөл нуурын орчны байгаль-экологийн судалгаанд тодорхой хувь нэмрийг оруулна хэмээн бид найдаж байна.

Тэрчлэн манай төслийн ажил эхлээд төдий л удаагүй боловч Монголын залуу судлаачид, музейн ажилтнууд сүүлийн үеийн шинэ техник, багаж хэрэгсэл, судалгааны аргатай танилцан, тэдгээрийг хэрэглэж сурах, мэргэжил боловсролоо дээшлүүлэхэд мэдэгдэхүйц дөхөм болж байна. Энэ бол манай хамтын ажиллагааны бас нэг өгөөж юм.

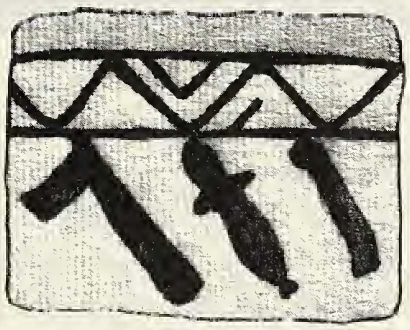
"Буган чулуу хөшөө" төслийн хамт олны судалгаа эхэлснээс хойш хуримтлуулсан шинжилгээний шинэ хэрэглэгдэхүүн, судалгааны үр дүнг эмхэтгэсэн анхны бүтээлээ судлаачид, уншигч олонд толилуулж байна.

Энэхүү ном нь нүүдэлчдийн түүх соёлын болон байгаль - экологийн судалгаанд шинэ мэдээ хэрэглэгдэхүүн, шинэ санаа дүгнэлтийг оруулж өгч байгаагаараа ач холбогдолтой юм. Эцэст нь манай хамтарсан судалгааны ажлыг зохион байгуулах, хээрийн шинжилгээний ажлын бэлтгэлийг хангахад ихээхэн хүчин зүтгэл гаргаж бидний хамтын ажиллагаанд байнга тусламж дэмжлэг үзүүлж байдаг Смитсоны байгалийн түүхийн музей, Смитсоны институтийн удирдлага, уг институтийн Хойд туйл судлалын төвийн захирал ноён William W.Fitzhugh, болон энэхүү номыг хэвлүүлэхэд туслалцаа үзүүлсэн Америкийн Монгол судлалын төвийн хамт олонд Монголын талын багийн нэрийн өмнөөс болон хувиасаа гүн талархлаа илэрхийлж сайн сайхныг хүсэн ерөөж байна.

Монголын Үндэсний Түүхийн Музейн
захирал доктор, профессор А. ОЧИР
2005 оны 3-р сарын 28.

Part 1

Conference Reports



Evening camp at Ulaan Tolgoi west of Erkhel Lake, Hovsgol Aimag. (photo: Fitzhugh)

1

The Deer Stone Project: Exploring Northern Mongolia and its Arctic Connections

William W. Fitzhugh
Arctic Studies Center, National Museum of Natural History
Smithsonian Institution

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).

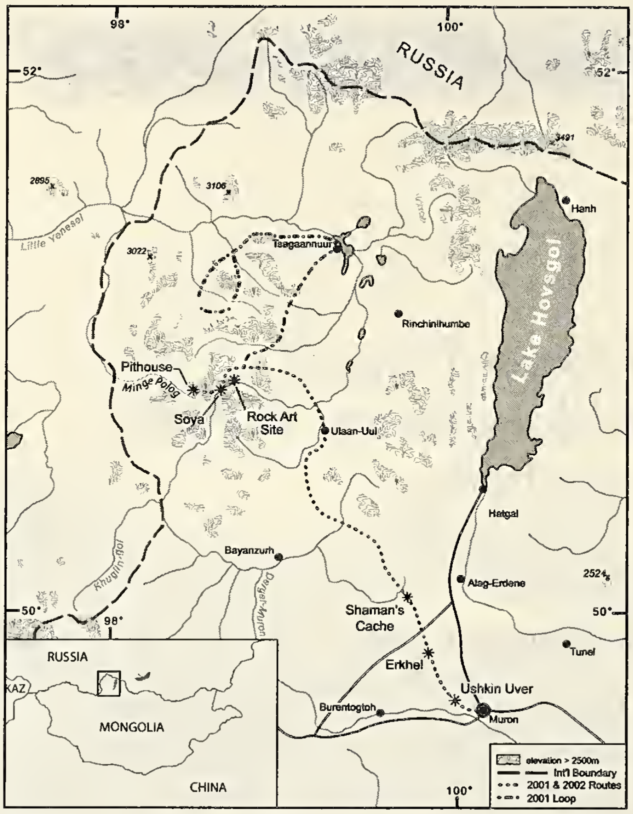


Figure 1.1. Map of field location

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 land-locked nation 1300 km south of the Arctic Circle, is relevant to circumpolar archeology.

Eskimo Origins

Figure 1.2. Expedition entering Sayan Mountains west of Soyo, west Darkhat Valley, June 2002.

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 Eurasiatic animal-style art complex (Schuster 1951; Schuster and Carpenter 1986:I(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

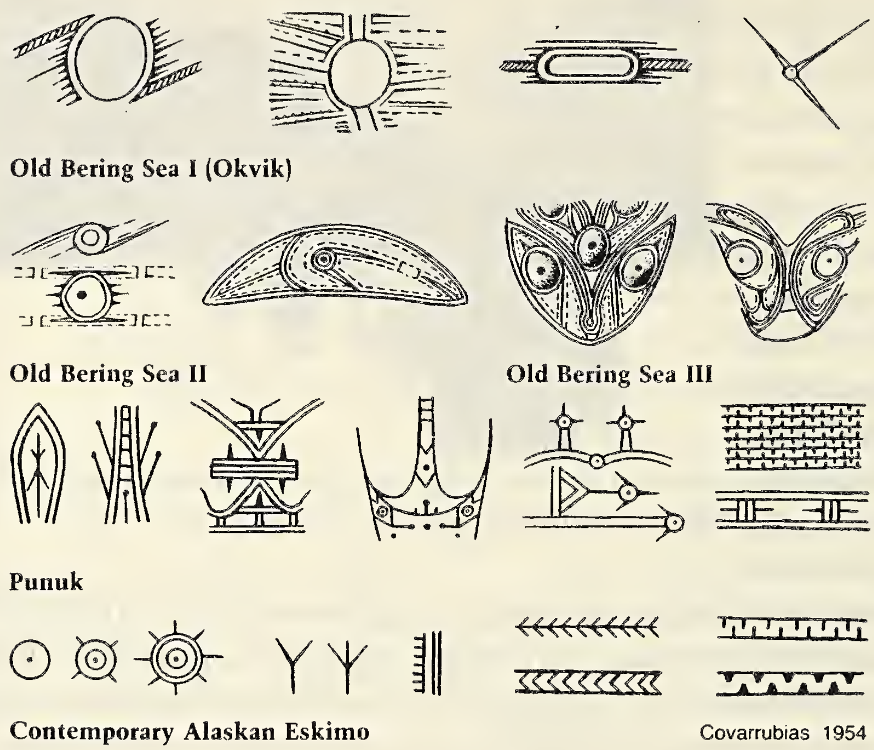


Figure 1.3. Ancient and modern Alaskan Eskimo art motifs, AD 1 to present (after Covarrubias 1954).

early Eskimo-like arctic maritime culture on the Yamal shores of the Kara Sea (Chernetsov and Moszynska 1974) – the find that prompted Larsen and Rainey to propose West Siberian connections at Ipiutak 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 Chuktoka 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 (Pitul'ko 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

Figure 1.4. Human-animal spirit engraving on harpoon winged objects, Old Bering Sea culture site at Ekven, Chukotka, ca. AD 500. (Arutiunov and Fitzhugh 1988, Fig. 138; courtesy of Museum of Anthropology and Ethnology, St. Petersburg).

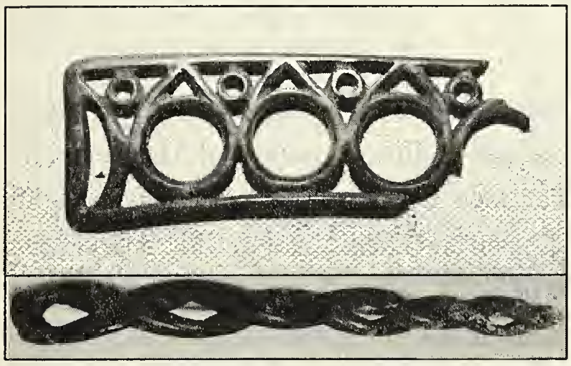


Figure 1.5. Open-work ivory carving from Ekven site, Chukotka (Arutiunov and Sergeev 1975, Arutiunov and Fitzhugh 1988: fig. 150) and Alaskan Ipiutak bone ornament (Larsen and Rainey 1948).

Figure 1.6. Bronze bird-man image from Yamal, Western Siberia, Kolmagorskii Treasury UAE-301 (Fedorova 1994: Fig. 47).

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 ofmetals 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.

Figure 1.7. Deer stone engraving of spirit maral (Asian Elk) with water bird beak or bill (Sanjmyatav 1995: Plate 25).

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

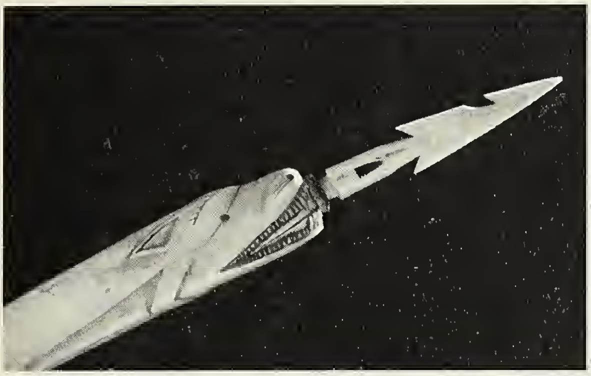


Figure 1.8. 19th Century Bering Sea Eskimo harpoon socket-piece with predator helping-spirit carving (Smithsonian E36339).

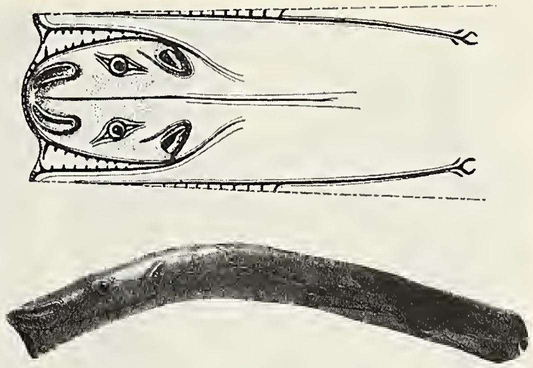


Figure 1.9. Ipiutak spirit sucking tube from Ipiutak site, Alaska. (Larsen and Rainey 1948).

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 Tologi (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.

taiga species like reindeer and elk), plant, and fish resources that would have attracted both herding and hunting peoples (Figure 1.11; Tseveendorj et al. 1999:68). The legacy of this cultural geography continues today in the relationship between the minority Dukha reindeer-herders and the politically dominant Mongols. Exploring the complex history of Hovsgol-Darkhat cultures, peoples, and changing environments for the past 4000-6000 years is also a scientific challenge with practical benefits in tourism, sustainable development, cultural survival, and international recognition (Figure 1.12).

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

Figure 1.11. Distribution of deer stone sites in Mongolia (adapted from Tseveendorj 1999).

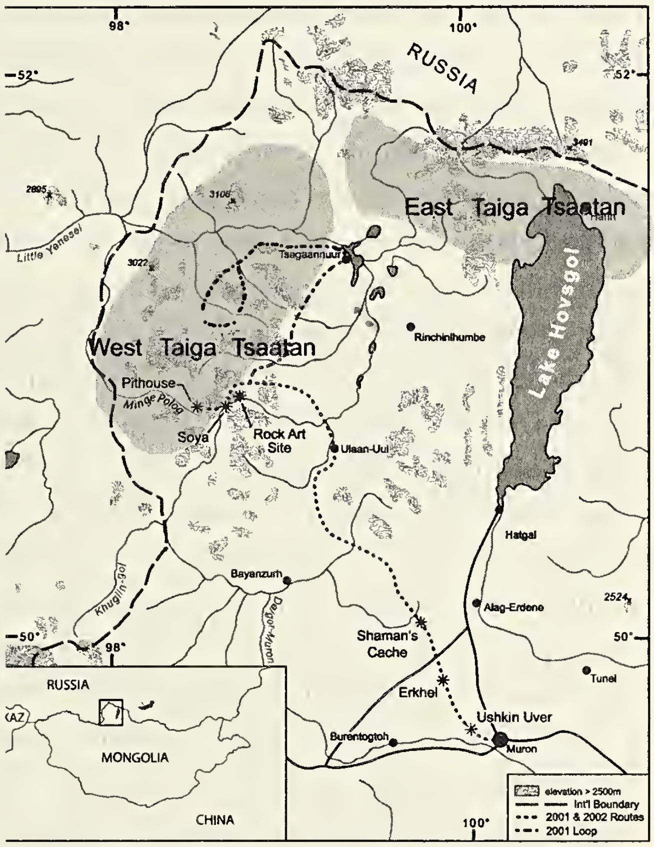


Figure 1.12. Distribution of West and East Taiga Tsaatan (Dukha) territories in Darkhat-Hovsgol region. Regions to the south are occupied by Mongol herders, but some of the highland zones were utilized by Tsaatan in the past.

times the Gobi, then well-watered, was a Central Asian 'Serengetti' 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

Figure 1.13. Melting pingo in Hovsgol Aimag in 2001, 49-53.33'N, 99-39.181'E.

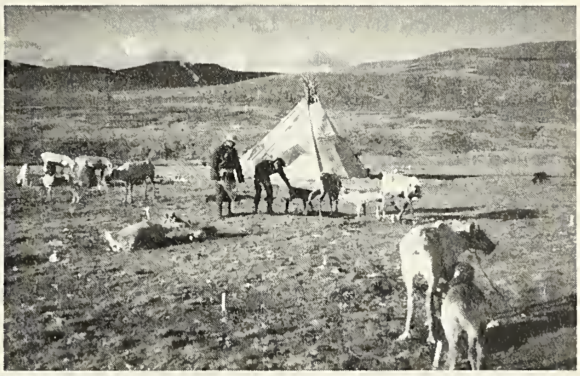


Figure 1.14. Tsaatan (Dukha) reindeer-herders in Menge Bulag tundra camp.

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, SevyanVainshtein (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

Figure 1.15. Ushkiin Uver deer stone site (north view).

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 Tolijgii Boom 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.

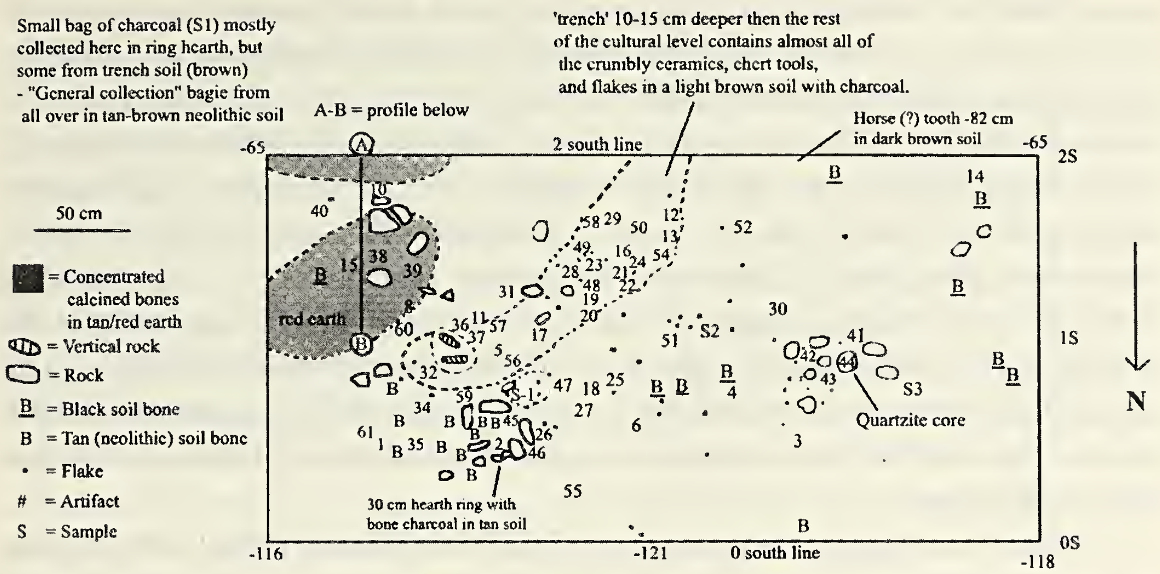


Figure 1.18. Neolithic level excavation map of Soyo 1, Feature 3.

Table 1.1. Radiocarbon Dates From Deer Stone Project Sites, 2002-2004.(See Figure 18.45 in this volume)

site / feature	location/year	sample no.	material	uncorrected	calib (2-sig)
Ulaan Tolgoi DS5	Erkhel / 2002	B-169296 AMS	charcoal	2090 ± 40 BP	BP 2150-1960
Ulaan Tolgoi DS4 S-17	Erkhel / 2003	B-182958 AMS	charcoal	2170 ± 40 BP	BP 2320-2050
Ulaan Tolgoi DS4 S-7	Erkhel / 2003	B-182959 AMS	charcoal	2930 ± 40 BP	BP 3220-2950
Ulaan Tolgoi DS4 F1	Erkhel / 2004	B-193738 AMS	bone coll.	2530 ± 40 BP	BP 2750-2470
Ulaan Tolgoi DS4 F2	Erkhel / 2004	B-193739 AMS	bone coll.	2950 ± 40 BP	BP 3240-2970
Ulaan Tolgoi DS4 F3	Erkhel / 2004	B-193740 AMS	bone coll.	2810 ± 40 BP	BP 2990-2800
Ulaan Tolgoi DS4, F5	Erkhel / 2005	B-207205 RAD	bone coll.	2790 ± 70 BP	BP 3220-2800
Ulaan Tolgoi DS4, F6	Erlhel / 2005	B-207206 RAD	bone coll.	2740 ± 70 BP	BP 3150-2780
Soyo 1 F1 hearth	Soyo / 2002	B-177013 RAD	charcoal	1170 ± 50 BP	BP 1230-1210*
Soyo 1 F2 hearth	Soyo / 2002	B-177014 RAD	charcoal	1020 ±50 BP	BP 1040-1030**
Soyo 1 F3, S-3	Soyo / 2003	B-182961 RAD	cal. bone	5480 ± 130 BP	BP 6510-5940
Khugiin Gol 1	Soyo / 2002	B-169298 RAD	wood	6090 ± 70 BP	BP 7180-6750
Menge Bulag 1	Tundra /2002	B-169297 RAD	charcoal	1300 ± 70 BP	BP 1320-1060
Tsatstain Khosuu	Tsatst. /2005	B-207207 AMS	tooth coll.	2920 ± 40 BP	BP 3330-3060

* This date has a second calib range: BP 1190-960

** This date has two other calib. ranges: BP 1000-890 and 860-800

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, facetted-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 eountry 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 1, cobble-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 poekets 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 pièces esquillées (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 blaek 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 whieh 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 loeation 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 batchelor'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 eontaining 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

Figure 1.20. Ulaan Tolgoi Deer Stone 5 trench, 2002.

Figure 1.21. Ulaan Tolgoi circular animal cremation feature, 2002.

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 khirigsuur 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.

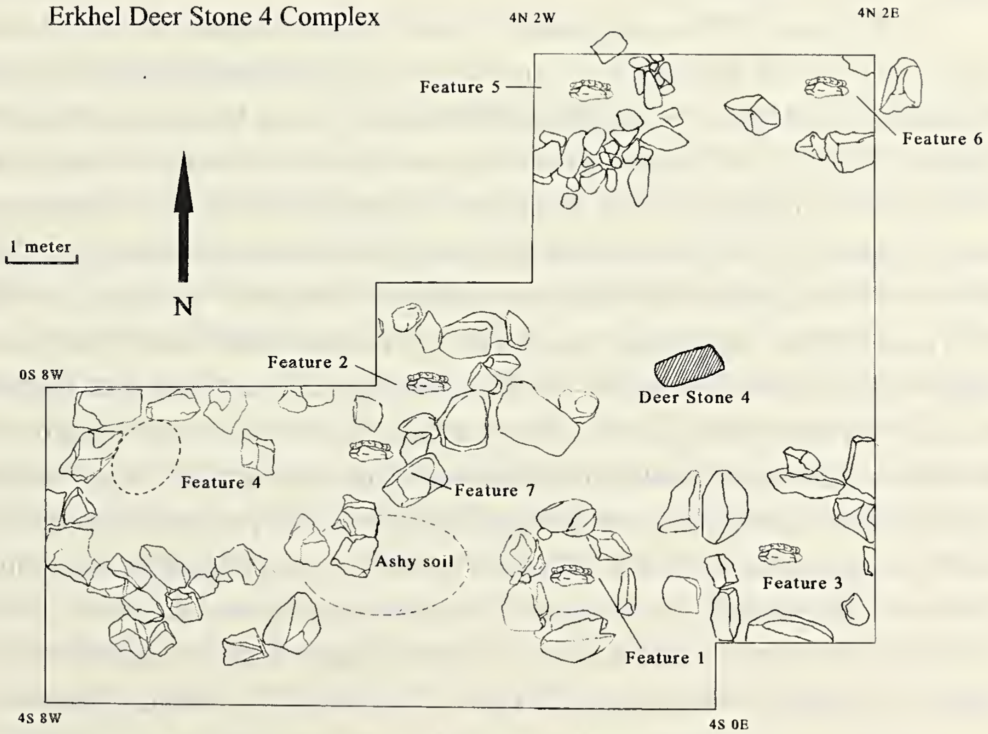


Figure 1.23. Excavation map of Ulaan Tolgoi DS-4 area.

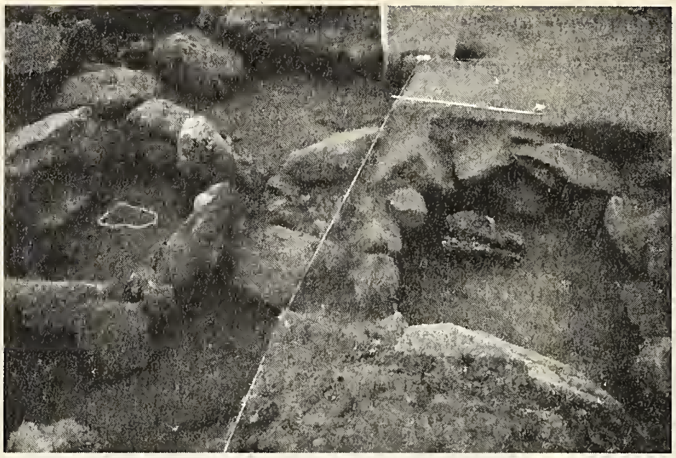


Figure 1.24a. Excavations at Ulaan Tolgoi Deer Stone 4, 2003. View to north, showing Feature 1 (left) and 2 (right).

Figure 1.24b. Feature 2 east-facing horse head burial at Ulaan Tolgoi Deer Stone 4.

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

Figure 1.25. Deer Stone 4 with one of several pecking stones excavated from surrounding features.

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 Erhkel 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.)

Figure 1.26. 2002 team members collecting bones from looted khirigsuur on south side of Ulaan Tolgoi hill.

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.

Figure 1.27. Erkhel Lake granite quarry.

Figure 1.28. Shaman equipment from Angarkhai Hill cache.

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 it 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 paleoenvironmental 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; Mon-Sol Project 1999/2000; Jacobson-Tepfer 2001; Jacobson et al. 2001, Jacobson 2002; 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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Contact address: Arctic Studies Center, National Museum of Natural History, Smithsonian Institution, Washington, D.C., 20560; www://mnh.si.edu/arctic; e-mail: *fitzhugh@si.edu*

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Буган Чулуун хөшөө төсөл: Монголын умард нутаг ба хойд туйлын уялдаа холбоотой асуудлыг судлах нь

Вильяам Фицү, Туйл Судлалын Төвийн захирал
Үндэсний Байгалын Тvvхийн Музей
Смитсонийн Институт

Монгол бол Төв Азийн бүсээс археологийн хувьд бага судлагдсан газруудын нэг юм. Гэвч Монгол улс өнгөрсөн 10 жилийн турш улс төрийн шалтгааны улмаас үүдсэн хаагдмал байдлаасаа салж, олон улсын эрдэмтэн судлаачидтай хийх хамтын ажиллагаа нь маш түргэн хурдацтайгаар өсөж байна. Баруун болон Төв Азийг холбосон Торгоны зам болон Хятадтай харьцах Монголын харилцаа нь харьцангуйгаар илүү судлагдсан болохоос биш Монгол болон, өмнөд Сибирь, Зүүн болон Зүүн хойд Азитай соёлын хөгжлөөрөө хэрхэн холбогдох, хүн амын шилжилт суурьшилт өрнөх явц зэрэг хүчин зүйлсэд Монголын эзлэх үүрэг ролийн талаар судалгаа хийгдээгүй байгаа гэж хэлж болно. Орос, Солонгос, Зүүн хойд Азид, Монголын хойд болон зүүн хэсгийн холбоо хамаарлын талаар тодотгосон зарим нэг судалгаанууд хийгдсэн боловч археологийн ба хүрээлэн буй орчны судлагааны асуултууд нь дөнгөж эхлэлийн төдий байгаа билээ. Америкийн Нэгдсэн Улсын Байгалын Түүхийн Үндэсний Музей дэх Смитсонийн Туйл Судлалын Төв, Монголын Үндэсний Түүхийн Музей болон Монголын Шинжлэх Ухааны Академитай хамтран хийсэн олон талт судалгаа шинжилгээний ажлын хүрээнд Монголын Хойд нутгийн соёл ба хүрээлэн буй орчны түүхэн асуудлыг Сибирь, Туйлын эргэн тойрон болон Номхон далайн хойд хэсэгтэй харьцуулан, түүхэн талаас нь судлаж эхэлсэн юм. Монголын хойд нутагт 2001 оноос 2004 онд хийгдсэн эрдэм шинжилгээний ажлын Үеэр судлагдсан асуудлууд, үүнээс урган гарсан урьдчилсан үр дүнгүүд нь энэхүү илтгэлд тусгагдсан болно.

"Буган чулуу хөшөө" төслийн гол зорилго нь Монголын хойд болон дорнод хэсгийн газар нутаг нь бусад бүс нутгийн соёлтой уялдаа холбоотой эсэх талаар гүнзгийрүүлэн судлах явдал бөгөөд энэ асуудал төдийлөн судлаачдын анхааралд өртөхгүй байсаар ирсэн гэж хэлж болно. Пермафрост ба амьтны аймаг гэх мэт орчин тойрныхоо хувьд Монгол нь туйл орчмын газар нутагтай ижил төстэйгөөс гадна ан ав хийх, цаа буга маллах гэх зэрэг соёл иргэншлийнхээ хувьд ч гэсэн ойролцоо байдаг бөгөөд туйл орчмын хүн ард болон тэдний соёл зан заншилд Монголчуудын оруулсан хувь нэмэр чухал байсан нь дамжиггүй. Монголын хойд нутаг нь цаа буга гаршуулж эхэлсэн анхны голомт байсан байх магадлалтай төдийгүй монголын хүрэл зэвсгийн Үеийн соёл иргэншил нь Скифчүүдийн урлагийн гарал үүсэлд чухал нөлөөтэй байж зарим нэг ухагдахуун нь зүүн тийш Номхон далайн хойд хэсэг рүү тархсан байж болзошгүй юм. Бага хэмжээгээр судлагдаж байсан Хөвсгөл аймгийн Дархадын хотгор орчмын бүс нутагт илүү их тулгуурлан явагдаж байгаа "Буган чулуу хөшөө" төсөл нь тайга, талын хөндлөн гулд хүй нэгдлийн үеэс эхлэн өнөөг хүртэл амьдарч ирсэн хүн ардын соёл иргэншлийн түүхийг сөхөх, хүрлийн үеийн шүтлэгийн зан үйлтэй холбогдох буган чулуун хөшөөний он цаг, бүтэц, агуулгыг гүнзгийрүүлэн авч үзэх, Цаатангуудыг угсаатны зүй, экологийн талаар судлаж, улмаар цаг агаарын дулаарал нь тэдний амьдралын хэв маягт хэрхэн нөлөөлж байгааг мөн тодруулах зорилготой байлаа. Түүнээс гадна Дархадын хотгорын бүсийн цаг агаар байгал орчны түүхийг судлаж, эдгээр нь соёл иргэншлийн хөгжилд хэрхэн нөлөөлсөөр ирсэнийг тодорхойлох нь төслийн бас нэгэн зорилго байсан юм.

Үр дүн: Буган чулуун хөшөө, хиригсүүр ба хүрэл зэвсгийн үеийн байгаль дэлхийг тахин шүтэх зан үйлийн талаар ерөнхий дүгнэлт хийх нь арай л эрт байсан боловч зарим нэг чухал ач холбогдол өгөхүйц урагштай алхамууд хийгдсэн юм. Алаг-Эрдэнэ сумын нутаг Улаан Толгойн өвөрт бид нэгэн буган чулуун хөшөөг (Буган чулуу 4) малтах явцдаа зүүн тийшээ харуулан тавьсан морины толгой, хүзүү, дөрвөн туурай зэргийг хамт булж тахилга үйлдсэн зан үйлийг илрүүлэн олсон юм. Эдгээр олдворууд нь буган чулуун хөшөөний эргэн тойронд буй тойрог хэлбэрийн чулуун байгууламж дотор булагдсан байх бөгөөд морины толгойн яс болон нүүрсний дээжинд хийсэн он цаг тогтоох лабораторийн судлагаагаар МЭӨ IX зууны орчимд холбогдох нь тогтоогдсон юм.

Буган чулуу хөшөөний судалгаанаас гадна GPS буюу Газарзүйн байршлын системийн зурганд оруулсан зуу зуун булш, хиригсүүрүүдийн тусламжтайгаар хиригсүүр болон хүрлийн үеийн оршуулгын газрын ерөнхий хэв зургийг гаргасан нь судалгааны ажлын нэг дэвшилттэй зүйл байсан гэж хэлж болно (Фрохлич, энэ дугаарт).

Дархадын хотгорын баруун талд орших загас агнуураар баялаг Хөгийн голын орчмоос археологийн чухал олдворууд олдсор байгаа билээ. Эдгээрийн хамгийн эртнийх нь болох МЭӨ 5500 жилийн өмнөх Хүй нэгдлийн үеийн жижиг суурингийн үлдэгдлээс цахиур олборлож байсны ул мөр болох ялтсан зэвдсгүүд, жижиг гурвалжин үзүүртэй сумны зэв, зүлгүүрүүд, нимгэн ур муутай сараачмал зураас гаргасан ваарны хагархай хэсгүүд, дугуй хэлбэртэй голдоо нүхтэй чулуун сувснууд олдсон юм. Эндээс жижиг голдуу сүүн тэжээлтэн амьтдын яснууд олдсон бөгөөд ихэд шатсан байсны улмаас танихад хүндрэлтэй болсон байна. Дараагийн олдвор нь МЭ 1000 оны орчим холбогдох нягт ширхэгтэй жижиг чулууг тойруулан тавьж гал түлж байсан галын ор болон бог малын яснууд, зузаан шавар сав суулганы хагархай жижиг хэсэг зэргээс бүрдэж байсан. Уулын тундрын бүсийн Баран голын орчмын судалгааны үр дүнд Хүй нэгдлийн үеийн олдворууд олдсон боловч энэ ан авын нуга бэлчээр нутгийн археологийн баримтууд нь маш хязгаардлагдмал хэвээр үлдэж байна.

Скифчүүдийн урлагийн бүтээлийн гарал үүсэлд Монголчуудын хувь нэмрээ оруулсаныг батлах судалгаа ба Жакобсон (1993) болон бусад судлаачдын Монголын буган чулуун дээрх урлагийн бүтээл нь Скиф-Сибирийн амьтан дүрслэлийн урлагийн эртний төрөл зүйл болох тухай онолууд нь Улаан Толгойн МЭӨ 3000 жилийн тэртээх үед холбогдох буган чулуун хөшөөний судалгаагаар урагшилах боломжийг олгож байгаа юм. Эдгээр хөшөө чулуун дээрх сийлбэр буюу үүнтэй ижил төстэй урлаг нь Монгол-Саянаас зүүн тийш тархаж Зүүн болон Зүүн хойд Азиар дамжин Берингийн тэнгист хүрсэн байж болзох талаар Карл Шустерийн (1951) анхны дэвшүүлсэн онолыг үргэлжлүүлэн судлан үзэх боломжтой болох нь энэ олдсон олдвороос харагдаж байна. Хэрвээ бид үүнийг лавшруулан судлаж чадах юм бол Сибирийн эртний Эскимосчуудийн урлаг нь үүний дотор үхсэн хүний нүүрний баг, зааны ясан гоёл чимэглэл, бөөгийн хэрэгсэлүүд, амьтантай холбоотой зан үйлүүд гэх зэрэг нь яагаад Сибирийн урлаг соёлтой холбогдохоосоо илүү Монгол болон Зүүн Азитай илүү ойр холбоотой байгаа нь улмаар Larsen-Rainey-гийн харилцан хамаарлын таамаглал батлагдахгүй 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)

2
The Ancient Art of Mongolian Reindeer Herding

Professor Oi. Sukhbaatar
Chinggis Khaan University

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).

Figure 2.1. Rock art displaying a reindeer herder with a long hunting spear.

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 *eter*, 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 (*eter*) 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 tired 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 Tuvan 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 popular 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 shrank 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.

Монголын Цаатаны урлагийн эртний нэгэн бүтээл

Профессор Ой. Сүхбаатар
Чингэс Хаан дээд сургуулийн дэд захирал

Монголчууд уламжлалт таван хошуу мал гэж ярьж хэвшсэн хэдий ч хэдэн мянган жилийн өмнөөс зургаа дахь төрлийн мал буюу цаа бугыг бэлчээрийн аргаар малласаар иржээ. Өнөөгийн Хөвсгөл аймгийн хойд хэсэгт Улаан-Уул, Ренчинлхүмбэ, Цагааннуур сумын нутагт цаа буга байдаг тухай монголчууд хэн хүнгүй мэднэ. 1985 оноос Хөвсгөлийн цаа бугыг шинээр байгуулсан Цагааннуур сумын нутагт бөөндүү байршуулсан хэдий ч цаатан ардууд зэргэлдээх Улаан-Уул, Ренчинлхүмбэ сумдын зах залгаа газраар нүүдэллэх явдал хэвээр байна.

Дэлхийд байгаа дөрвөн төрлийн цаа бугын үүлдрээс Монгол, Тувагийн цаа буга биеэр хамгийн том нь юм. Монголын нас гүйцсэн цаа буга сэрвээгээрээ 110-аас 125 см өндөр, 120-оос 220 кг хүртэл жин татдаг. Иймээс дэлхийн бусад орны цаатангууд цаа бугыг хэд хэдээр нь чарганд хослон хөллөж, уналганд ашигладаг бол Монгол, Тувад цаа бугыг морь адил эмээллэн унаж уналганд хэрэглэнэ, үхэр, морь, заан мэт бас нуруу ачна. Цаа буга 60-аас 120 кг ачаа ачуулуулаад уул тайгын бартаат замаар нэг өдөртөө 40 км хүртэл явж чадна. Цаа бугыг унаж явахад явдал нь зөөлөн учраас хүмүүс морь унасан шиг ядардаггүй. Намганд шигдэж, асга хаданд халтирдаггүй учраас ой тайгын бартаат замд хамгийн тохиромжтой унаа юм. Энэ нь эрт гаршуулж, уналга эдэлгээнд оруулсны үр дагавар юм. Монголд цаа буга маллах үйл ажиллагаа хамгийн энгийн, харьцангуй хөнгөн хялбар байдгаас үзвэл энэ нь олон мянган жилийн маллагааны явцад боловсрон энгийн болж хувирсан арга ажиллагаа юм. Малыг маллаж эдлэх тусам бие нь томорч, маллагаа нь энгийн болдог зүй тогтолтой билээ

Бидний дүгнэлтийг батлах бас нэг нотолгоо бол археологийн дурсгалууд юм. 1944 онд Орост нэгдэн орсон Тувагийн нутагт, манай улсын хилийн ойролцоо цаа буга сийлж зурсан хэд хэдэн хадны зургийг ОХУ-ын судлаачид олж үзээд хэвлэлд нийтлүүлсэн байдаг. Манай улсын нутагт гэхэд Увс аймгийн Сагил сумын хойд хэсэгт Зүүн тураг уулын Хар нартын байц цохионы өвөрт орших Цагаан өтөг хэмээх богино аманд бид 1968 оны 6-р сард хөдөлмөрийн баатар Буянжаргал нарын зэрэг нутгийн хүмүүсээр газарчлуулан бух цаа буга унаж, урт жад бариад анд явж буй хүний зургийг олж үзсэн билээ. Энэ зурагт цөөвтөр (гурван) салаатай, богинохон эвэртэй, хэнхдэгийн харвин ихтэй этэр (бух цаа буга гэж ойлгоно уу) зурсныг үзвэл хаврын сүүлч, зуны эхэн үеийн этэр бололтой. Этэр хөлөглөгч нь хормойтой дээл маягийн хувцастай зурагдсан нь сонин байлаа. Тэр анчин жадаа хоёр гараараа барьсан, этэр нь жолоо цулбуургүй мэт зурагдсаныг үзвэл ороо морийг дагадаг уургын морь мэт, ангаа дагаж давхидаг сурмаг этэр байв уу? Этэр хөлөглөгчийн барьсан жадны арын үзүүр махир байгаа нь амьтан бүлсэн жадаа алдахгүй байх, жадлагдсан амьтнаас чирэгдэхэд зориулагдсан нь тодорхой байна.

Цагаан өтөгийн хаднаа дүрслэгдсэн зургаас үзвэл Монголд цаа буга хөлөглөх явдал дор хаяж 4000 жилийн өмнө хэвшмэл болсон байна. Увс нуураас Бөхмөрөн голын хооронд орших уул хаданд (Тагнын салбар) бугын зураг сийлэгдсэн нь олон байхын зэрэгцээ буга, цаа буга хоёрын алин болохыг тодорхойлоход эргэлзээтэй бугын хэд хэдэн дүрс бий.

Бичиг судрт ч гэсэн Монголд 1000 шахам жилийн өмнө цаа буга маллаж байсан тухай мэдээ бий. Персийн түүхч Рашид-ад-диний (Тухайн үедээ Ил хаант улсын ерөнхий сайд байсан) “Судрын чуулган”-д (Он дарааллын ойллого) Монголын умард нутгийн ойт уулсаар цаа буга маллаж, хонь ямаа малладаггүй, цана хөлөглөж, ан хийж аж төрдөг иргэд охиноо талын хоньчин эрд богтолж өгнө гэж айлгадаг байсан тухай бичсэн байдаг зэргээс үзэхэд эртний уламжлалтай байсан нь мэдэгдэж байна.

Ushkiin Uver 'singing shaman' deer stone near Muren. (photo: Fitzhugh)

3

Shamanistic Elements in Mongolian Deer Stone Art

Jamsranjav Bayarsaikhan
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 Kazakstan 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

Figure 3.1. Pazyryk mummy tatoo decoration (after Rudenko).

Figure 3.2. Typical deer images on a deer stone fragment.

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 tatoo 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.

Figure 3.3. The handle of a shaman drum on display at the National Museum of Mongolian History.

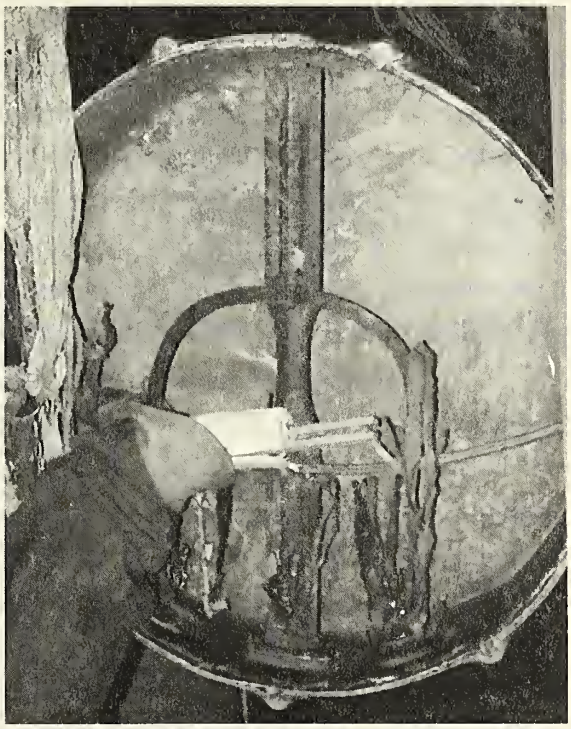

Figure 3.4.The interior of the NMMH shaman drum.

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 *ongodiin 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

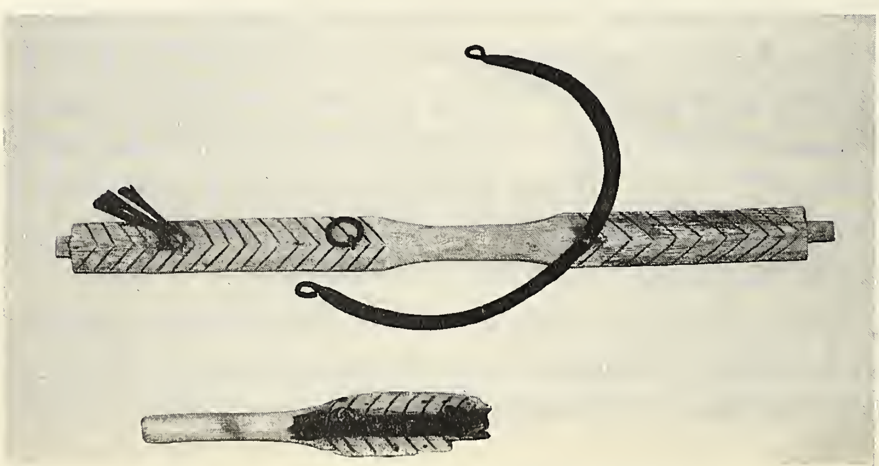

Figure 3.5 The drum handle and drum beater of the Angarkhai Hill shaman drum.

Figure 3.6 Shamanic figure from Bayan Ulgii.

Figure 3.7 Palate-shaped pentagonal figure.

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.

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Mongolian Abstract

Буган чулуун хөшөө түүний зарим дүрслэлийн тухай

Ж. Баярсайхан
МҮТМ-н э/ш-ний ажилтан

Монгол орны хүрэл болон төмөр зэвсгийн түрүү үед холбогдох томоохон дурсгалын нэг бол буган чулуун хөшөө юм. Буган чулуун хөшөө нь тархалт, газар нутгийн байршил дүрслэл зэргээрээ нүүдэлчдийн дурсгал гэдэг нь маргаангүй бөгөөд харин түүний утга учир, бүтээлчдийн оюун сэтгэлгээний үндэс нь олон тооны судлаачдын сонирхлыг татсаар байна.

Энэхүү өгүүлэлд бид буган чулуун хөшөө түүнд дүрслэгдсэн буга болон бусад дүрслэлүүдийн учир холбогдлын тухай зарим нэг таамаглал дэвшүүлэхийг зорьсон юм. Ялангуяа судлаачдын "тагнай хээтэй таван талт дүрс" хэмээн нэрлэж заншсан дүрсийг монголын уламжлалт бөө мөргөлийн баримтанд тулгуурлан тайлбарлахыг хичээлээ. Энэ дүрслэлийг судлаачид бамбай, байшин сууц, сүнс орших сав гэх мэтчилэн олон янзаар зохих баримтанд тулгуурлан тайлбарласан билээ. Харин бидний дэвшүүлж буй саналын гол цөм нь бөөгийн хэнгэрэгний бариул, хэнгэрэгний ташуур, бөөгийн онго, дээл зэрэг эд хэрэглэл дээр дүрслэгдсэн тагнай хээ болон буган чулуун хйшййн дээрх тагнай хээт дүрсний хувьд утга зан үйлийн холбоо байж болох үндэслэл байгаад оршиж байна.

Бөөгийн тамлагын үгэнд "Ижил сүргээсээ салж, баатар хүний хэрэг бүтээхээр дүрс хувилсан", "Хувь ихтэй баатарын хүчээр агаарт дэгдсэн" ер бусын, бодит бус бугын тухай санаа гарч байгаа нь бидний сонирхолыг татсан бөгөөд үүнээс үндэслэн монголын бөө мөргөл дэхь буга, буган чулуун хөшөөн дэх буга хоёрыг ямар нэг хэмжээгээр холбож үзэж болмоор байна.

Бидний үзэж буйгаар бөө мөргөл, Пазирыкын муми, буган чулуун хөшөөн дэх буга дүрслэлийн түүхэн гарал нэг байж болох юм. Энэ нь бугыг дүрслэгчид тухайн амьтныг талийгаачдын сүнсийг тэнгэрт (харанхуйн оронд) хүргэгч шидэт унаа хэлэг хэмээн үздэг төсөөлөлтэй холбогдож болох юм.

Буган чулуун хөшөөн дэх өөр нэг сонирхолтой дүрслэл бол судлаачдын нэрлэдэгээр «тагнай хээтэй таван талт дүрс» юм.

Бөөгийн шашинд аливаа адгуусан амьтан хийгээд хүний биеийг "гол нуруу, дөрвөн цул, 10 заадас, 80 судас..." аар холбогдож бүтсэн гэж үздэг бөгөөд энэхүү дөрвөн зүйлээ төлөөлүүлсэн зүйлсийг бөөгийн хэнгэрэгнд оруулж хийсэн байдаг. Энэ ёсны дагуу хэнгэрэгний бариулан дээр онгодын унаа болгож буй амьтны нуруу хавирганы ясыг төөлөөлүүлэн тагнай хээг сийлж, зурж дүрсэлдэг байсан уламжлал байна. Мөн Монгол, Тува бөөгийн хувцсан дээр лус, савдагийн орныг ээлүүлэн хүний араг яс оёдог явдлыг тухайн бөөг галын дунд ч, тэнгэрт ч, лус савдагийн орноор ч чөлөтэй аялан явагч хэмээн хийсвэрлэн төсөөлснийх хэмээн үздэг.

Иймээс буган чулуун хөшөөн дэх "тагнай хээтэй таван өнцөгт дүрс" нь дээр дурдсан тагнай хээт эд өлгийн зүйлстэй маш ойр төсөөтэй байгаа нь санаандгүй хэрэг биш болов уу гэж үзэж байна. Үүнээс үзэхэд буган чулуун хөшөөн дэх "таван өнцөгт дүрс" нь хүн болон амьтны биеийг ерөнхийлөн нэгтгэж төлөөлдөг тодорхой утга агуулгатай дүрслэл байж болох юм гэсэн саналтай байна. Өөрөөр хэлбэл талийгаачийн хойд нас, сүнс сүлдтэй холбоотой зан үйлийн шинжтэй дүрслэл хэмээн үзэж болмоор байна.

4

Rock Art from the Darkhat-West Hovsgol Region

T. Sanjmyatav
Center for the Study of Chinggis Khaan
Ulaanbaatar, Mongolia

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 ahd 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.

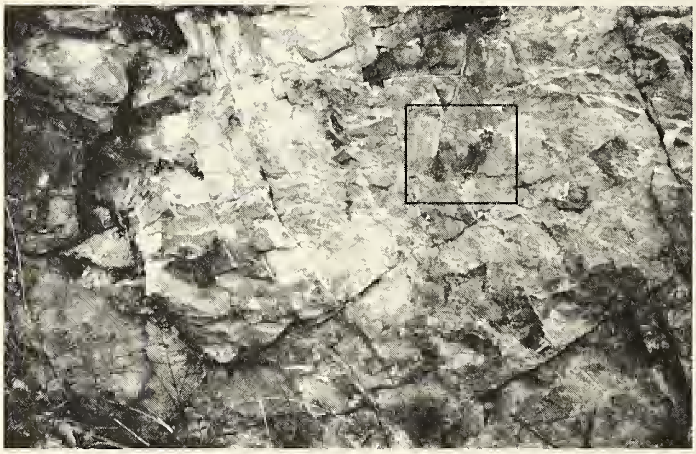

Fig. 4.2. Tolijgii Boom site with defaced panel showing water bird.

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 doted 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.

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.

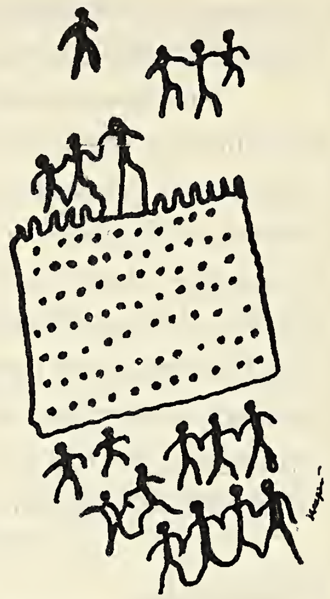

Figure 4.6. Narangiin Bulag.

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 Tolijgii 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

Figure 4.7. Ider River Cave.

Figure 4.8. Human figure in the Ider River Cave.

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.

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Хөвсгөл аймгийн нутаг дахь эртний хадны зургийн зарим дургсгалт газрууд

Т.Санжмятав
Чингис судлалын төв
Улаанбаатар, Монгол

Монгол орны байгалийн хадан дээр улаан хүрэн зосон будгаар дүрсэлсэн зураг сүг 2О гаруй газраас олдсоноос Хөвсгөл аймгийн нутагт 8 байна. Эдгээр зосон зургийн зохиомж, зургийн бөрдэл, өнгө бусад аймгийн нутгаас олдсон зосон зургуудаас ялгаатай байдаг тул мэргэжил нэгт судлаачидтай санал, дүгнэлтээ сололилцох зорилго тавьсан юм.ҮҮнд:

Тольжгий боомын хадны зосон зураг: Улаан уул сумын төвөөс зүүн хойш 4О км-т байгаа Тольжгийн боомын ханан хаданд улаан хүрэн зосон будгаар шувуу, ан амьтан ,мал, дөрвөлжин хашлага дотор хүн,олон дугариг тэмдгийг эртний хүмүүс зурсан байна Энэ зургийг 2ОО2 онд Монгол-Америкийн хамтарсан археологийн шинжилгээний анги очиж судлан зосон будгаар зурсан морин тэрэгнии зураг анх удаа олсон явдал Монголын хадны зосон зургийн судалгаанд шинэ сэдэв болсноороо эрдэм шинжилгээний ач холбогдолтой юм. Энэ зосон зураг хүрэл зэвсгийн үед холбогдох нь тодорхой байна. Харин хүн, буга хоёрын зургийг нёолитын үед зурсан бололтой.

Бичигт булангийн хадны зосон зураг: Баянзүрх сумаас баруун хойш 45 км-т Дэлгэр мөрөний хөвөөн дэх Ханан хаданд улаан хүрэн зосон будгаар ан амьтан, мал, хүн, дөрвөлжин хашлага дотор олон толбон тэмдэг, шувуу зурсан байгааг археологичид судлан МЭӨ ll мянган жилд холбогдуулсан байна. Энэ зурагнаас зүүн хойд зүгт 200 м орчимд өндөр ханан хадан уулын баруун талын өнцөгт тус бүр дөрвөлжин хашлага дотор олон толбон тавьсан хоёр хэсэг зураг шинээр олж судалгааны хүрээнд оруулав. Бичигт булангийн хадны зураг дүрслэсэн арга барил, зургийн бүтэц, сэдвийн агуулгаараа МЭӨ ll жилд холбогдуулна.

Нарангийн булагийн хадны зосон зураг: Баянзүрх сумын төвөөс баруун урагш 25 км-т Дэлгэрмөрөний зүүн гар талд орших. Нарангийн булагийн хаданд ганцхан дөрвөлжин хашлага дотор 78 ш дугариг толбон тэмдэг зурсан байгааг анх судлагаанд оруулж хүрэл зэвсгийн үед холбогдуулж байна.

Тээлийн голын Агуйн хадны зосон зураг: Шинэ-идэр сумын төвөөс баруун хойш 3О км-т Тээлийн голын Агуйн баруун хажуугийн ханан хаданд улаан хүрэн зосон будаг, хар будаг, улаан шарга будаг /гурван ангийн будаг/ -аар хүмүүсийн бие бялдарыг янз бүрийн хэлбэр хөдөлгөөнтэй, олон арга барил, утга санааг илэрхийлэн дүрсэлсэн зургийг шинээр олж судалгааны хүрээнд оруулж байна. Энэ зураг дүрслэл зүйн хувьд маш болхи гурван өнгийн будгаар зурагдсанаараа түүхэн уламжлалтай, ан амьтан, малын дүрс зураагүй үндэслэн неолитын үед холбогдуулж байна.

Агуйн хадны зосон зураг: Шинэ идэр сумын төвөөс доош 2 км-т Идэрийн голын хөвөөнд Агуйн хад оршино. Энэ Агуйны баруун хажуугийн гадна талд хар хүрэн зосон будгаар 18 см өндөр хүн зурсан байгааг неолитын үед хамааруулсан юм.

Хөвсгөл нутгийн хадны зосон зургийг Монголын бусад аймгийн нутаг болон

хөрш орны хадны зосон зурагтай харьцуулан үзэхэд Нэгд: Монгол нутгаас олдсон зосон зургуудаас Хөвсгөл нутгийн хадны зосон зураг сэдвийн агуулга, зургийн бүрдэл, будгийн өнгөөрөө ялгаатай. Хоёрт: Монгол орны байгалийн хадан дээрх зосон зураг дөрвөлжин буюу дугариг тойрог дотор хүн, олон толбон тэмдэг зурагдсан байхад, Орос улсын нутаг Байгаль нуурын өмнөх хадны зосон зураг задгай зурагдсан онцлогтой байна.

Агуйн хад ба Тээлийн голын агуйн хад, Тольжгий боомийн хадны зарим зосон зургийг дүрсэлсэн арга барил, утга санааг илэрхийлсэн байдлар нь неолит ба энеолитын үед хамааруулах санал дэвшүүлж байна. Хоёрт Тольжгий боомын хадны зарим зураг, Бичигт булан, Нарангийн булагийн ханан хаданд зурсан зосон зургуудын утга санаа бол Овгуудийн биеэ даасан байдал хил хязгаарыг тодорхойлсон тэдний шүтдэг онго болох тураг шувуу ба дөрвөлжин хашлага дотор олон толбо тавьж, ан гөрөө хийж, мал маллаж, хөсөг тээврээр зочиж аж ахуй эрхлэн яваа зэрэг нийгмийн харилцааг илэрхийлсэн байдлаар нь хүрэл зэвсгийн үед хамааруулж байна.

Хөвсгөл далай орчмын хадны зосон зургийн дотор дөрвөлжин хашлагатай байгууламж 13 байгаагийн 3 нь тураг шувууны дүрстэй байна. Эдгээр хашлага дотор 400 гаруй толбо тэмдэг, 80 орчим хүний зураг байгаагаас үзэхэд нийт хүн ам 500 гаруй буюу хагас сая байжээ гэж таамаглаж болох юм. Улаанбаатар хотын өмнөх Богд уулын ар бэлийн ханан хаданд нэг дөрвөлжин хашлага дотор 300 гаруй толбо тавьсан байна. Монголын хаданд зосоор зурсан толбо тэмдэг ба хүмүүсийн тоог барагцаалан нэгтгэхэд 1,6 сая хүн байжээ.

Хөвсгөл нутгийн хадан дээр улаан хүрэн зосон будгаар зурсан дурсгалын түүх соёл, эрдэм шинжилгээний гол үр дүн бол Хөвсгөл нутгаас шинээр олдсон зосон зураг дүрслэл зүй, будгийн өнгө сэдвийн бүрдлээрээ Монголын хадан зосон зургийн судалгааг өөрчлөн баяжуулж, он цагийг неолитын үеэр цаашлуулсан юм.

Хүй нэгдлийн цусан төрлийн хүйн амьдарлаас Овгийн байгууллын задрал хүчтэй өрнөсөн түүхэн хөгжлийн үе байсныг судлагдаж байгаа Хөвсгөлийн зосон зургууд неолит, энеолит, хүрлийн түрүү үед 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)

5

Burial Mounds in Hovsgol Aimag, Northern Mongolia: Preliminary Results from 2003-2004

Bruno Frohlich, Department of Anthropology
National Museum of Natural History
Smithsonian Institution, Washington, DC

Naran Bazarsad, Institute of Archaeology
Mongolian Academy of Sciences
Ulaanbaatar, Mongolia

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.

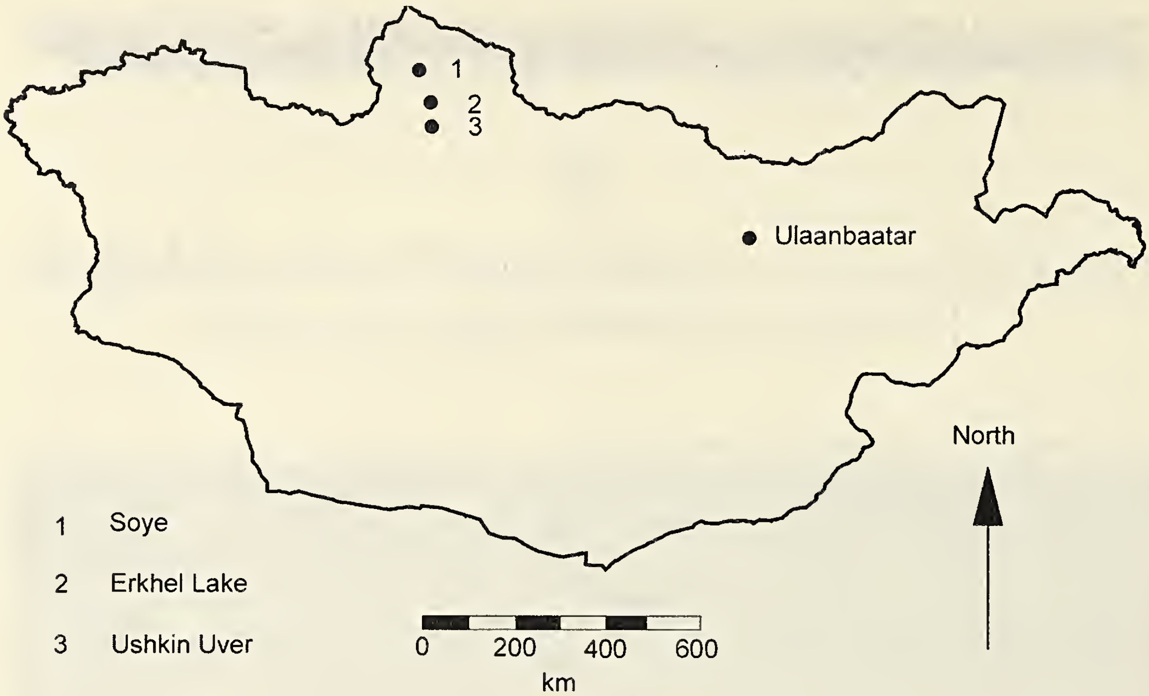

Figure 5.1. Areas of 2003 and 2004 research.

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.

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

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

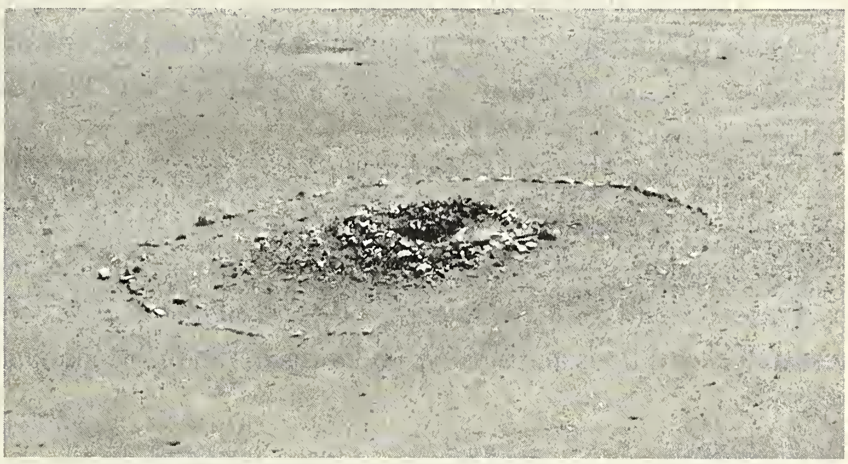

Figure 5.3. Ulaan Tolgoi Class I mound with squared fence.

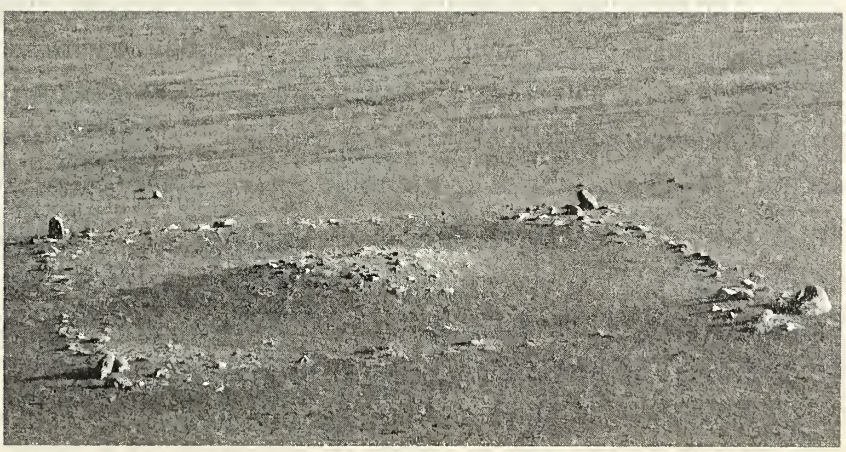

Figure 5.4. Five of the 14 deer stones remaining at Ushkiin Uver. When Volkov mapped the site there were 15 standing deer stones.

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.

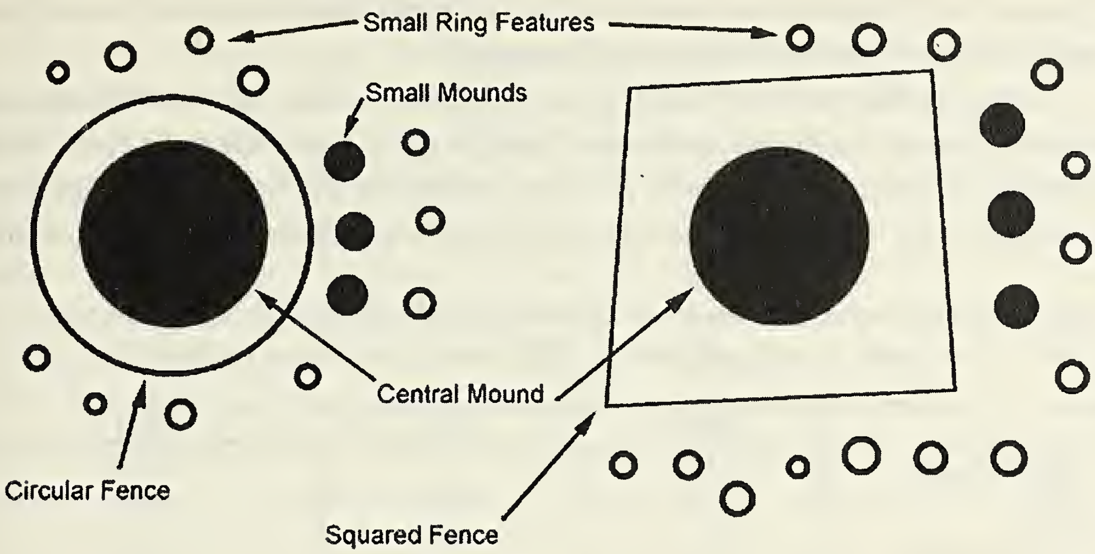

Figure 5.5. The two most common expressions of khirigsuur: Mounds with circular fences and mounds with squared fences. *Central mound: the centrally located pile of stone including burial chamber.* *Circular fence or squared fence: the surrounding wall of stones, either circular or squared.* *Small mounds: 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.

Table 5.1. Distribution of mounds surveyed during 2003 and 2004. Table does not include 110 mounds visually recorded in 2004 about 5 km west of Ushkin Uver.

	2003	2004	Total
Erkhel Lake	87	31	118
Soyo	171	107	278
Ushkiin Uver	24	0	24
Total	282	138	420

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 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

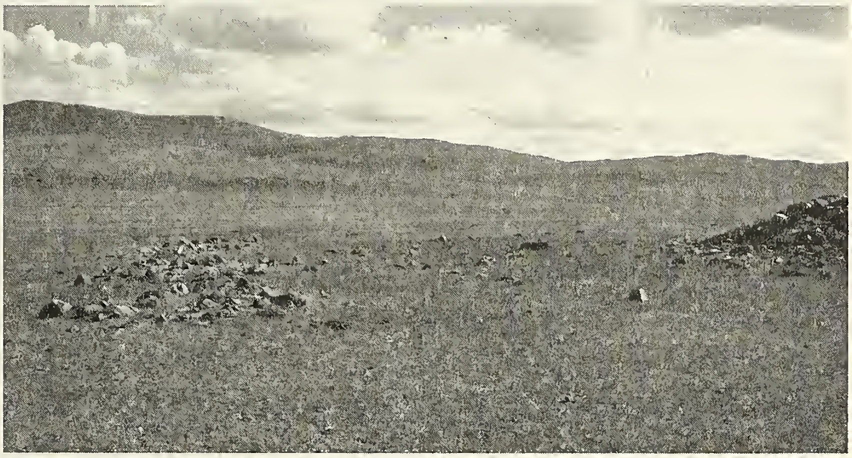

Figure 5.6. Three small mounds (left) located east of circular fence (center) and central mound (right). Class I mound at Ulaan Tolgoi.

Figure 5.7. Matt Gallon recording points on Class II burial mound at Ulaan Tolgoi using the Ashtech/Magellan Locus GPS receiver (Rover). A central Base Station including a similar unit is placed permanently within a radius of 20 km. Using both receivers allows a precision of better than 3 cm.

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.

	Class I	Class II	Class III	Total
Ulaan Tolgoi	21	60	37	118
Soyo	102	79	97	278
Ushkiin Uver	24	0	0	24
Total	147	139	134	420

Figure 5.8. Class I mounds located on the flat steppe southeast of the Ulaan Tolgoi deer stone complex. In the foreground, sections of Class II mounds. Class I mounds are found on the flat steppe and Class II mounds on the boundary between steppe and hills.

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.

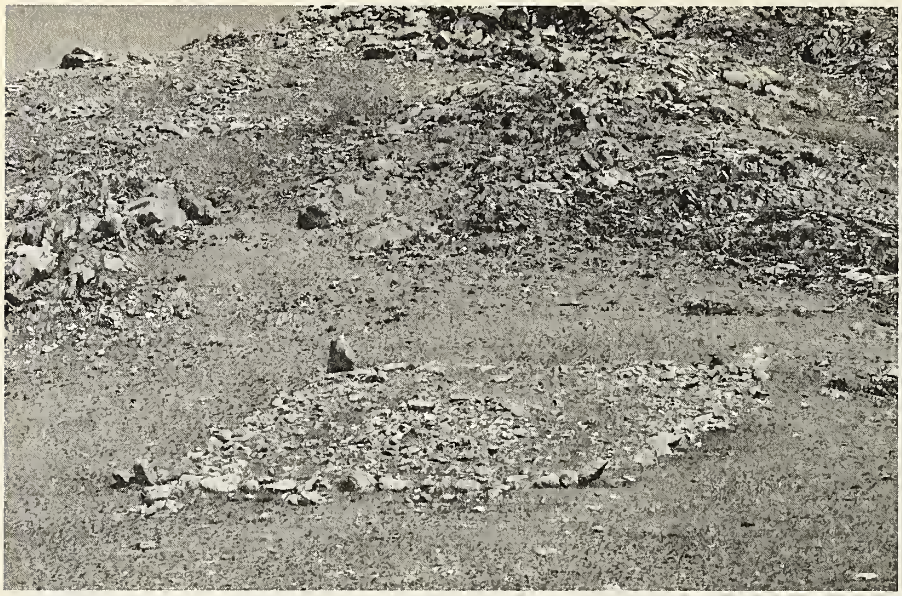

Figure 5.9a. Class III mound with squared fence and standing corner stones, located about 2 km east of the Ulaan Tolgoi deer stone complex. Class III mounds are defined as being located on well defined hillsides.

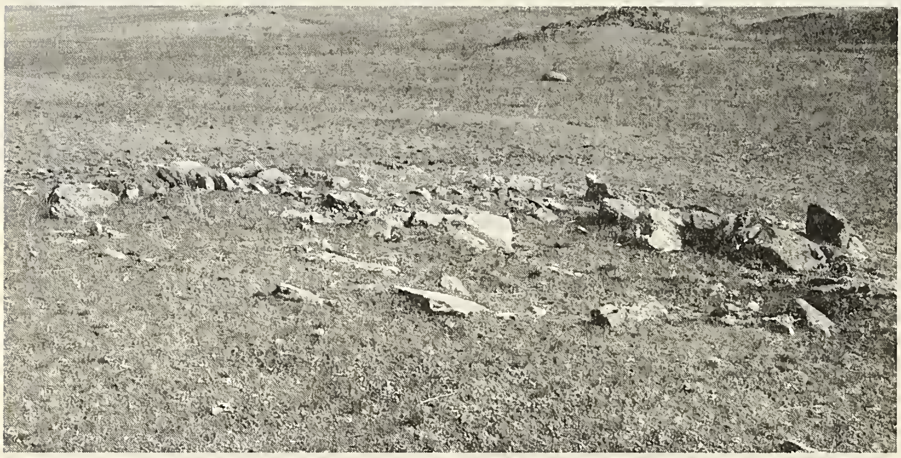

Figure 5.9b. Class III mound with circular fence about 1 km north-west of Ulaan Tolgoi deer stone complex

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

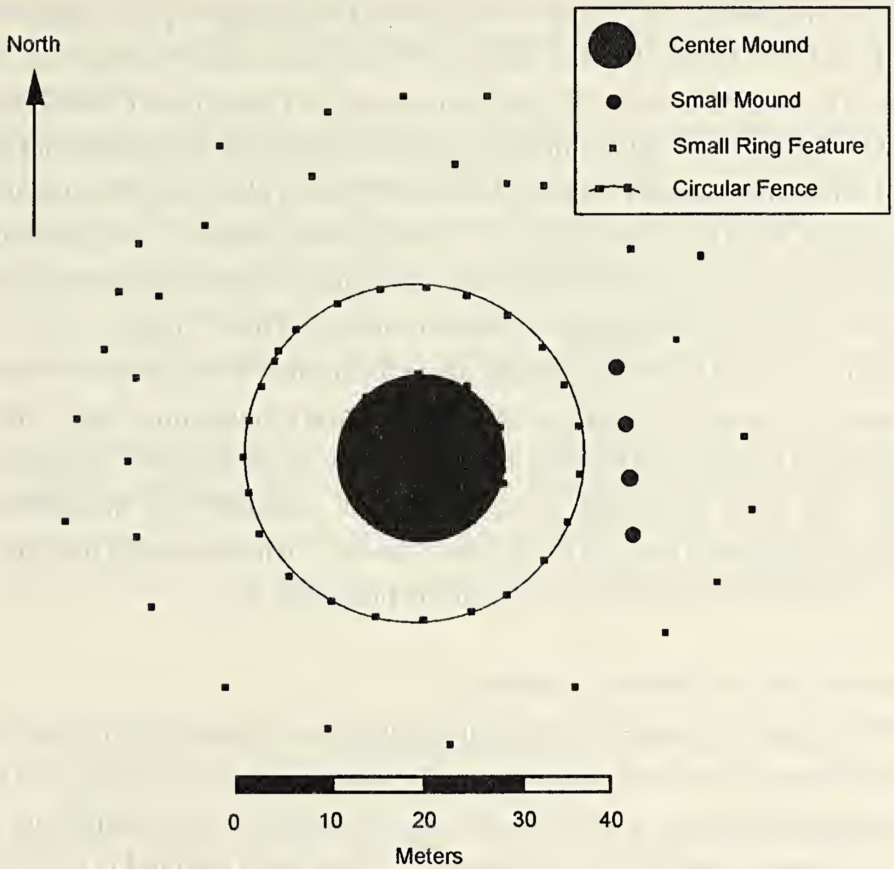

Figure 5.10. Mound no. 20 at Ulaan Tolgoi includes a perfect circular fence with a diameter of 34 meters. Center mound diameter is approximately 18 meters. Each small square represents one recording with the Locus GPS receivers.

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 (km^2), we find that the Soyo research area covers 195 km^2 and the Ulaan Tolgoi area covers 16.8 km^2. 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/km^2) is almost 6 times higher than in the Soyo area (0.9 mounds/km^2). 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.² 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.

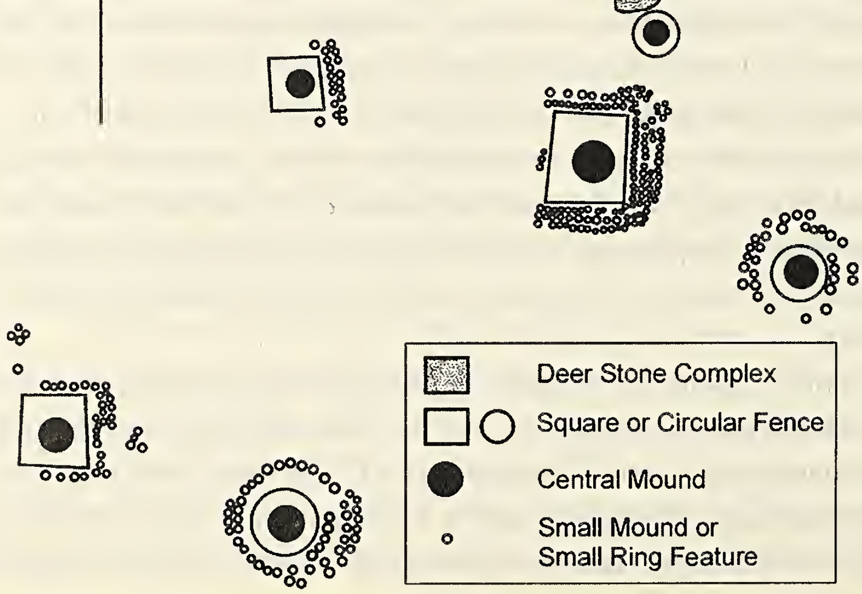

Figure 5.11. Four squared and two circular mounds located adjacent to the deer stone complex at Ulaan Tolgoi. The deer stone complex includes five deer stones, two medium size circular mounds and approx-imate 650 smaller stones.

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 vertebrae 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 hand-held 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.

	Circular	Sqaure	No Data	Total
Ulaan Tolgoi	55	53	10	118
Soyo	121	73	84	278
Ushkiin Uver	4	9	11	24
Total	180	135	105	420

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.

	N	Min	Max	Mean	SD
D1	35	331°	65°	11.8°	24.2
D2	36	59°	149°	99.1°	24.6
D3	35	332°	70°	11.5°	25.7
D4	35	64°	145°	103.7°	23.4

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 dimentions 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 deduct 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

Figure 5.13. Slab burial at Ulaan Tolgoi (Mound E03-29). Matt Gallon recording mound features.

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

Figure 5.14. Small chamber added to the external part of center mound at Mound E03-30.

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 graphieal 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.

	N	Min	Max	Mean	SD
L1	35	5.0 m	58.0 m	15.6 m	11.0
L2	36	5.0 m	47.0 m	14.3 m	9.2
L3	35	4.5 m	57.0 m	16.4 m	11.5
L4	35	5.0 m	50.0 m	14.9 m	10.2

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).

ID	LOC	YEAR	TYPE	N	LATITUDE	LONGITUDE
UU-DS-1	Ushkiin Uver	2003	Deer Stone	1	49° 39' 19.1"	99° 55' 42.1"
UU-DS-2	Ushkiin Uver	2003	Deer Stone	1	49° 39' 19.5"	99° 55' 42.1"
UU-DS-3	Ushkiin Uver	2003	Deer Stone	1	49° 39' 20.0"	99° 55' 42.0"
UU-DS-4	Ushkiin Uver	2003	Deer Stone	1	49° 39' 21.4"	99° 55' 39.0"
UU-DS-5	Ushkiin Uver	2003	Deer Stone	1	49° 39' 20.1"	99° 55' 38.8"
UU-DS-6	Ushkiin Uver	2003	Deer Stone	1	49° 39' 19.3"	99° 55' 39.1"
UU-DS-7	Ushkiin Uver	2003	Deer Stone	1	49° 39' 19.0"	99° 55' 39.2"
UU-DS-8	Ushkiin Uver	2003	Deer Stone	1	49° 39' 18.9"	99° 55' 39.0"
UU-DS-9	Ushkiin Uver	2003	Deer Stone	1	49° 39' 18.5"	99° 55' 39.0"
UU-DS-10	Ushkiin Uver	2003	Deer Stone	1	49° 39' 18.4"	99° 55' 39.0"
UU-DS-11	Ushkiin Uver	2003	Deer Stone	1	49° 39' 17.7"	99° 55' 39.9"
UU-DS-12	Ushkiin Uver	2003	Deer Stone	1	49° 39' 17.6"	99° 55' 39.3"
UU-DS-13	Ushkiin Uver	2003	Deer Stone	1	49° 39' 17.5"	99° 55' 39.3"
UU-DS-14	Ushkiin Uver	2003	Deer Stone	1	49° 39' 16.6"	99° 55' 39.0"
EL-DS-1	Ulaan Tolgoi	2003	Deer Stone	1	49° 55' 54.5"	99° 48' 15.1"
EL-DS-2	Ulaan Tolgoi	2003	Deer Stone	1	49° 55' 54.6"	99° 48' 15.0"
EL-DS-3	Ulaan Tolgoi	2003	Deer Stone	1	49° 55' 54.9"	99° 48' 14.8"
EL-DS-4	Ulaan Tolgoi	2003	Deer Stone	1	49° 55' 55.4"	99° 48' 14.2"
EL-DS-5	Ulaan Tolgoi	2003	Deer Stone	1	49° 55' 55.7"	99° 48' 14.0"
S-DS-1	Soyo	2003	Deer Stone	1	50° 58' 37.0"	99° 22' 26.5"
S-DS-2	Soyo	2003	Deer Stone	2	50° 57' 07.1"	99° 20' 47.1"
DS-COMPL	Ul. Tolg.-Ushk.	2004	Deer Stones	5	49° 48' 54.0"	99° 54' 02.8"

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 10.5km,^{2} 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 18.3km^2 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

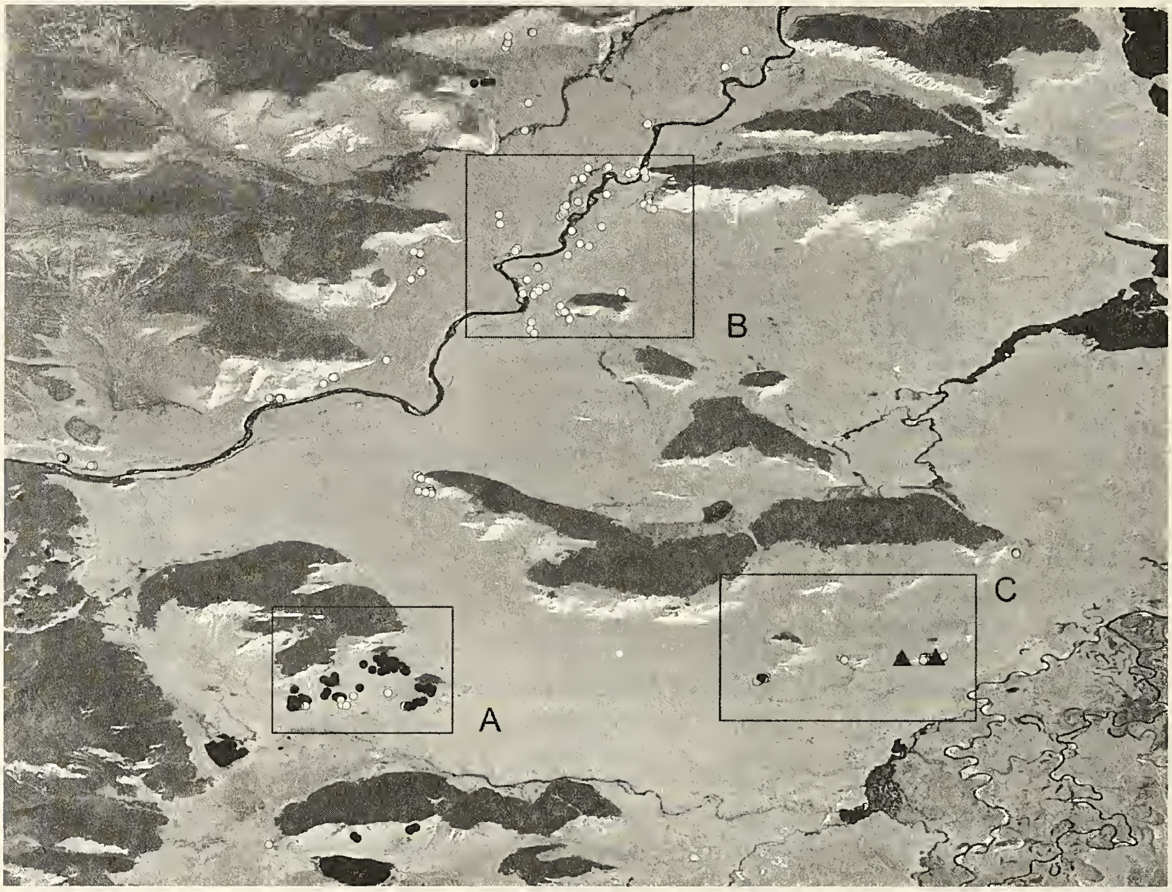

Figure 5.15. Landsat image of Soyo area, West Darkhat Valley. Areas A, B & C enlarged in Figures 5.16, 5.17 & 5.18. Image size: 20.5 x 23.9 km. Class I, II and III mounds depicted respectively as white circles, grey circles and black circles. Two deer stone sites depicted as black triangles (in Area 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.

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 km^2, 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 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 - Erklhel 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 bee 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

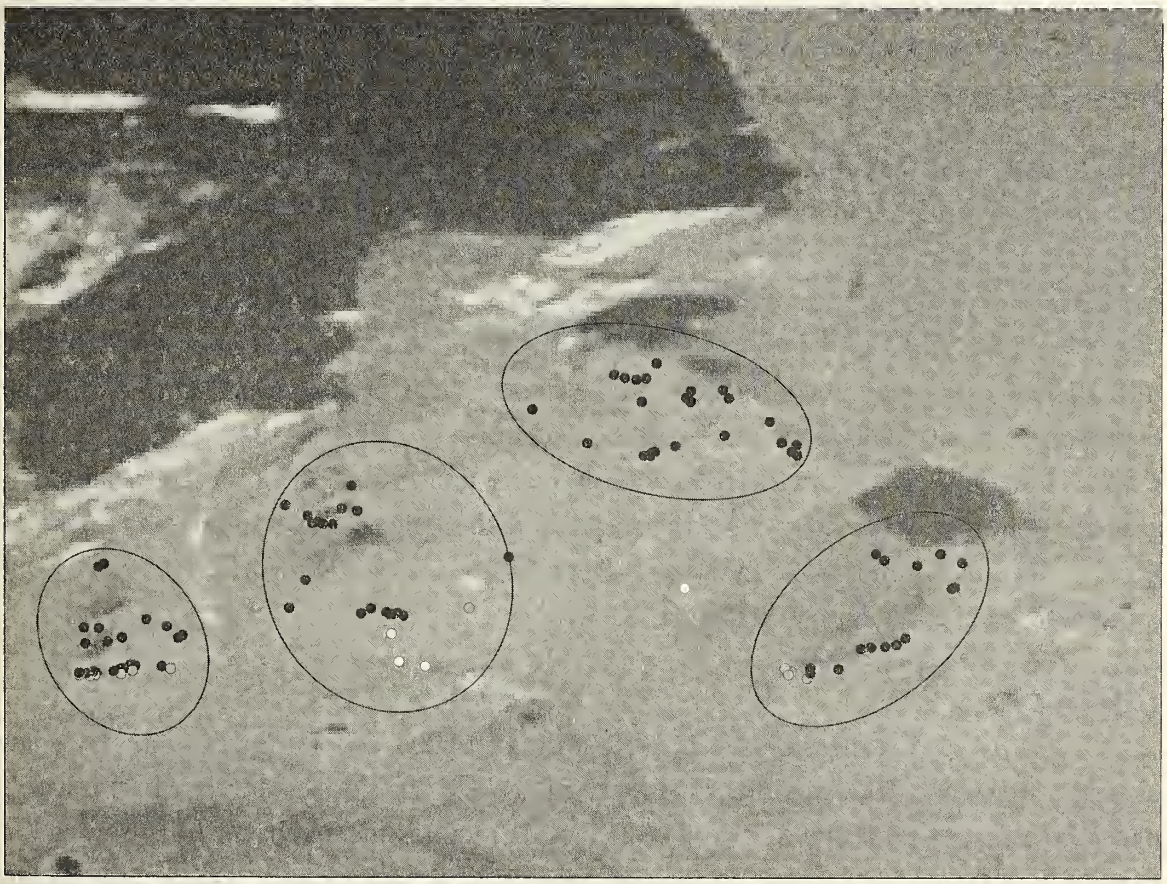

Figure 5.16. Soyo area A. Four clusters of mounds all located on southern hill sides. Class I, II and III mounds depicted respectively as white circles, grey circles and black circles. Black areas represent forest growth and grey areas steppe or grass growth. Image size: 3.6km x 3.3km.

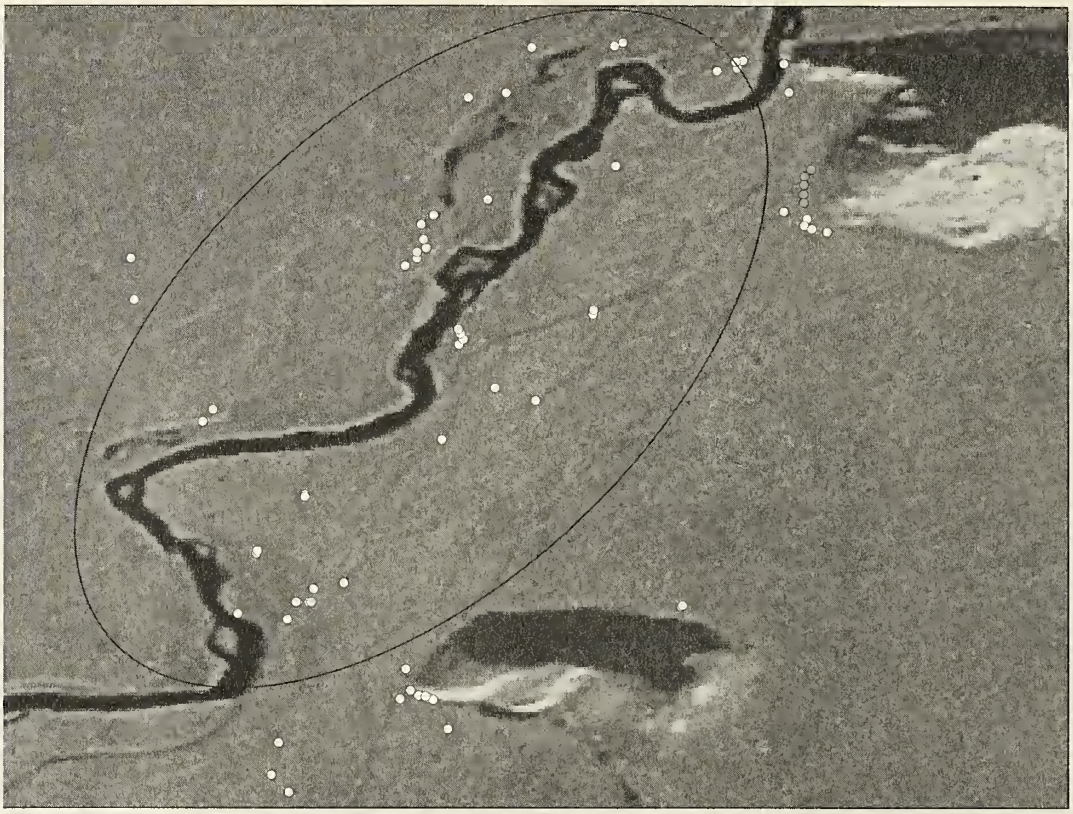

Figure 5.17. Soyo Area B. Class I mounds (white circles) clustering around the Khug River. About five Class II mounds (grey circles) located at the lower hillsides to the northeast. Area measures: 4.1km x 5.0km.

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.

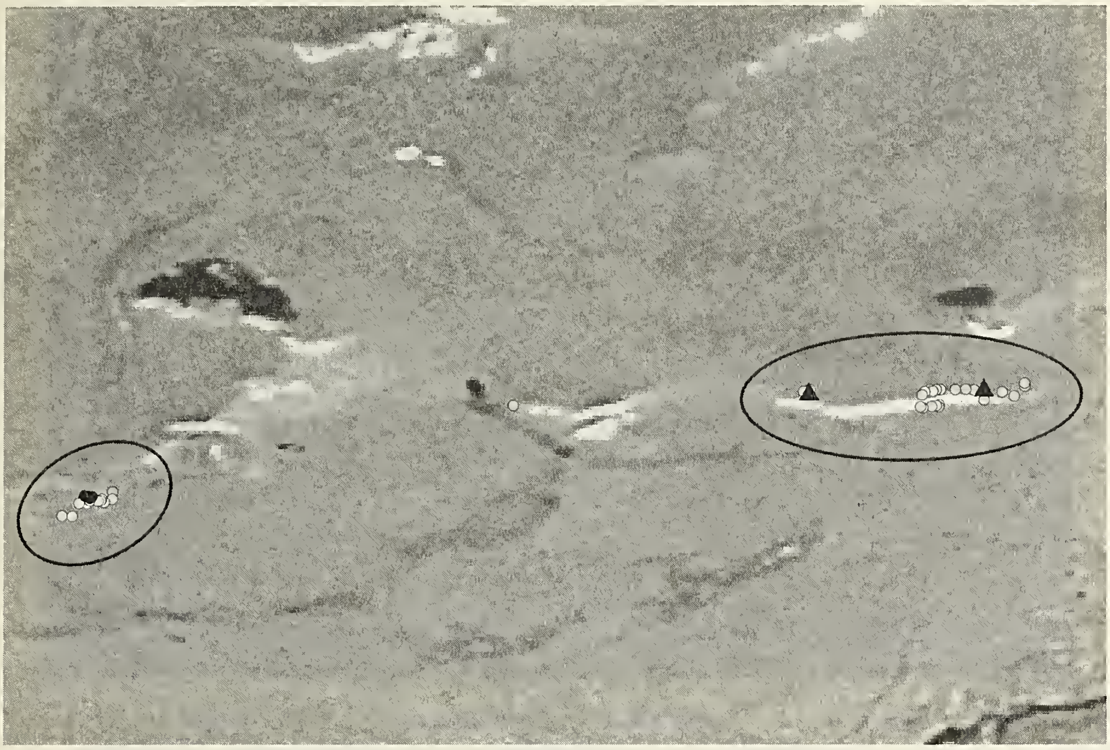

Figure 5.18. Soyo Area C. Two clusters of mostly Class I mounds (white circles and to the west) and Class II mounds (grey circles and to the east). Two sites within the eastern cluster include deer stones (black triangles). Area measures 4.0km x 4.4km.

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

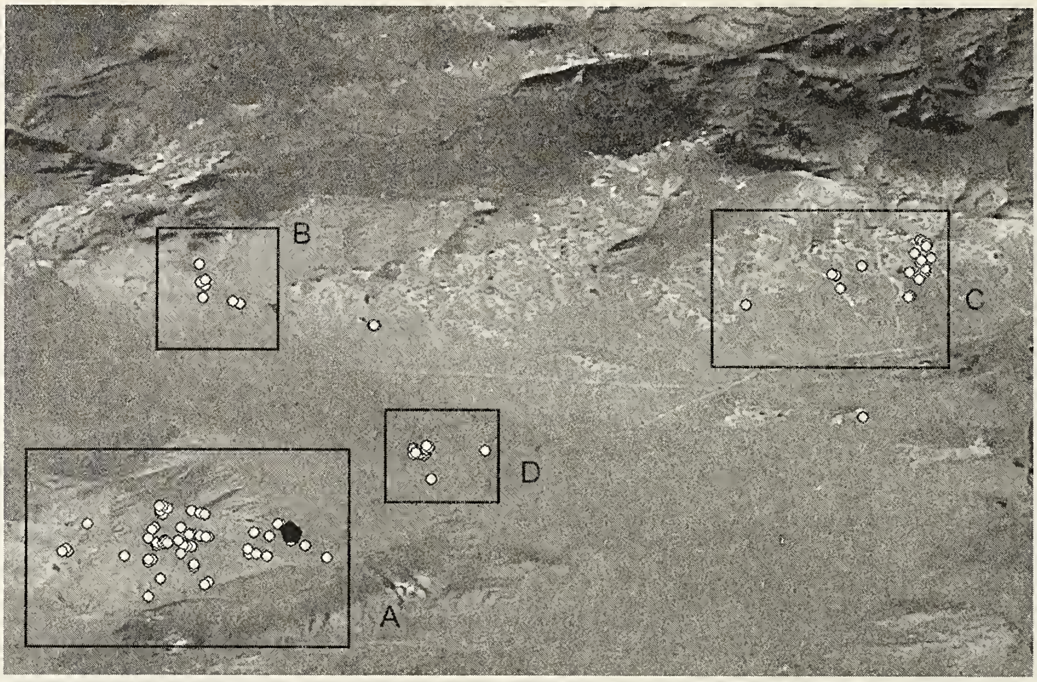

Figure 5.19. Ulaan Tolgoi research areas. Image measures 10.6km x 9.6km. Each mound, including all types and classes, are depicted by a white circle. Deer stone complex including 5 deer stones depicted by black polygon. Mounds to the west and north of deer stones recorded in 2003 and mounds just northwest of Erkhel Lake recorded in 2004.

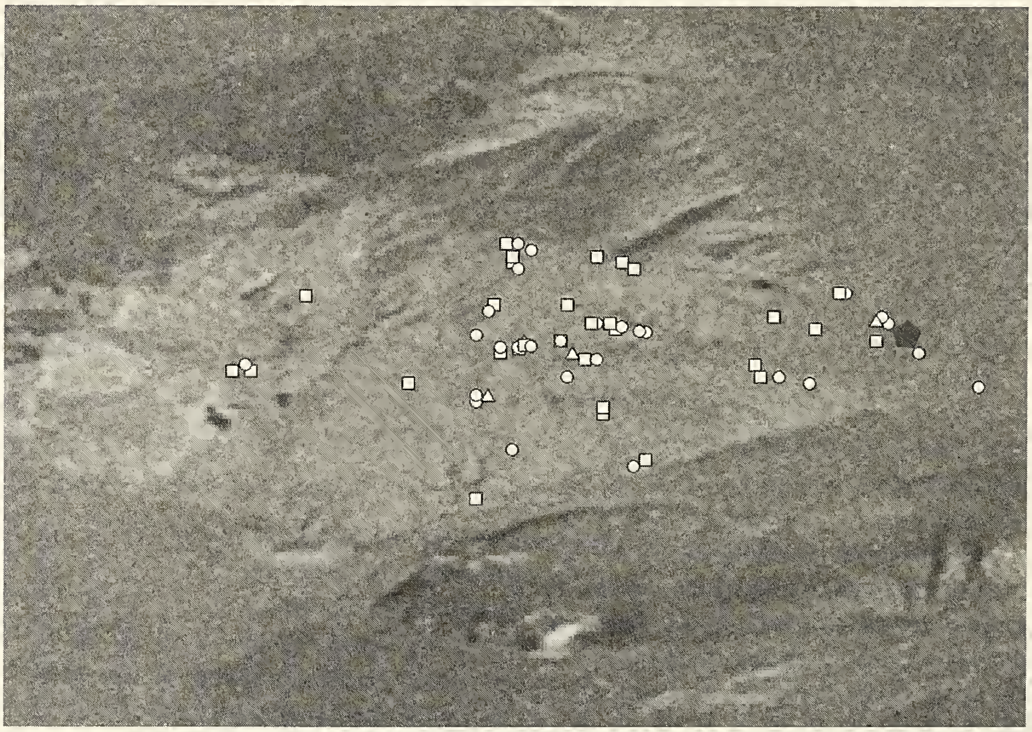

Figure 5.20. Ulaan Tolgoi Area A. Mounds with circular fences and squared fences are depicted as white circles and squares, respectively. Mounds with no fences are depicted as white triangles. Because symbol size exceeds more than 100 meters, mounds located close to each other may be 'covered' by a single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

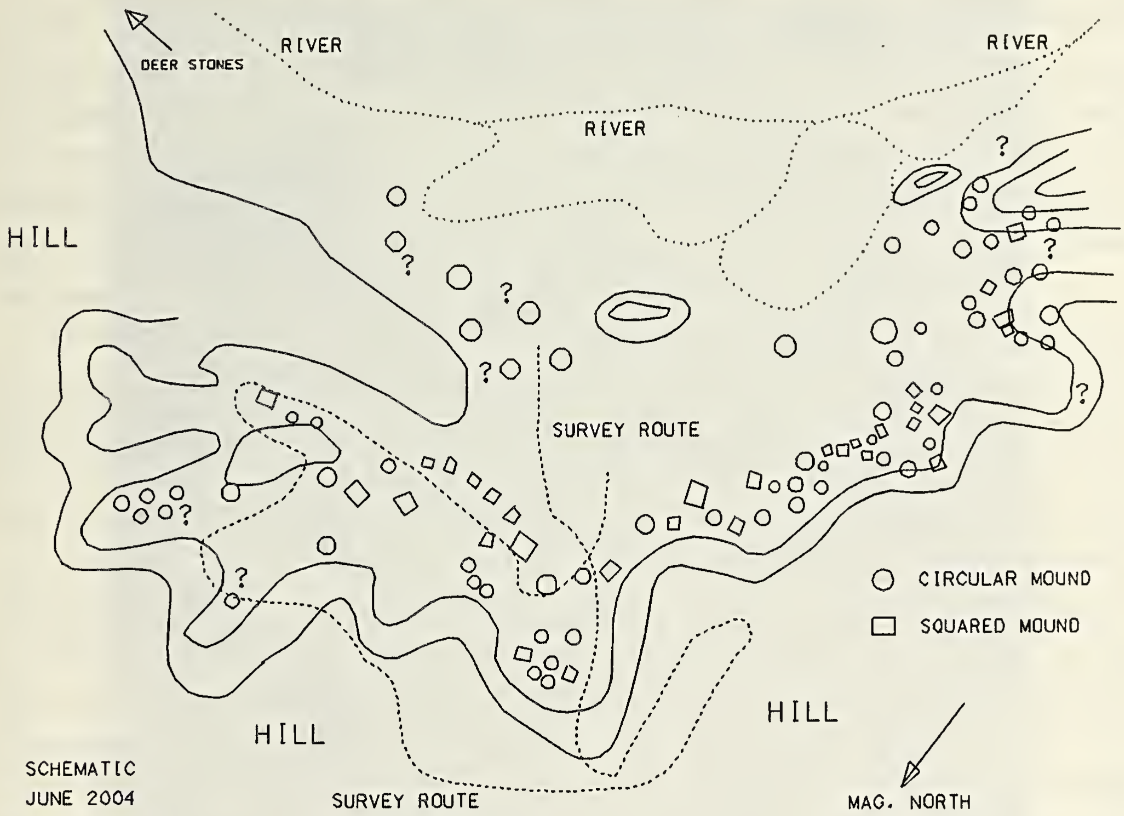

Figure 5.21. Mounds located about 5km west of the Ushkiin Uver deer stone complex. Distribution is schematic and is based on visual observation, only.

classes. Beneficially, our increasing familiarity with the data and continued processing of the results from the 2003 and 2004 field seasons allows us to coherently identify areas in need of additional research, as well as additional and innovative research questions, and sophisticative areas of future research and field work.

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 then 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

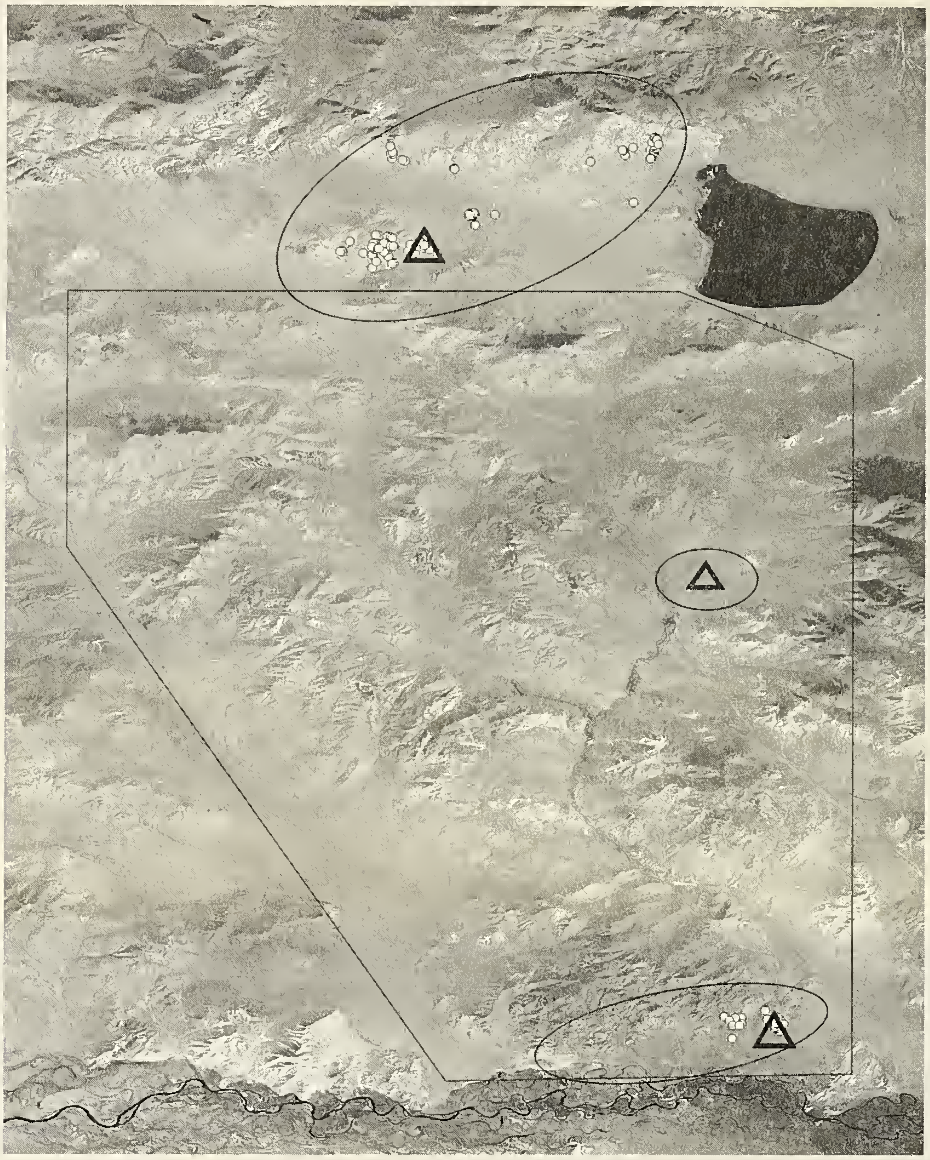

Figure 5.22. Landsat image depicting area between Erkhel Lake and Ushkiin Uver. Ellipsoid areas represent 2003 and 2004 research areas. Irregular hexagon covering areas between Erkhel Lake and Ushkiin Uver represents area to be surveyed in 2005. Deer stone sites are identified as black triangles. In addition to the Ulaan Tolgoi and Ushkin Over deer stone complexes, a small complex including six deer stones is located around midway between Erkhel Lake and Ushkiin Uver (See Table 5.6).

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 proeess 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 eomplete 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 km^2 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 аймгийн нутагт 2003, 2004 онуудад хийсэн хайгуулын явцад илрүүлэн олсон булш, хиргисүүрүүдийг бүртгэх ажлын урьдчилсан үр дүнгээс

Бруно Фролих
Смитсонийн Институт дэх Байгалын Түүхийн Үндэсний Музейн Антропологийн Тэнхим

Базарсадын Наран
Монголын Шинжлэх Ухааны Академийн Археологийн Хvрээлэн

2003-2004 оны зуны турш Монголын хойд хэсгийн Хөвсгөл аймагт Хүрлийн үеийн булш хиргисүүрүүдийг бүртгэхээр Монголын Шинжлэх Ухааны Академ болон Смитсонийн Институтаас бvрдсэн баг хамтран ажилласан юм. Эдгээр булшнуудыг “хиригсүүр” хэмээн нэрлэж заншсан бөгөөд Монголын төв болон хойд хэсгээр өргөн тархацтайгаар байрлаж байдаг нь ажиглагдсан юм. Булшнуудын тархацыг судлаж, булш бүтээгчдын хаана ямар аргаар булшаа бүтээж байсан шалгууруудыг таньж мэдэх нь манай судалгааны ажлын гол зорилт байсан юм. Үүний үр дүнд бид нар зарим нэг булшны байрлалтын уялдаа хамаарлыг олж ажигласан боловч тархацыг нь хараад өөр хоорондынх нь онцлогийг тайлбарлах боломжгүй санаандгүйгээр энд тэнд байрласан булш ч бас тааралдаж байв. Эдгээр булшнуудыг олон тооны булш малтаж судласны эцэст арай илүү үр дүнтэй шинжилгээ хийх боломжтой.

Бидний судалгааны ажил статистикийн судалгаанд тохирохуйц олон төрлийн хэмжээг дээж болгон цуглуулахад тулгуурласан байв. Зйвхйн ердийн (нормал) тархацыг илэрхийлсэн тоо баримтыг л ашигласнаар судалгаа шинжилгээний үйл явцад алдаа гажилт гарахгүй гэдэгт бид итгэлтэй байлаа. Манай судалгааны ажил хоёр vе шатаас бvрдэж байв: 1) эвдэж гэмтээлгvйгээр хайгуулын ажил хийх vе шат, 2) малтлагааны vе шат. Бид хайгуулын ажлаа Уушигийн өвөр орчмоор (n=125), Эрхэл нуур хавиар (n=120), Соёо орчимд (n=270) тус тус хийсэн бөгөөд нийтдээ 515 гаруй булш бүртгэн авсан юм.

Булшийг бүртгэн авах болон судлан шинжлэхдээ бид төрөл бүрийн арга техник хэрэглэсэн бөгөөд үүнд булшнуудын ялгааг хэмжихэд ашигласан Locus GPS –ийн Ashtech/Magellan (0.15-0.30 метрийн нарийвчлалтай) гэсэн хоёр нэгдмэл системүүд орно. Булшнуудын ялгааг хэмжихдээ Locus системээс гадна Garmin GPS-12 (6 –10 метрийн нарийвчлалтай) системийг соронзон луужин болон метр хэмжигч туузтай зэрэгцүүлэн ашигласан. Эдгээр өөр өөр арга техникүүдийг хэрэглэхэд булшнуудын ойролцоогоор 25 хувь нь дор хаяж хоёр удаа давхцаж тэмдэглэгдсэн бөгөөд эдгээр арга техникийн нарийн зйв хэмжилтийг тодорхой болгоход бидэнд маш их тус болж байсан юм. Эдгээр тоо баримтууд DBMS буюу Тоо баримтыг зохицуулах системд хадгалагдан үлдсэн бөгөөд үүнд уртраг, өргөрөг, далайн түвшнээс өргөгдсөн хэмжээ, хашлаганы төрөл, ангилалт, урт өргөний харьцаа, бага хэмжээний булшны гаднах хүрээ гэх мэт булшны гадаад бүтэц зохион байгуулалт зэрэг багтсан болно. Орост хэвлэсэн 1:200.000 –н хэмжээст газрын зургийг буулган векторт шилжүүлэн Landsat 7 –н зурагтай (2,4 ба 7) хамтруулан Газарзүйн Мэдээллийн Системийн

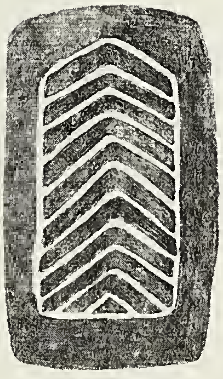
(GIS) үндэс бааз болгон хэрэглэсэн болно. Алфа тоон баримт ба векторын графикийг хамтруулан хэрэглэснээр цуглуулсан мэдээллээ чухам ямар арга хэлбэрийг ашиглаж судлан үнэлж дүгнэх боломжийг бидэнд олгосон ба энэ нь өөр аргаар бол биелэгдэх боломжгүй юм.

Бидний одоогийн байдлаар хүрсэн урьдчилсан үр дүн нь булшнуудыг ангилан ялгаж танихад тулгуурласан бөгөөд энэ нь цаашдын судалгаанд мэдээллүүдийг төрөл зүйлд хуваахад хэрэгцээтэй алхам болох юм. Жишээлбэл: булшнуудын ойролцоогоор 50% нь тойрог хэлбэрийн ханан чулуунуудаар (тойрог хэлбэртэй хашлага), 45% нь дйрвйлжин хэлбэрийн хашлагаар хvрээлэгдсэн байгаа ба 5% нь огт хашлагагүй байна. Энэхүү нүдэнд шууд тусах ажиглалт нь бидний булшнуудыг төрөл зүйлд ялгах анхны ангиллын шалгуур хэмжүүр болсон. Үүнээс гадна бид булшнуудыг газарзүйн байрлалынх нь хувьд 3 хэсэгт ангилсан. Тухайлбал, 1-р ангилалд тал газар байрлах булшнууд (ойролцоогоор 25%), 2 р ангилалд уул толгодын хормой бэлд байрлах булшнууд (ойролцоогоор 25%), 3–р ангилалд уул толгодын хормой бэлээс дээш дунд хэсгээр байрлах булшнууд (ойролцоогоор 50%) тус тус багтсан байна. Энэ ангилал нь булшны том жижигтэй салшгүй холбоотой болох нь ажиглагдсан ба үүнд: том хэмжээтэй булшнууд ихэнхдээ 1-р ангилалд багтах газар, бага хэмжээтэй булшнууд 3-р ангилалд багтах газар тус тус байрлаж байсан бол дунд зэргийн хэмжээтэй булшнууд 2–р ангилалд багтах газар байрлаж байсан. Чухам яагаад булшны гадуур тойрог эсвэл дөрвөлжин хашлага сонгодог байсан талаар тайлбарлах ажиглалт дүгнэлтийг бид одоохондоо хийж амжаагүй байгаа. Өөр өөр хэлбэртэй хашлаганууд эдгээр гурван ангилалд багтах булшнуудад ижил харьцаатайгаар тааралдаж байсан ба хашлаганы хэлбэр нь булшны хэмжээнд болон байрлалын ангилалтай төдийлөн холбоо хамааралгүй бололтой. Хашлаганы хэлбэр нь оршуулсан хүний эрэгтэй эсвэл эмэгтэй байсантай холбоотой эсвэл нийгэм эдийн засгийн хүчин зүйлүүд хашлаганы хэлбэр сонгоход нөлөөлж байсан эсэх нь бидний хувьд одоогийн байдлаар танигдаагүй маргаантай сэдэв болж байна. Булшнууд хашлагагүй байх хоёр онцгой шалтгаан байж болно. Үүнд: Цаг хугацааны хувьд өөр өөр (Жишээ нь Хүннүгийн үе) ба он цагийн турш элэгдэж үгүй болсон эсвэл ургамал ногоо ургаж бүрхсэн шалтгаанууд орж байна. Бидний бас нэгэн ажигласан зүйл бол 2 ба 3 р ангиллын булшнууд уул толгодын урд зүгт нь эсвэл ойролцоо байрлаж байсан бөгөөд маш цөөн тооны булш (5+/-) хойд зүгт нь байрлаж байсан.

Бидний цуглуулсан тоон баримтын судалгаагаар булшнууд маш олон тоогоор уул толгодын урд хэсэгт бөөгнөрсөн ба ингэж шавж байрласнаар ихэнх тохиолдолд өнцгийн зайн өөрчлөлт гэх мэт газрын өвөрмөц төрх байдалтай холбоо хамааралтай байж чадахгүй болох нь бидэнд харагдсан. Гэхдээ зарим тохиолдолд холбоо хамаарал ажиглагдсан ба бид 2004 оны судалгааныхаа ажлын үеэр 1 ба 2–р ангиллын булшнуудыг Соёогийн хойд ба зүүн хойд хэсгээс бүртгэсэн билээ. Ингэхэд ихэнх нь (51+/-) голын ойр орчмоор байрлаж байсан ба 1 р ангиллын булшнууд тааралдаж байсан. Энд тааралдаж байсан 1 р ангиллын булшнуудын тархац нь өөр газарт байрлах 1–р ангиллын булшнуудын тархацаас эрс өөр болох нь харагдаж байсан.

Бидний урдаа тавьсан зорилго бол илүү их хэмжээний газарзүйн байрлалыг хамарсан булшнуудын олон талын судалгаа, дэлгэрэнгүй хайгуул хийх юм. Бид булшинд малталт хийхээс зайлсхийж байгаа юм. Гэхдээ зарим нэг хүмүүсийн буруутай үйл ажиллагаанаас болон булш өмнөнь тоногдсон эсвэл сүйтгэгдсэн байвал бид булшаас шарилын яс, булшны гадна хэсгээс морьны араг ясны хэсгүүд (гавлын яс, нурууны нугаламны яс гэх мэт) зэргийг дээж болгон авахад бид цагаа зарцуулсан. Булшны функцийн тал дээр бид одоог хүртэл санал зөрөлдөн маргалдсаар байгаа билээ. Тоногдсон болон сүйтгэгдсэн булшнаас цуглуулсан шарилын араг яснууд (хүний ба морьны) мөн түүнчлэн буган чулууны цогц бүрдэлтэй хамаарах араг яснууд (морьны) аль цаг үед хамаарах нь бидний маргаад байгаа ярвигтай системийг ойлгож учрыг нь тайлахад ихээхэн тус нэмэр болно гэж бид найдаж байгаа.

Бид 2005 оны судалгааны ажлаараа 2 ба 3–р ангиллын булшнуудыг Соёогийн хойд хэсгээр үргэжлүүлэн бүртгэж тэмдэглэхээр төлөвлөж байгаа. Түүнээс гадна, 2004 онд бүртгэсэн булшнуудын 25% орчмыг тоон баримтаа улам лавшруулан чанартай хөтлөх үүднээс дахин бүртгэх болно. Уушигийн өврийн баруун урд хэсгийн буган чулууны орчмоос 100 гаран 2–р ангиллын булш болон 10–аад 1–р ангиллын булшнууд тус тус ажиглагдан бүртгэгдсэн. Харамсалтай нь энэ бүртгэл бидний дээр дурдагдсан арга техникээр хийгдэж чадаагүй бөгөөд бид дахин бүртгэхдээ дээрх аргыг хэрэглэх мөн Уушигийн өвөр орчмын хөрш зэргэлдээ хэсэгт бас судалгаа шинжилгээ хийхээр бид зорилт тавьж байгаа. Эцэст нь хэлэхэд булшнууд хэрхэн хэсэг бүртээ ялангуяа буган чулуунуудын хэсгээр үргэлжлэн тархдаг эсвэл хэрхэн тархац нь тасалддаг талаар бид одоохондоо бүрэн гүйцэд ойлголттой болж амжаагүй байгаа. Тийм учраас бид өргөн хүрээний хайгуулын ажлыг хойноос урд зүг уруу чиглэлтэйгээр Уушигийн өвөр болон Эрхэл нуурын хоорондох газарт хийхээр төлөвлөж байна.



Ulaan Tolgoi khirigsuur mound complex south of the deer stone site. (photo: Frohlich)

6

Bronze Age Burial Mounds in Northern Mongolia: Use of GIS in Identifying Spatial and Temporal Variation

Eliza Wallace and Bruno Frohlich, Department of Anthropology
National Museum of Natural History
Smithsonian Institution

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 6.1. Class I mounds (located on the flat steppe) at Soyo. Each mound consists of a center mound surrounded with either a circular or squared fence.

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

Figure 6.4. Landsat image measuring approximately 49km², showing the distribution of Class I, II & III mounds respectively depicted as white, grey, and black circles. The total number of mounds recorded in the Soyo area is 278 and includes four deer stones found at two sites.

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 reeorded 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

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

Элиза Уолас ба Бруно Фролих
Смитсонийн Институт дэх Байгалын Тvvхийн Үндэсний Музейн Антропологийн Тэнхим

Монголын тал нутаг хиригсүүр хэмээн нэрлэгдэх эртний дурсгалаар баялаг билээ. Эдгээр булшуудыг Монгол, Оросын судлаачид бага хэмжээгээр судласан бөгөөд сүүлийн үеэс Ази, Европ, Америкийн судлаачид өргөн хүрээтэйгээр судлаж байна. Эдгээр булшнуудын зарим нь маш том хэмжээтэй байхад зарим нь археологичдийн мэргэжлийн хурц нүдээр ч харахад анзаарагдамгүй жижиг байх нь олонтаа тохиолддог. Монголын умард бүсийн нутаг Хөвсгөл аймагт хийсэн судалгааны ажлуудын нэг болох хүрлийн үеийн булшны бүртгэл дээр тулгуурласан дүгнэлтийн талаар бид энэ судалгааныхаа ажилд тусгасан билээ. 2003-2004 оны хооронд явагдсан хайгуулын ажлийн хvрээнд 500 гаруй байршлыг тодорхойлсон бөгөөд бид хэлбэр хэмжээ болон тархалтаас хамаарсан мэдээллүүдийг бvртгэн авсан. Энэ удаад бид Газарзvйн Байршил тогтоох системийн буюу Ashtec/Magellan Locus GPS–р 20-35 мм-ийн нарийвчлалтайгаар, Garmin GPS-12-н тусламжтайгаар 6-10 метрийн нарийвчлалтайгаар тус тус хэмжин мэдээллийг бүртгэн авсан болно. Эдгээр GPS–ийн бҮртгэлийн үр дүнд газар нутгийн 7 зураг (2, 4, 7-р хэсэг) болон Оросын байрлал зүйн газрын зураг нь GIS буюу Газарзүйн Мэдээллийн Систем –ийн программ хангамжинд хэрэглэгдсэн юм (Газарзvйн Мэдээллийн Систем, ArcView 8.3). GIS системийн технологийг ашиглах нь маш чухал үр дүнтэй байсан бөгөөд дараа дараагийн хайгуулын ажилд шинэ таамаглалууд дэвшүүлэн шинжлэх хэрэгсэл болох нь дамжиггvй гэж үзэж байна.

GIS буюу Газарзүйн Мэдээллийн Систем нь газрын зураг тодорхойлох программ хангамжийн маш оновчтой арга хэлбэр бөгөөд хэрэглэгч төрөл бүрийн газарзүйн бүртгэл мэдээллийг хамтатган судалгаа шинжилгээндээ ашиглах боломжтой. Газарзүйн байрлалын талаарх мэдээлэл гэх мэт ямар нэгэн цуглуулсан тоон баримт мэдээллүүдийн бүрдэл дээр анализ хийн шинжлэхэд энэ программ хангамж нь хэрэглэгдэж болно. Газарзүйн координатын тоон үзүүлэлтүүд, далайн түвшнээс дээших дижитал загвар, газрын зургийн хуулбарт байгаагаар гэх мэтчилэн мэдээллийн бүрдлийг энэ системд оруулж болно. Судалгааны ажлын зорилгодоо тохируулан, хэрэглэгч өөрийн GIS системийг хүссэнээрээ бүрэн удирдаж зохион байгуулах боломжтой. Бид нарын хувьд зорилго маань эртний булш бүтээгчдийн булшаа байрлуулах шалгуурыг илрүүлэх явдал байсан учир бид булшны байрлалтын хэв шинжийг тодруулахаар GIS системийг хэрэглэсэн билээ. Энэ зорилготоо хамгийн үр дүнтэйгээр хүрэхийн тулд бид GIS системээ энгийн хэлбэрээр ашигласан болно.

Бидний гаргахыг хүссэн булшны тархацын хэв маяг маань өргөн хэмжээний масштабыг хамарсан учир тухайн орон нутгийн газрын зураг дүрслэл дээрх булшнуудыг цэгнүүдээр илэрхийлэх дүрсэн тэмдэглэгээг бид бий болгосон. Ингэснээр бид булшнуудын тархацын хэв шинжийг өөр хоорондн нь

болон газарзүй геологийн онцлог талаас нь судлах хайх боломжтой болсон юм. Хайгуулын ажлын үеэр ажигласан санаа сэтгэгдлүүд нь эдгээр булшнуудыг газар нутгийн байдалтай нь харьцуулан харсаны дараа батлагдах эсвэл бүр няцаагдах боломжтой. Түүнээс гадна, газарзүйн тоон баримтаас үүдэн гарсан асуултуудыг бүрдүүлснээр хэлбэр гэх мэт бусад олон хэлэлцэгдсэн ангиллын хэв шинжийг тайлбарлах боломжтой. Arc-View программ хангамж нь булшны газарзүйн тоон баримтыг багтаасан зарим нэг хүчин зүйлүүд дээр тулгуурлан хооронд нь ялгаж салган газрын зургуудыг хурднаар бий болгох чадвартай. Бидний хувьд хэлбэр хэмжээнд зориулан өөр өөр тэмдэглэгээг энгийнээр хэрэглэх нь хэв шинжийг ялгахад хамгийн тохиромжтой арга байсан.

Олон төрлийн газрын зураг дээр тулгуурлах нь маш хэрэгтэй арга болох нь ажлын үеэр батлагдсан ба бид хоёр өөр аргаар илэрхийлэгдэж буй газарзүйн тоон баримт дээр тулгуурласан булшны байрлалыг олж харах боломжтой байсан. Жишээлбэл, сансрын хиймэл дагуулын тусламжтайгаар авсан ердийн фото зураг шиг харагдах дvрс зурагнаас гадна бидэнд дижитал хэлбэрт оруулсан энгийн газрын зурагнуудаас бүрдсэн дүрс зурагнууд бас бидэнд байдаг байсан. Газар нутаг болон газрын гадаргын зураг аль аль дүрсэнд харагдахуйц байдаг байсан боловч хоёр өөр байдлаар харагддаг байсан. Тийм учраас энэ хоёр дүрсийг ээлжлэн харах буюу зарим тохиолдолд хамтруулан ашигласнаар нэг газрын зураг хэрэглэснээс илүү олон хэв шинжийг олж илрүүлэх боломжтой болж байлаа.

Бидний ажиллагааны анхны загварууд маш энгийн бүтэцтэй байлаа. Таамаглал болон загварууд аль болох энгийн байлгах нь дүгнэлтийг харьцангуйгаар түргэн гаргаж улмаар дараагийн шинээр урган гарсан судалгааны ажил руу шилжихэд хялбар болгож байлаа. Ийм учраас бидний ажилд GIS систем нь хамгийн чухал хэрэглүүр болж байлаа. Ерөнхийдөө хэлбэр хэмжээ бусад ангилалууд болон гаднах бүтцийн одоо байгаа байдал, алга болсон хэсэг, далайн түвшнээс дээр орших байдал зэргээр цуглуулсан олон хэмжээст тоо баримт нь судалгааны ажлыг хялбар болгож байдаг. Ингэснээрээ бид зөвхөн хоёр хүчин зүйлийг сонгон булшны хэв шинжийг тодорхойлоход ашиглахад амархан болж байсан.

GIS систем нь булшны тархалтанд шинэ хэв шинж илрүүлэхэд дөхөмтэй хэрэгсэл болж байв. Хайгуулын ажлын үеэр уул дов толгодын өмнөд хэсэг дэх булшнуудын хэв шинж нь аль хэдийн ажиглагдсан байсан бол тодорхой сонгосон хэсгийн бөөгнөрсөн булшнууд нь хайгуулын үеэр ажиглахын аргагvй байсан. GIS системийн тусламжтайгаар зарим нэг тойрог мөн дөрвөлжин хэлбэртэй ховор тохиолдох булшнуудыг тодорхойлох боломжтой байсан ба эдгээр ховор тохиолдох булшнууд нь ихээхэн хэмжээний булшыг малтах үед олдох боломжтой байсан байна. Өөрсдийн цуглуулсан тоон баримтуудыг шинэ баримтаар баяжуулах ялангуяа өмнө нь хайгуулын ажил хийгдэж амжаагүй газруудаас цуглуулах нь бидний дараагийн алхам юм.

GIS систем нь бидний дараагийн судалгаанд чухал хэрэгсэл хэвээр байх болно. Бид өөрсөддөө байгаа бөх тоон баримт, ялангуяа хайгуул, малталгаа, фото зураг гэх мэт мэдээллийг олон хэмжээст тоо баримтандаа бүрдүүлэх бөгөөд энэ нь GIS системийн программ хангамжинд багтаж интернетээр бусад судалгааны ажил хийж байгаа хүмүүст бас ашиглагдах боломжтой болно гэж бид төлөвлөж байна.

Tsaatan woman riding reindeer in Menge Bulag summer tundra. (photo: DePriest)

7

Tsaabug, Tsaahag, Tsaatan: An Ethno-Ecology of Mongolia's Dukha Reindeer Herders[1]

Paula T. DePriest
Smithsonian Center for Materials Research and Education
Department of Botany, National Museum of Natural History, Smithsonian Institution

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

[1] These terms are Mongolian for 'Reindeer,' 'Reindeer Lichen,' and 'Reindeer People.'

Figure 7.1. Map of Mongolia showing the location of Tsaatan reindeer herding in northwestern Mongolia. The insert map shows the location of Ulaan Taiga in the Sayan Mountains, migratory area of the Tsaatan reindeer herders west of Darkhat Valley, and the Mongolian borders with Tuva and Siberia.

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.[2] 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,

[2] "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)."

Figure 7.2. Tsaatan reindeer herders wearing traditional dels examine a bear skull near Ulaan Taiga in the Sayan Mountains, northwestern Mongolia, August 2003.

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

Figure 7.3. Tsaatan reindeer uses and products: a. reindeer milking, b. reindeer cheese, c. reindeer hides used as pad for packsaddle on a cow, d. reindeer meat drying inside an urts (teepee), reindeer riding using a Mongolian saddle, f. reindeer transport using packsaddles.

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

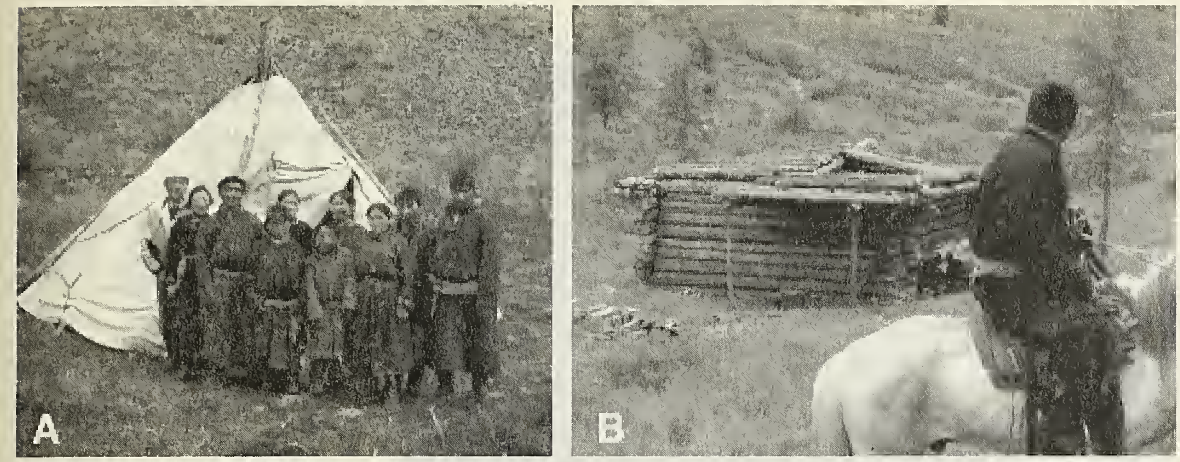


Figure 7.4. Tsaatan shelters: a. Bayar's family in front of one of their three urts *(teepees) in the fall pasture; b. one of Bayar's huts adjacent to the larch forest in the winter pasture.*

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

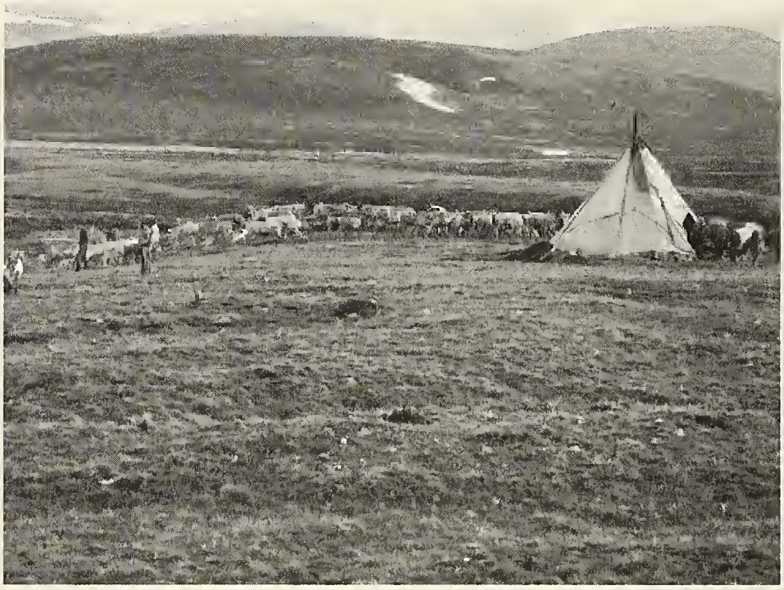


Figure 7.5. Reindeer and cows on the summer pasture at Menge Bulag.

Figure 7.6. Tsaatan children riding reindeer in the fall pasture.

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,

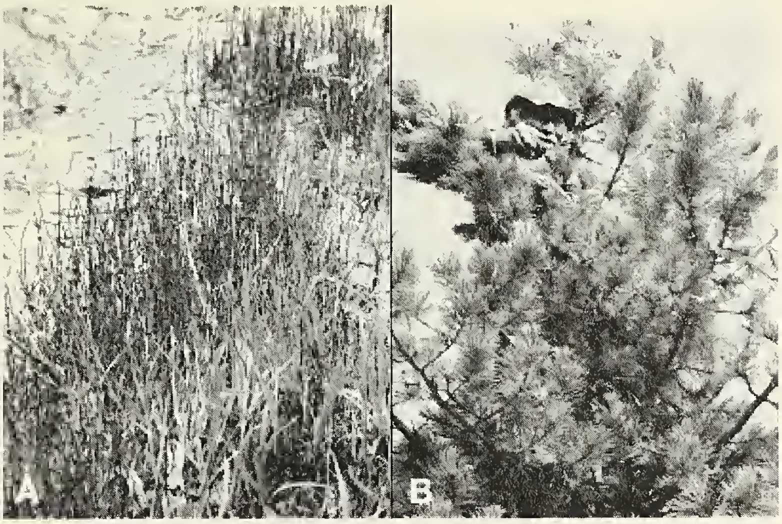


Figure 7.7. Plants used by Tsaatan: a. horsetails along the Joloc River provide fall fodder, b. Tsaatan herder Sanjim collecting pine nuts in the fall.

Figure 7.8. Urts *poles standing in a winter camp with larch and pine trees.*

Figure 7.9. Evidence of forest fire in a larch stand.

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

Figure 7.10. Reindeer does and a calf in the spring pasture.

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.

Contact Address: Smithsonian Center for Materials Research and Education, Museum Support Center, 4210 Silver Hill Road, Suitland, Maryland 20746-2863, and Department of Botany, National Museum of Natural History, Smithsonian Institution, 10th and Constitution Ave. NW, Washington, DC 20013-7012, e-mail: *depriesp@si.edu.*

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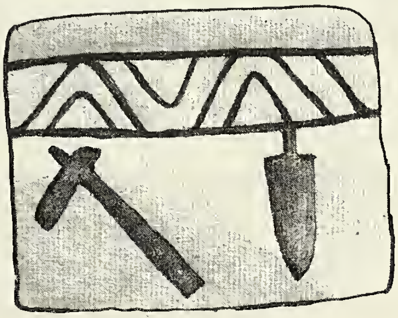
Цаа буга, Цаахаг, Цаатан: Духа буюу Монголын Цаатан нарын талаар хийсэн Угсаатны зүй-Экологийн судалгаа

Паула Т. ДеПриест
Смитсоны Хүрээлэн дэх Байгалын Түүхийн Үндэсний Музейн
Ургамал судлалын тэнхим

Духа буюу Монголын Цаатнууд нь Монголын баруун хойд хэсгийн Саяны нуруунд амьдрах цаа буга маллаж нүүдэллэдэг анчин гөрөөчин хүмүүс юм. Өөрсдийн малладаг цаа бугын амьдрах нөхцөл нь болсон тундар болон тайгын билчээрийн тэжээлээс хамаараад цаатнууд нь мод, бут, эмийн ургамал, хаг, мөөг зэргийг эрт дээр үеэс уламжлан тун чадамгайгаар таниж мэдэн нэрлэж ирсэн байна. Альп тундарт зусах ба тайгад өвөлжихийн хоорондох улирлын чанартай нүүдлийнхээ үеэр тэд нэлээн олон төрөл зүйлийн ургамлыг олж хэрэглэдэг байна. Морин сүүл (Equisteum sp.) гэх мэт эдгээр төрөл зүйлийн зарим нэг нь цаа бугын маллагаанд зориулагдан Жолхын голын сав газраар намрын цагт олддог байна. Боргоцойн самар (Pinus sibirica) гэх мэт зарим нэг нь Дархадын хотгорын доод захаар орших ой хөвчөөс өвлийн цагт идэш тэжээл хуримтлуулах зорилгоор хэрэглэдэг байна. Зарим нэг нь дээр үеэс уламжлал болон хэрэглэгдэж байсан боловч одоо хориглогдсон байна. Эдгээрт Бусийн голын хавь орчмоос зуны улиралд хус модны үйс цуглуулах уламжлалт зан үйлийн дагуу хус модны үйс (Betula sp.) түүх зэрэг орно. Хамгийн сонирхолтой нь Жолх болон Жамс голын дархан цаазат цөөн газарт тааралдах Монголд ховордсонд тооцогддог жодоо (Aibes sp.) гэх мэтийн шилмүүст моднууд Бөөгийн мөргөлд хэрэглэгдсээр ирсэн байна.



West Taiga Tsaatan at Menge Bulag tundra camp in June 2001. (photo: Fitzhugh)

8

Ethnography of the West Taiga Tsaatan Reindeer Herders

Ts. Ayush
National Museum of Mongolian History

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 Hotgoid 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 Soyon [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 tugrugs 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 *urts* depends on the number of family members and their financial status, the roof of a typical *urts* 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 cold season, while they eat reindeer milk products, pastry, bread, pancake, and fried dough 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 *urts* 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 *urts*.

All Tsaatan families keep a small object wrapped in a cotton bag in the position of honor in their *urts*. 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.

Figure 8.2. Reindeer herders have recently begun to herd livestock typically herded by their Mongolian neighbors.

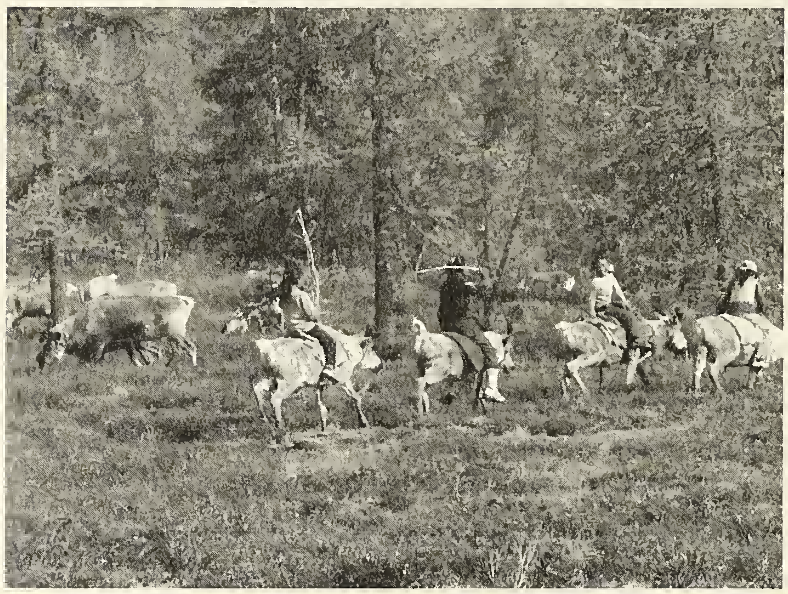


Figure 8.3. Tsaatan children usually look after reindeer in the summer time.

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 bosgoh*. 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 mamber 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.

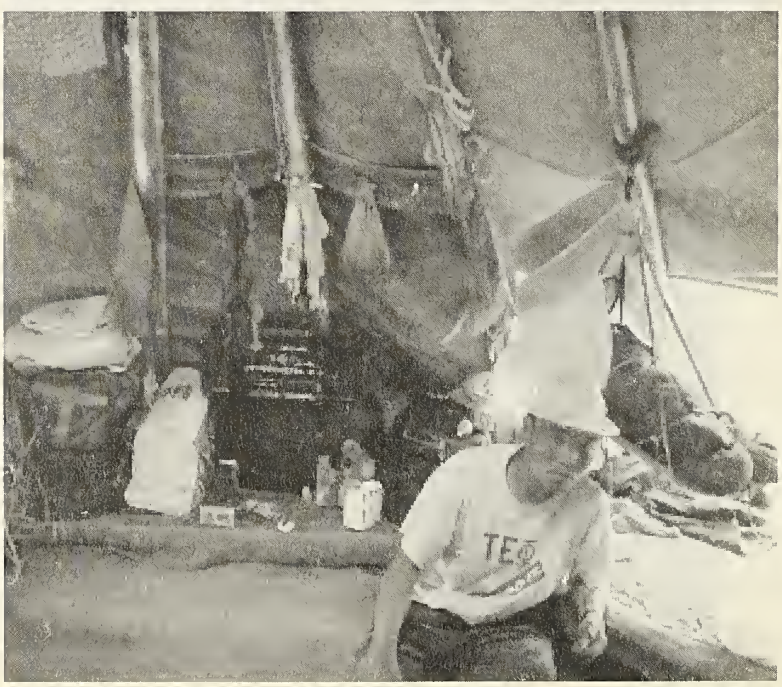


Figure 8.8. The interior of an urts.

Figure 8.9. *Preparing breakfast.*

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

Figure 8.11. An ongon-sakhiul *of a reindeer herding family.*

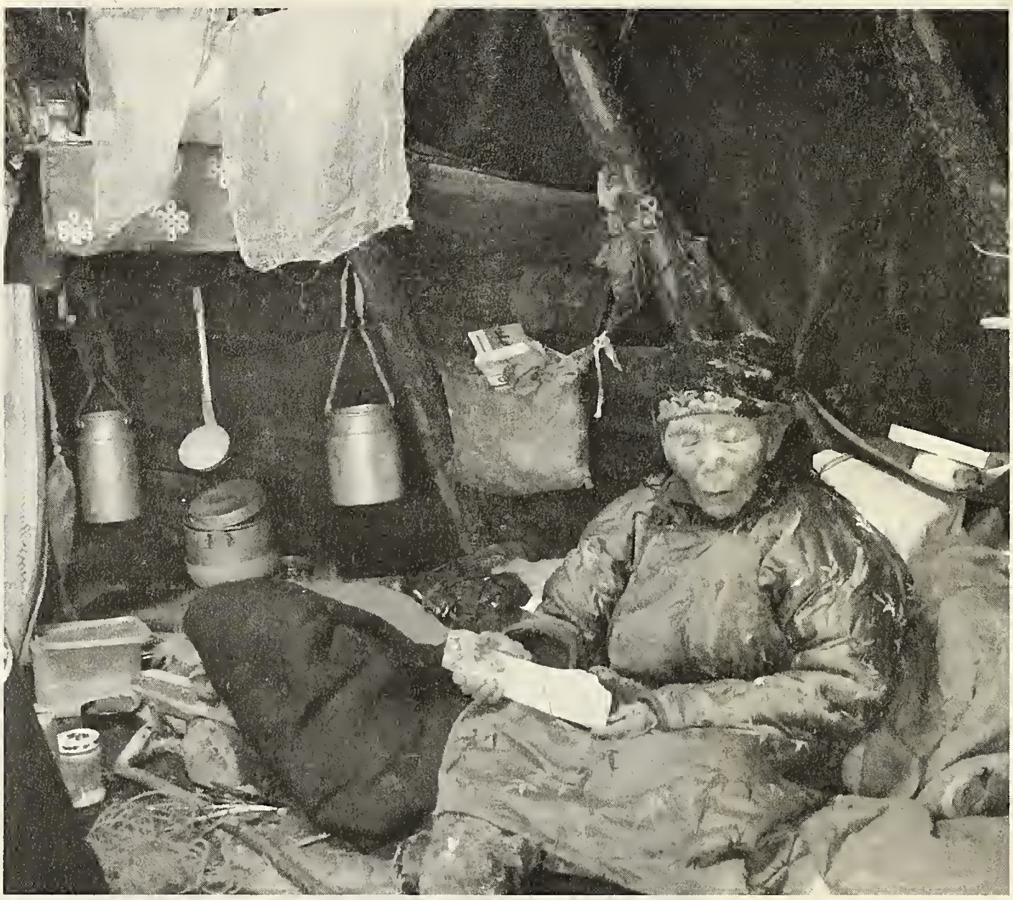


Figure 8.12. The 100-year old Tsaatan reindeer herder shaman named Suyun.

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.

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2003 онд Цаатан нарын дунд явуулсан угсаатны зүйн судалгааны зарим үр дүн

Ц.Аюуш
МҮТМ-н эрдэм шинжилгээний ажилтан

Энэхүү илтгэлд 2003 онд "Буган чулуун хөшөө" төслийн хүрээнд Хөвсгөл аймгийн Цагаан хуур сумын Цаатан нарын дунд явуулсан угсаатны зүйн судлагааны зарим үр дүнгийн талаар авч үзсэн болно. Тухайлбал цаатангуудын уг бүс нутагт нүүдэллэж ирсэн он цаг эдүүгээгийн нутагшилт, тэдний аж ахуйн уламжлал, нүүдэл, уналга болон тээврийн тоног хэрэглэлийн онцлог, орон сууц, хоол ундны төрөл зүйл, бэлтгэх арга, мөн цаатангуудын бөө мөргөлийн талаарх судлагааны хэрэглэгдэхүүнд зарим ажиглалт, дүгнэлт хийхийг оролдсон.

Хөвсгөлийн бүс нутаг нь угсаатны түүхийн хувьд багагүй сонирхолтой нутаг. Өнгөрсөн зууны эхэн гэхэд энэ бүс нутагт аж ахуй, хэл аялгуу болон соёлын талаараа зарим өвөрмөц ялгаа бүхий түрэг, монгол угсаа гаралтай том, жижиг хэд хэдэн угсаатны бүлгүүд нутаглан сууж байсан.

Цаатан нарын хувьд тэд яг хэдий үед энд ирж нутаглах болсоныг судлаачид тодорхой хэлээгүй байна. 1764 оны Шавийн тоо бүртгэлийн дансанд "отог шавиас 192 цаа бүртгэв" гэсэн мэдээнээс үзэхэд 18-р зууны 2-р хагас гэхэд цаатангууд одоогийн нутагтаа нүүдэллэж ирээд байсан нь лавтай байна.

Эдүгээ цаатангууд Хөвсгөл аймгийн Цагаан нуур сумын баруун болон умард бүс нутгийн өндөр уулын тайгад нутаглаж байна. Нэг айлд байх цааны тоо ихээхэн зөрөөтэй, зарим айлд 60-70 цаа, ихэнх нь 20-н хэдээс 30 орчим цаатай, 10 хүрэхгүй цаатай айл хэд хэд байгаагийн дотор ганцхан цаатай айл ч байна. Мөн айл бүр цөөн тооны адуутай, бас тэдний нэлээд нь сүүл үед үхэр, ямаатай болоод байна. Цаатангууд цаагаа голдуу ачих, унах, дулааны улиралд сүү саалийг нь авах, маш бага хэмжээгээр махыг нь хүнсэнд хэрэглэж байна.

Цааны аж ахуйтай холбогдох соёлын нэг уламжлал бол уналга, ачилгын тоног хэрэглэл юм. Нэг айл 2-оос доошгүй эмээлтэй, 6-7 ачааны янгирцагтай, нэг буудлаас нөгөөд нүүхдээ нэг айл ихэвчлэн 2 удаа нүүдэл хийдэг, эхлээд "зөөвөр нүүх" гэж эхний ачааг хүргэдэг, дараа нь гэр орноо нүүлгэдэг байна.

Цаатангууд эдүгээ уламжлалт орон сууц болох урцандаа амьдарцгааж байна, гэхдээ сүүлийн үед зарим айл жижиг модон байшин барьж суух, мөн урцны дотоод тавилга зэрэгт зарим шинэ зүйл нэвтэрүүлээд байна.

Цаатангуудын хоол ундны нэр төрөлд цааны сүү цагаа, ангийн гаралтай хоол хүнс давамгайлж байна. Мүн махан хүнсэндээ адуу, бас сүүлийн үед үхрийн мах хэрэглэх заншил ч нэлээд дэлгэрч байна. Харин цааны махыг хоол хүнсэнд төдийлөн хэрэглэхгүй байна. Талх барих, түүнийг хоол хүнсэндээ хэрэглэж эхэлсэн нь цаатангуудын хувьд маш чухал зүйл болжээ гэж хэлмээр байна.

Цаатангууд одоо хүртэл бөө мөргөлийнхөө шүтлэгийг хаяагүй явна. Цаатан айлд ороход урцны хойморт жижиг даавуун ууттай зүйл өлгөөтэй байхыг хялбархан ажиглаж болно. Зарим айлд нэг, заримд нь хоёр ч ууттай ийм зүйл байдаг. Тэд үүнийгээ "ээрэн", "онгод", "сахиул" гэхчилэн өөр өөрөөр нэрлэнэ. Бөөгийн онгод нь зарим үед шувуу, амьтдын дүрээр үзэгдэж, харагддаг гэх буюу

ялангуяа баавгайн дүрээр онгоноо төсөөлөх, баавгай онгоноо бүр газар дэлхийн онгон-ээрэн гэх үзэл ч хадгалагдсаар иржээ. Энэ нь Тагна-Соён, Сибирийн ой тайгаар оршин сууж байсан угсаатан-ард түмнүүдийн эртний бөө мөргөлийн онгоны тухай төсөөллийн ул мөр гэж хэлж болно.

Ер нь цаатангуудын амьдралын уламжлалт хэв маяг, тэдний өнөөгийн байдлыг цаашид нарийвчлан судлах, товчоор хэлбэл, тэднийг үнэн зөв ойлгох явдал чухал байна. Цаатан нарыг гоё сайхан байгалийн дунд өвөрмөц сонин дадал заншилаа хадгалж яваа ховорхон хүмүүс мэтээр ойлгомооргүй байна. Цаатангууд өнөөдөр байгалийн хамгийн хүнд нөхцлийн дунд ашиг шим нэн бага аж ахуй эрхэлж байна.

Bayandalai with leather lasso rounding up horses. (photo: Fitzhugh)

9

Fourteenth Century Mummified Human Remains from the Gobi Desert, Mongolia

Naran Bazarsad, Institute of Archaeology
Mongolian Academy of Sciences, Ulaanbaatar, Mongolia

Bruno Frohlich, Department of Anthropology
National Museum of Natural History, Smithsonian Institution

Natsag Batbold, Institute of Archaeology
Mongolian Academy of Sciences, Ulaanbaatar, Mongolia

David Hunt, Department of Anthropology
National Museum of Natural History
Smithsonian Institution

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

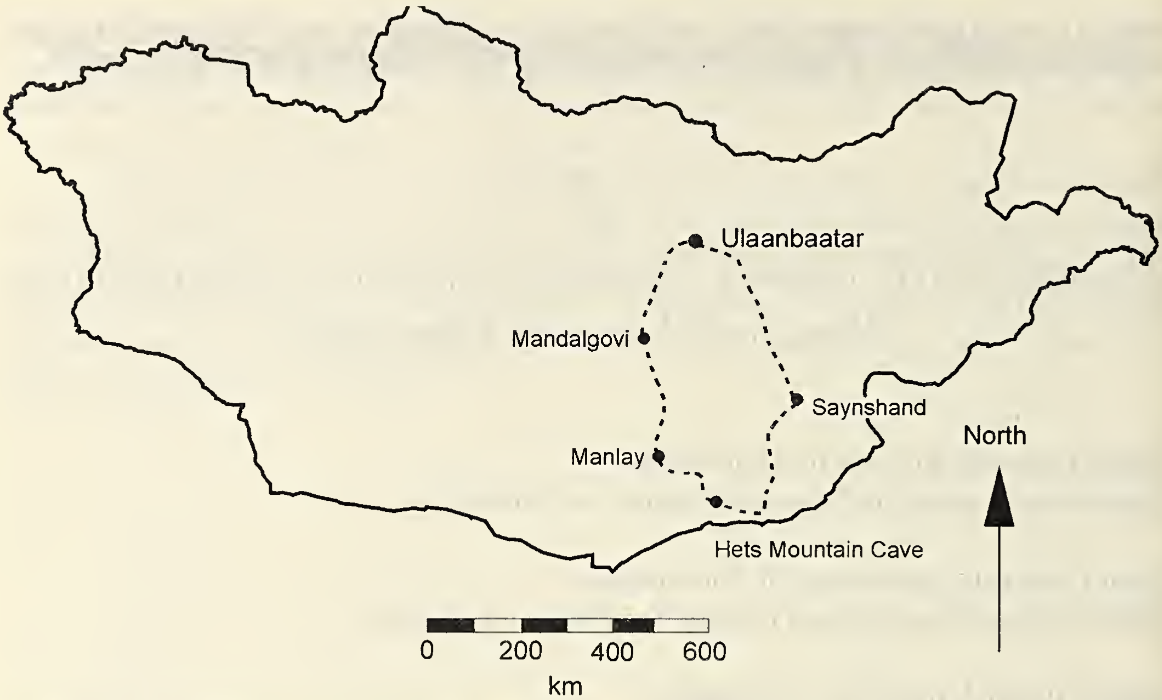


Figure 9.1. Location of Hets Mountain Cave.

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 Dashsamba

Figure 9.2. Survey team. Left to right: N. Batbold, G. Sukhbaatar (driver), B. Erdene, B. Frohlich, T. Amgalantugs, and N. Bazarsad.

Figure 9.3. Hets Mountain area.

massacred his entire family during a killing rampage and later escaped criminal charges by fleeing across the border to China. Originaly 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.

Figure 9.4. Natsag Batbold entering the second tunnel.

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

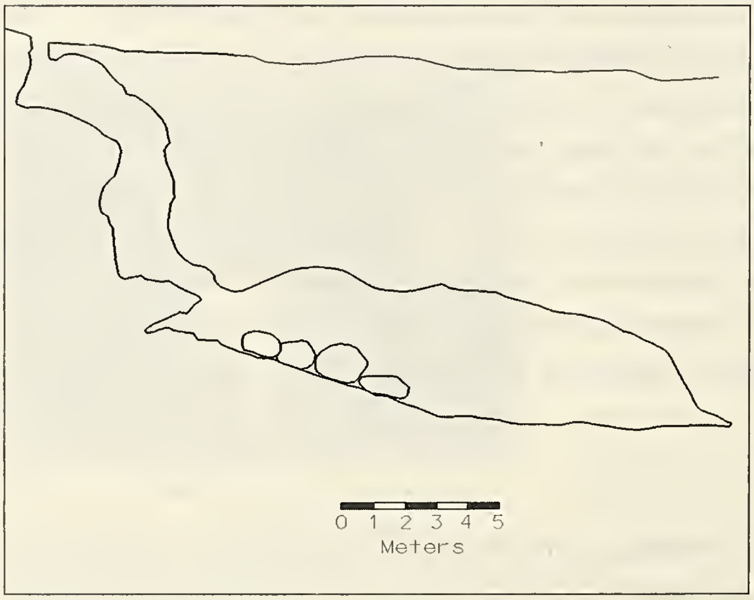


Figure 9.5. Lateral section of cave.

Figure 9.6. Cave viewed from western end.

Figure 9.7. N. Batbold and T. Amgalantugs mapping 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).

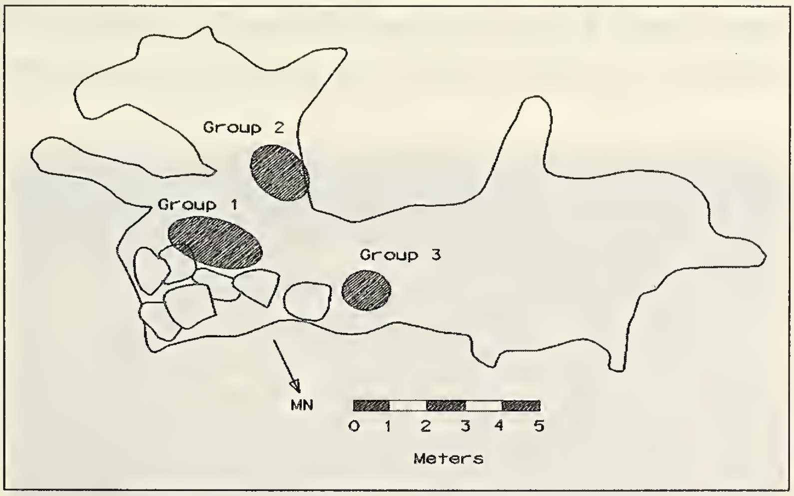


Figure 9.8. Horizontal view of cave. Hatched areas include major concentration of human remains. Cave entrance is a meter southeast of Group 1.

Figure 9.9. Group 1 human remains. Looting has resulted in some disarrangement of bodies and body parts.

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

Figure 9.10. Group 1 human remains.

Figure 9.11. Forty year-old woman with fractured neck.

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

Figure 9.12. Facial view of forty year-old woman seen in 9.11.

Figure 9.13. Sampling the material for radiocarbon dating. Left to right: N. Bazarsad, N. Batbold, B. Erdene, and B. Frohlich.

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

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

innominate bone (hip bone) with a white surface color was also found. Such light coloration is an indication of exposure to direct sun light 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.

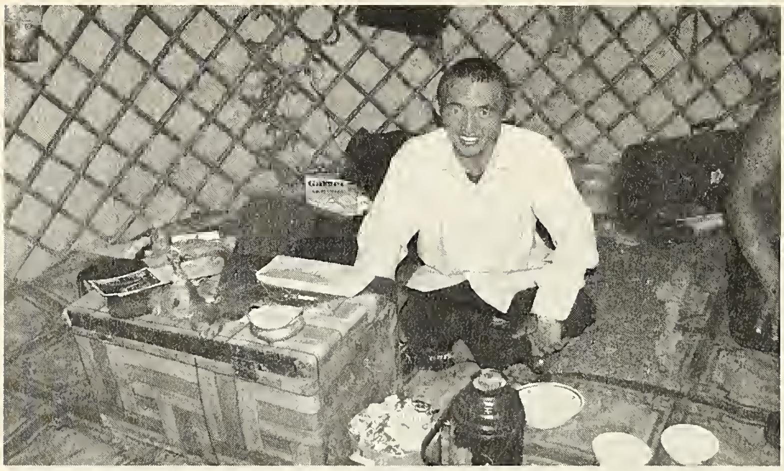


Figure 9.14. Buddhist lama explaining · paraphernalia thought to protect people from sickness.

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 Omno Gobi 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 Omno Gobi 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 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.

Tugsu transporting a mummy. (photo: Frohlich)

Монголын Говиос олдсон 14-р зууны үед холбогдох хүний занданшуулсан шарил

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

(1) Монголын Шинжлэх Ухааны Академийн Археологийн Хүрээлэн, Улаанбаатар
(2) АНУ–н Смитсонийн Институт дэх Байгалийн Түүхийн Үндэсний Музейн Антропологийн Тэнхим

2004 оны хавар Монголын Шинжлэх Ухааны Академийн Археологийн Хүрээлэн, Смитсонийн Институтын Антропологийн Тэнхмийн гишүүдээс бүрдсэн таван хүний баг Монголын Говийн Хятад Улстай хил залгаа өмнөд хэсэгт орших газар доорх нэгэн агуйг очиж судалсан юм. 1974 онд энэ агуй нь анх Монгол Улсын Засгийн газарт бүртгэгдсэн бөгөөд хожим 1982 онд Монголын эрдэмтэд очиж судлаж байсан байна. өмнө нь тэмдэглэгдэж байснаас үзэхэд уг агуйгаас дор хаяж 12 ширхэг занданшуулсан хүний шарил олдсон бөгөөд зарим нь тоногдож байсан байна. 2004 оны эхээр Монголын Шинжлэх Ухааны Академиас урьд мэдээлэгдсэн олз ашиг хайгчдын тоножс сүйтгэсэн хэсгийг судлах, мөн үлдсэн хэсгийг хамгаалалтанд авах шийдвэр гаргасан байна. Бид нарыг 2004 оны 5 сард очиход агуйн үлдсэн хэсэг нь ч гэсэн тоногдож сүйтгэгдсэн байсан ба бид хамгаалах бас судлах зорилгоор үлдсэн хэсгийг Улаанбаатар хот руу нүүлгэн шилжүүлэхээр шийдвэрлэв.

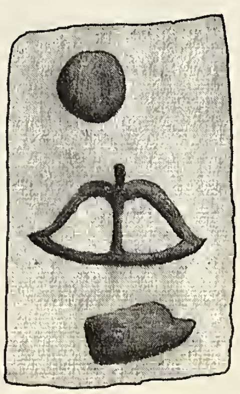
Үлдэгдэл хэсгийг хамгаалан Улаанбаатар руу зөөвөрлөхөд бүх зүйлийг аюулгүй байлгахад бидний энэ богино аялал төвлөрч байсан юм. Агуйг судлан газрын зурагт буулган зарим нэг туршилтын малтлагыг хийсэн бөгөөд хэдэн жилийн настайг тодорхойлох үүднээс шарилаас эд эсийн дээж шинжилгээнд авсан. Мөн ойр орчмын газар нутгийн байдлыг тодорхойлон газрын зурагт тэмдэглэсэн. Ийнхүү агуйд ажиллах явцдаа шарилын үлдэгдэл хэсгийг хянамгай дүрсэлсэн бөгөөд шарилыг хөндөж гэмтээхгүй нарийн аргаар фото зургийг авсан болно.

Судалгааны ажлын хүрээнд хийсэн ажиглалтуудаас доорх дүгнэлтүүдийг гаргаж болно: 1) Уг агуй нь Монгол Хятадын хилээс хойд зvгт 5 км зайд, зүүн уртрагийн 108-аас зүүн тийш 25 км зайд оршиж байна. Мөн энэ агуй нь газрын түвшнээс доош 13 метрийн зайд байрлах бөгөөд тавцан болон хоолойн тогтцоос бүрэлдсэн байна. Агуйн хамгийн урт хэсэг нь 16.8 метр,өргөн нь 5.9 метр, өндөр нь 3.4 метр тус тус хүрнэ. Бидний энэ удаагийн судалгаанаас харахад хэдийгээр зарим нэг хүний гараар бvтсэн байгууламжууд байж болох боловч энэ агуй нь байгалийн тогтоцоор үүссэн гэж бид үзэж байна. 2) Агуйгаас олдсон нийт шарилын тоо 13-15 ширхэг. Эдгээрээс арван шарилынх нь хатуу ба зөөлөн эдийнх нь зарим нь бүтнээрээ хадгалагдан үлдсэн байсан бөгөөд байгалиас занданшуулагдсан байсан учраас ингэсэн байх магадлалтай. 3) Эдгээрийн зөвхөн 3 шарилаас нь гавлын яс олдсон байна. Гавлын яснууд алга болсон шалтгаан нь сүүлийн 30 жилийн турш ашиг хонжоо хайгчдын сүйтгэсэн үйл ажиллагаанаас болсон гэж бид таамаглан дүгнэлээ. 4) Нилээн хэдэн тооны ялган танихын

аргагүй болсон яснууд зарим нэг газар тархан байрласныг олсон бөгөөд энэ нь мөн л буруугаар ашиглах гэсэн сүйтгэгчдээс болсон гэж үзэв. 5) Бүтнээрээ үлдсэн шарилуудыг бүртгэн үзэхэд дөрвөн насанд хүрсэн хүн, хоёр өсвөр насны хүн, нэг хүүхэд, гурван нярай хүүхэд байсан байх магадлалтай байна. Насанд хүрсэн хүмүүс болон өсвөр насны хүмүүсийг ажиглахад дөрвөн эрэгтэй хоёр эмэгтэй байсан гэж ялгаж болохоор байв. 6) Үхлийн шалтгаан нь боомилж, дүүжилж алсан эсвэл хүзүүний орчим хүчтэй гэмтээснээс болсон байх магадлалтай байв. Гэмтсэн хэсгээс авсан зөөлөн эдийн зураасыг харахад боомилох явцад олс дээс хэрэглэсэн байж болзошгүй. Хоолойны орчимд ороосон байдлаар эсвэл хоолойны ойролцоо байгаа байдлаар олснууд олдсон байна. 40 гаран насны эмэгтэйнх нь нурууны үе болон чамархайн үений дунд хэсэгт гэмтэл авсан тод ул мөр харагдсан байв. Энэ нь бусдаасаа өөр маягаар амиа алдсан болохыг харуулж байна. 7) Энэ нь цаг үеийн хувьд хэдий үед хамаарагдахыг одоогоор тогтоогоогүй.

Нутгийнхны ам дамжсан ярианаас үзэхэд 65-70 жилийн өмнө энэ хавьд хүмүүсийг хороосон явдал гарч байсан байна. Бидний судалгааны ажлын үед эдгээр шарилтай холбоотой ямар нэгэн соёл иргэншлийн чанартай ул мөр баримт ажиглагдаагүй. Шарилаас авсан эдийн шинжилгээ болон олсны хэсэгт хийсэн шинжилгээний он цаг тодорхойлсон хариултыг аль болох хурдан гаргах болно. 8) Шарил одоогоор Улаанбаатарын Археологийн Хүрээлэнд хадгалагдаж байгаа бөгөөд цаашид Смитсонийн Институтын томографийн аппарат гэх мэт гэмтэл, хор нөлөө учруулахгүй арга техник хэрэгслийг ашиглан судалгаа шинжилгээний ажлыг үргэлжлүүлэн хийхээр төлөвлөж байна.

Бид өөрсдийн зорьсон хэргээ долоо хоногийн дотор бүтээсэн ба 1908 километрийг техникийн яльгүй жижиг сааталтайгаар туулсан. Бид цөөхөн хүнээс бүрдсэн боловч өндөр бтээлтэй хамт олныг бүрдүүлэн агуйгаа олох, доторх зүйлсийг нь тэмдэглэн бүртгэх, Улаанбаатар дахь Институт руугаа бүх зүйлээ аван буцах зэргээр маш амжилттай ажилласан. Бидний амжилт нь хамт олны гар нийлсэн ажиллагаа, институт болон тэнхимээс үзүүлсэн тусламжууд болон Монголын Шинжлэх Ухааны Академи, Монголын Ардын Арми, Смитсонийн Институт гэх зэрэг Монгол Америкийн засгийн газрын байгууллагуудын хамтын ажиллагааны үр дүнд бий болсон юм.



10

Some Comparative Analysis of Alpine/Arctic Plants in Hovsgol Province of Northern Mongolia

Ts.Tsendeehuu
Department of Botany, Faculty of Biology
National University of Mongolia

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, Sellagnella, Thalictrum, Betula,* as well as various kinds of grasses and sedges probably dominanted 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.

Family	Genus	Species	Author
63	230	609	Grubov 1955
67	259	746	Batraeva and others 1976
68	262	750	Ivelskay and others 1979
90	305	914	Gubanov 1996

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 oxyodonta* 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, Cetaria, 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), Icmadophila (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),* *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 is 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 Kazakstan, etc.) was used in the analysis. Also, the value Ss was calculated along with Sorenson's coefficient of similarity (Martin Kent and Paddy Coker 1992). The value Ss is defined as Ss=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 (Ss=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 *Betulacaceae.* 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, Caryophylaceae, 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.

Main group		Hovsgol			Alaska		
		Family	Genus	Species	Family	Genus	Species
Pteridalis		12	15	28	14	21	65
Gymnospermae		3	6	8	3	9	15
Angiospermae	*Monocots*	18	58	213	14	102	443
	Dicots	57	225	665	58	280	1036
Total vascular plants		90	305	914	89	412	1559

Table 10.3. Comparison of the main families of vascular plants in Hovsgol and Alaska.

Dominant families in Mongolian flora	Coefficient similarity (Ss)	
	Genus	Species
Astraceae	0.18	0.08
Fabaceae	0.37	0.10
Poaceae	0.27	0.13
Rosaceae	0.25	0.15
Brassicaceae	0.22	0.12
Cyperaceae	0.36	0.17
Ranunculaceae	0.24	0.15
Chenopodaceae	0.15	0.07
Lamiaceae	0.00	0.00
Caryophylaceae	0.35	0.16
Strophulariceae	0.21	0.27
Polygonaceae	0.20	0.10
Apiaceae	0.30	0.05
Salicaceae	0.33	0.13
Alliaceae	0.50	0.10
Boragnaceae	0.21	0.06
Gentainaceae	0.23	0.13
Orchidaceae	0.50	0.21
Juncaceae	0.40	0.24
Primulaceae	0.13	0.22
Saxifragaceae	0.00	0.16
Plumbaginaceae	0.00	0.00

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).

The most similar genus	Coefficient similarity (Ss)	
	Mongolia-Alaska	Hovsgol-Alaska
Lycopodium	0.4	0.28
Equisetum	0.47	0.46
Botrichium	0.36	0.25
Selaginella	0	0
Dryopteris	0.5	0.4
Cystopteris	0.4	0.4
Woodsia	0.26	0.31
Pinus	0	0
Picea	0	0
Abies	0	0
Larix	0	0
Agrostis	0.32	0.35
Bromis	0	0
Calamogrostis	0.15	0.12
Festuca	0.16	0.15
Hierochloe	0.33	0.33
Poa sp	0.16	0.19
Carex	0.17	0.15
Eriophorum	0.37	0.3
Kobresia	0.33	0.46
Juncus	0.24	0.12
Lusula	0.33	0.33
Cypripedum	0.33	0.33
Populus	0	0
Salix	0.15	0.15
Betula	0.18	0.17
Polugonum	0	0
Caltha	0.36	0.36
Thalictrum	0.25	0.31
Saxifraga	0.28	0.23
Dryas	0	0
Potentilla	0.16	0.23
Rubus	0.3	0.3
Arctuos	0.4	0.5
Oxycoccus	0.4	0
Rhododendron	0.22	0.22
Vaccinium	0.25	0.27
Primula	0.1	0.13
Gentiana	0.13	0.15
Artermisia	0.45	0.13
Hieracium	0	0

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.*

Hovsgol		Alaska	
Genera	Species	Genera	Species
5	11	14	37
Both Sites			
Genus		Species	
4		6	
Coefficient Similarity (Ss)			
0.24		0.17	

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.*

Hovsgol		Central Siberia	
Genus	Species	Genus	Species
5	11	10	20
Both Sites			
Genus		Species	
4		8	
Coefficient Similarity (Ss)			
0.40		0.34	

Names of the species in both areas: *Ledum decumbens, L. calulata, Vaccinium uliginosum, Rhododendron adamsii, Rh. aureum, Rh. parvifolium, Arctous alpine, Chameadephne calculata.*

Table 10.7: Comparison of the genus Ericaceae *in Alaska and Central Siberia by coefficient of similarity*

Alaska		Central Siberia	
Genus	Species	Genus	Species
14	37	8	14
Both Sites			
Genus		Species	
9		12	
Coefficient Similarity (Ss)			
0.41		0.26	

Names of the species in both areas: *Ledum decumbens, L. palustre, Vaccinium uliginosum, Rhododendron parvifolium, Chameadephne calyculata, Vaccinium vidis-idaea, Arctostaphylos uva-ursi, Oxycoccus palustris, Ox. Microcarpus, Andromedia polifolia, Cassiope tetragona, Phyllodoce coerulea.*

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)

Seasons	Beginning and finishing date in Hovsgol tundra	Lichen, kilogram/ha
Summer	June 25-August 20	0.5-1.2
Autumn	August 20-October 25	2.4-3.6
Winter	October 25-April 20	3.7-4.6
Spring	April 20-June 25	2.7-3.6

Table 10.9. Plants grazed by Reindeer.

Hovsgol Alpine Tundra		Summer time	Winter time
Vascular plants	Family	19	5
	Genera	36	5
	Species	56	8
Lichen (dominated by *Cladonia*, *Cetraria*, and *Peltigera*)	Genera	6	5
	Species	22	50
Mushroom	Genera	5	-

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.

Season	Winter	Early spring	Late spring	Summer	Early autumn	Late autumn
Tundra	10-20	10-20	30-50	18-40	20-40	14-20
Forest tundra	10-15	10-15	30-50	18-25	20-40	14-20

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.

100kg/ha Pasture type	Willows	Birch	Herb	Sedge	Grass	Lichen	Total
Birch-lichen-herb-moss	-	11.0	9.0	-	-	22.0	33.9
Herb-sedge-*salix*	2.2	-	7.6	7.5	0.7	-	18.0
Sedge-herb-heavily grazed	-	-	6.6	8.5	-	-	15.1
Sedge-grass-herb-*salix*	2.2	-	9.9	10		-	22.1
Birch-salix-lichen-herb	7.0	7.0	1.6	-	-	16.5	25.2
Lichen	-	-	-	-	-	19.0	19.0

Table 10.12. Diet selection of the reindeer in their summer pasture (Menge Bulag, summer camp), July 2001 (Note: + is degree of pasture selection).

Lichens and Mosses	*Cladonia*	++++
	Stereocaulon	+
	Leafy moss	0
Willows & Birch	*Salix*	++++
	Salix dwarf	++++
	Betula rotundifolia	++++
Flowering plants	*Caltha sp*	+++
	Polygonum sp	+++
	Pedicularis sp	+++
	Polygonum viviparum	++
	Gentiana grandiflora	++
	From *Compositae*	+
	Ranunculus sp	+
	Potentilla sp	0
	From *Apiaceae*	0
	Trollius	0
	Myosetes	0
	Allium sphaenophragum	0
Sedge and Grass	*Carex*	++
	Bromus/Festuca	+

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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 DePriest 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 dorogostaiskii, *relic vegetation from the period of glaciation, found beside the Jamso River, 2002.*

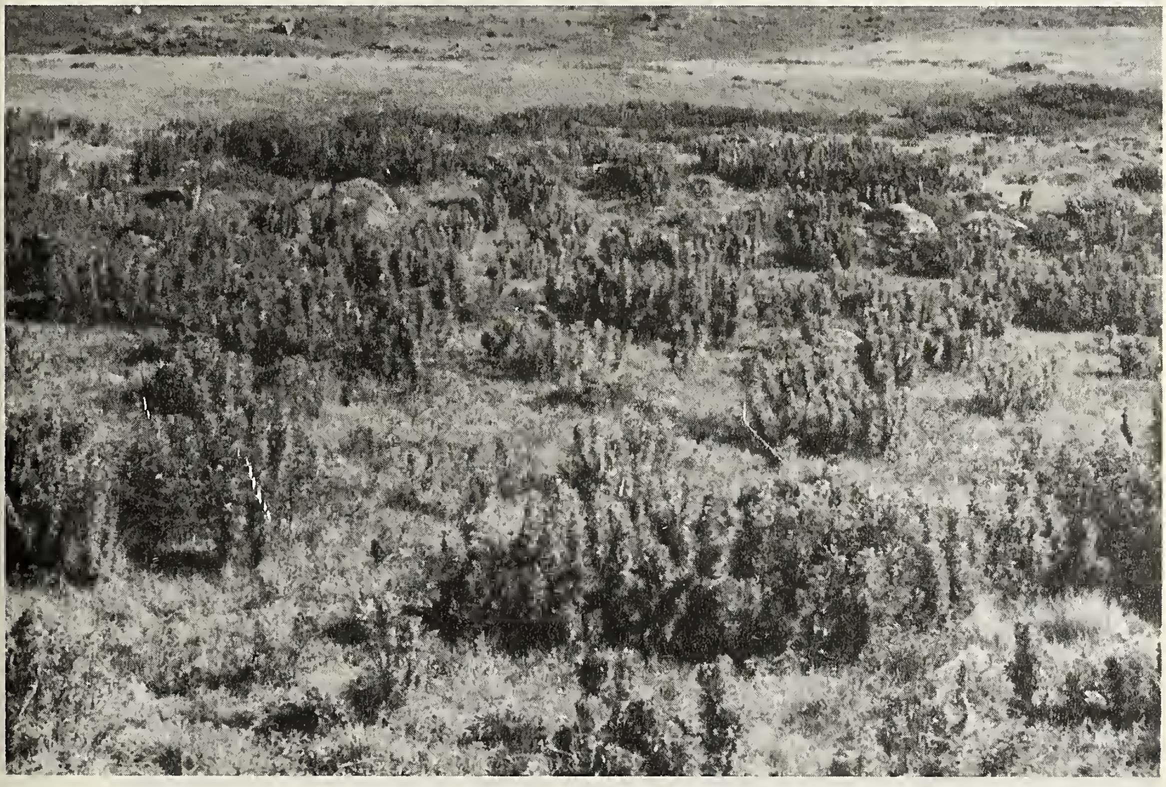

Figure 10.5. Caragana jubata, *relic vegetation from the period of glaciation, near the Evt Mountain pass, 2002.*

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.*

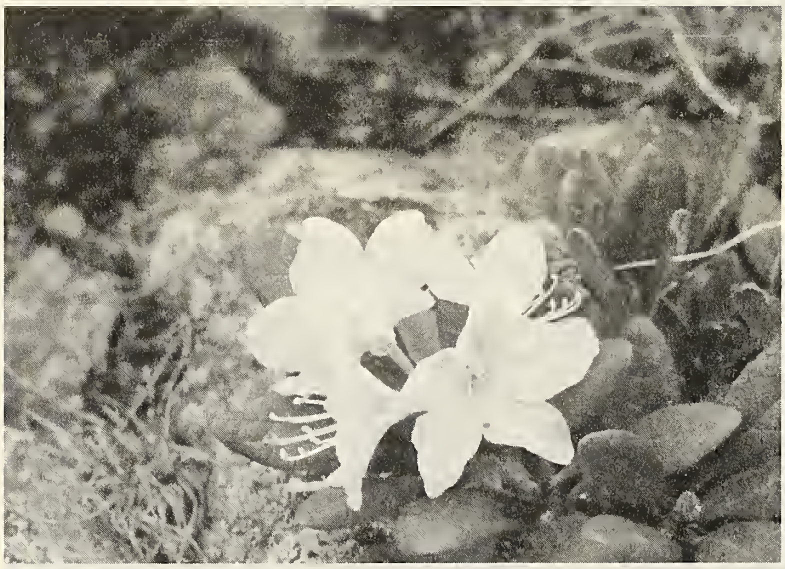

Figure 10.8. Rhodendron aureum, *a rare plant in the taiga, near Uhert Mountain pass, 2001.*

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.

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Хөвсгөл аймгийн тайгын бүс дэх туйлын ургамлын зарим харьцуулсан судалгаа

Ц.Цэндээхүү
МУИС-ийн Биологийн тэнхэмийн Ургамал судлалын хэлтэс
Улаанбаатар, Монгол

Бид 2001-2002 онуудад `Reindeer herders, global change, and the prehistory of Hubsugul Province, northern Mongolia` (W. Fitzhugh, S. Young) төслийн багт ажиллаж Мөрөн-Улаан уул-Соёо-Мэнгэ булаг-Цагаан уул-Мөрөн замаар экспедицийн хээрийн судалгаанд оролцсон, мөн 2000 онд Хатгал суурингаас Хорьдил Сарьдагийн өндөр уулын тундрт (protected area) ургамлын цуглуулга хийж тодорхойлох ажлыг мориор аялж гүйцэтгэсэн юм. Эдгээр судалгаанд ботаник, флорын судалгааг ихэнхдээ ой тундрын бүсэд явуулсан.

Смитсоны Хүрээлэн, Үндэсний Байгалийн Түүхийн Музей, Туйл Судлалын Төвөөс Монголд явуулж буй хамтарсан төсөлд Умард Монголын Хөвсгөл мужийн байгаль орчин, соёл, археологи, уур амьсгал, ургамал судлалын өнгөрсөн түүх өнөөгийн байдлыг умардын (circumpolar north) судлал, Арктикийн экосистемтэй холбож судлах асуудлыг дэвшүүлсэн нь бидний анхаарлыг татсан.

Монголын ургамал газар зүйн 16 тойргийн нэг нь болох Хөвсгөлийн уул тайгийн ургамлын аймаг, ургамалжилтийг (flora and vegetation) орос монголын судлаачид нилээд судалсан боловч Сибирь, Зүүн хойд Ази, Номхон далайн умард хэсэгт түүхэн талаас нь холбож харьцуулаагүй, барууны эрдэмтэдтэй хамтарсан ажил байхгүй байна. Ийм учраас Хөвсгөл орчмын ботаник, фитогеографын судалгаа ба түүхын асуудлыг Умардын судлалтай холбож үзэх санаа төрсөн юм.

Иймээс Хөвсгөлийн уул тайга тундрын ботаникийн судалгааг Сибирь ба Аляскийн Арктикийн флортой харьцуулж үзсэн анхны оролдогыг энэ өгүүлэлд тусгасан болно. Харьцуулсан анализын үр дүнд Хөвсгөл ба Аляскийн гуурст ургамлын овгийн тоо бараг адил 90 ба 89, төсөөтэй коэффициент нь 0.42, эдгээрээс хос талт ургамлын тоо мөн адил (57 ба 57) байна. Монголын флорт хамгийн олон зүйл агуулсан 23 том овгоос 26% нь Аляскийн флортой төстэй байна.

Альп/Арктикийн тундрт түгээмэл тархдаг 22 овгийн 41 төрлөөс Хөвсгөл ба Аляскт 16 төрөл нь төстэй (Ss = 0.3-0.5) эдгээрээс Eguisetum, Dryoptris, Botrychum, Eriophorium, Azctous, Caltha (Ss =0.5) хамгийн их төстэй, Монголын Eracaceae овог нь бараг бүтнээрээ Хөвсгөлийн ургамал газар зүйн тойрогт тохиолдох бөгөөд энэ овог нь Төв Сибирь ба Алясктай төсөөтэй байна. Экспедицын явцад тус овгоос Phylodoce coerulea зүйлийг Монголын флорт шинээр олж тэмдэглэсэн . Дээрх үзүүлэлт нь плейстоцены хожуу мөстлөгийн дараа Хөвсгөл, Сибирь, Аляскийн тэр үеийн ургамлууд адилхан хээр тундрын хэв шинжтэй байсныг харуулж байна. Харин голоцейны үед ихээхэн ялгаа гарсан нь тодорхой юм.

11

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
Sterling College, Vermont

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 a 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 Productivity Paradox

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 presencc 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 summcr 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 Vallcy 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 vallcy would providc 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.

The Beringian 'Birch Zone'

Virtually every palynological study conducted in Beringia whose time frame extends back into thc 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 pollcn. 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 warming climate would result in longer, warmers 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.

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Монголын Хөвсгөлийн бүсийн ургамалжилтын өнөөгийн байдал: Арктикийн Мөстлөгийн сүүн тэжээлтний нутаглаж байсан газрын нууцыг тайлах боломжит түлхүүр

Стивин Б Яан
Хойд Судлалын Төв

Монголын хойд хэсгийн Хөвсгөлийн бүсийн хүйтэн хэсэг нь цаг агаарын хувьд Беринг гэж нэрлэгддэг Берингийн Хоолойн Плейстоцений хожуу Үеийн зарим хэсэгтэй адил төстэй байдаг. Хөвсгөлийн бүсэд судалгаа хийх нь Хойд Америкийн баруун тийш чиглэсэн хүмүүсийн анхны нүүдэлтэй холбоотой Беринг орчмын байгаль экологийн талаарх асуултуудад хариулт авах чухал ач холбогдолтой юм. Хөвсгөлийн бүсийн өндөрлөг хэсэг нь одоо устаж үгүй болсон сүүн тэжээлтний нутагладаг байсан Берингийн газартай адил төстэй шинжийг агуулж болох бөгөөд сүүн тэжээлтний нутаг нь их хэмжээгээр амьдарч байсан талын өвсөн тэжээлтний талаар мэдэх боломжийг олгож болох юм. Далайн түвшнээс өндөрлөг хэсэгт орших альп тундрын бутлаг хус мод өргөн хэмжээгээр тархсан нутаг нь сүүн тэжээлтний нутаг нь хэрхэн шим тэжээл муутай бутлаг газраар солигдсон талаар тайлбар өгөх бас боломжтой юм. Плейстоцений төгсгөл үед устаж үгүй болсон Берингийн аварга биет сүүн тэжээлтний төрөл зүйлийн тайлагдаагүй нууцыг 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 a the National Museum of Mongolian History. (photo: Hunt)

12
Workshop Summaries

Harriet F. Beaubien
Smithsonian Center for Materials Research and Education
Smithsonian Institution

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.

Bruno Frohlich with students learning GIS in Ulaanbataar square. (photo: Neighbors)

Гуравдугаар хэсэг-Ажлын хэсгийн дүгнэлт

Хариет Ф Бөйбейн
Смитсонийн Материал Судлал ба Боловсролын Төв
Смитсонийн Институт

Монгол Америкийн хамтарсан "Буган чулуу хөшөө" төсөл нь эрдэм шинжилгээний анхны хурлаа жил бүр уламжлал болгох зорилготойгоор зохион байгуулсан юм. 2004 оны 6 сарын 2–оос 4 ний хооронд Монгол Улсын Улаанбаатар хотноо болж өнгөрсөн уг хуралд ихэвчлэн Монголын их дээд сургууль болон Улаанбаатарын музейн мэргэжлийн багш ажилтнуудаас бүрдсэн 50 гаруй хүмүүс оролцсон. Смитсонийн Институтээс Байгалын Түүхийн Үндэсний Музейн Антропологи, Ургамал судлал, үзмэрийн танхим болон үзмэрийн төвийн хэлтэс, Материал судлал болон Боловсролын Төвийг төлөөлөн нийт 9 мэргэжилтнүүд оролцсон билээ.

Смитсонийн болон Монголын эрдэмтэн судлаачид хоёр өдрийн турш Монголд явагдсан хуралд археологи, антропологи болон ургамал судлалын өргөн хүрээнд бэлтгэсэн илтгэлүүдээ тавьсан бөгөөд уг үйл ажиллагаа Монгол Улсын Их Сургуулийн эрдмийн танхимд болж өнгөрсөн. Гурав дахь өдөр нь буюу 6 сарын 4-ний өдрийг нийлмэл хоёр хэсгээс бүрдсэн дадлагын ажил хэлбэрээр зохион байгуулсан бөгөөд эхний хэсэг нь GIS буюу Газарзүйн Мэдээллийн Системийн талаар хуралд оролцогчдод танилцуулсан бол дараагийн хэсэг нь Монголын Үндэсний Түүхийн Музейд болж өнгөрсөн биетийн хэв цутгах үйл ажиллагаа болон музейн материал цуглуулах, хадгалах менежментийн асуудал дээр тулгуурлан явагдсан юм.

Музейн хадгалалт болон цуглуулалгын менежмент

Цуглуулга гэдэг бол ямар нэг биет зүйлийн бүрдэл. Энэ нь тухайн хайгуул, малтлагын ажлаас олж авсан материалуудыг илэрхийлэхээс гадна аль нэг институтээс дэлгэн гаргасан бүх л бүтэн эд агуурсыг ч бас багтааж болно. Цуглуулгыг нүдлэн хамгаалах амин чухал ухагдахуун нь цуглуулга бүрийн үнэ цэнийг олж мэдрэхэд оршино. Хамгийн гол нь цуглуулга гэдэг бол соёлын болон байгалын үнэтэй өвийг багтааж энэ талаарх мэдээллийг шууд дамжуулж байдаг материаллаг шинж чанартай гэдгийг ойлгох хэрэгтэй. Цуглуулгыг үнэ цэнэтэй болгох бас нэгэн хүчин зүйл нь цуглуулга бүр дээр бидний бичиж зүүдэг цуглуулгатай холбоотой бүртгэгдсэн баримт болон мэдээллийн агуулга, онцлох тайлбарууд нь юм.

Цуглуулга хийж эхэлсэнээс эхлээд дараагийн үеүдэд бид бүхэн цуглуулгыг дэлгэн үзүүлэх орчныг бүрдүүлэх болон өөрсдийн үйл хөдлөлөөр эд зүйлийн байгалиас заяасан материаллаг хэв шинжид ашигтайгаар эсвэл хохиролтойгоор нөлөөлөх алхамыг хийдэг. Эдгээрт хадгалах ба үзмэрт дэлгэн тавих орчин нөхцөл болон хадгалах судалгаа хийхтэй холбоотой үйл ажиллагаанууд багтана. Эд зүйлсийн онцгой чухал материаллаг хэв шинжийг аль болох гэмтээж муутгахгүй аргаар аль болох хамгаалалт сайтай орчин нөхцөлд хадгалж үзүүлэх нь амьдрал дээр хамгийн бэрхшээлтэй асуудал байдаг билээ.

Цуглуулга хийх үйл ажиллагаа нь эд зүйлсийг орчин тойрон, бусад баримт сэлтээс нь биетээр салгаж авдаг учир анхны байдлаар нь орчинтой нь уялдуулж дахин сэргээх нь хамгийн шийдвэрлэх чухал асуудал байдаг. Эд зүйлсийг цуглуулан бүртгэх, боловсруулах, орчин нөхцлийг бүрдүүлэх зэрэг нь уг биет зүйлийн ерөйнхий суурь шинж төрхийг илэрхийлэх үүрэг гүйцэтгэхээс гадна шинжилгээ судалгааны баримтын нэгэн адил нөлөөлөх чадвар бүхий чухал хэрэгсэл болж тухайн эд зүйлийн талаарх бидний ойлголтыг өсгөн нэмэгдүүлж улмаар уг зүйлийн үнэ цэнийг өндөрт өргөх боломжтой.

Цуглуулгыг нүдлэн хамгаалах гэдэг нь цуглуулгын үнэ цэнийг хамгаалах зорилготой үйл үйлдэл бөгөөд үүнд цуглуулгыг газар дээрээс нь бүртгэхээс эхлээд боловсруулах, музейд хадгалах, сургалт эрдэм шинжилгээний зорилгоор ашиглах гэх мэт бүхий л материаллаг биет зүйлс болон түүнтэй дагалдах бүртгэлийн аль аль нь хамаарна. Энэ хэсэгт багтсан илтгэлүүд нь хадгалах, үзмэр бэлтгэх, судалгааны ажил хийх ба цуглуулах менежментийн хэтийн төлвийг хамтатган оруулсан бөгөөд цуглуулгыг нүдлэн хамгаалах аргуудаас хайгуулын ажлын үеэр археологийн материалыг хэрхэн хадгалах, музей дотор хүний араг яснуудыг болон ургамал зүйн төрөл зүйлийн цуглуулгыг хэрхэн хадгалах зэрэг жишээнүүдийг дурдсан болно.

Natalie Firnhaber and Adiyabold Namkhai instructing workshop in museum object conservation. (photo: Hunt)

13
Archaeological Conservation: Collections Care from the Field to the Museum

Harriet F. Beaubien
Smithsonian Center for Materials Research and Education
Smithsonian Institution

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 recornition 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.

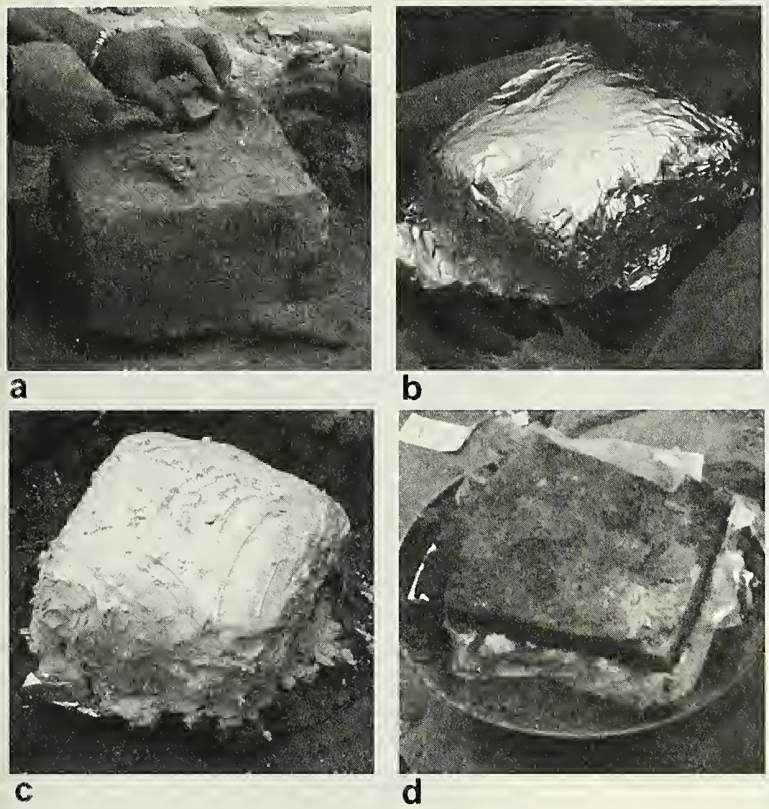

Figure 13.1. Blocklift sequence: (a) beads partially exposed on a pedestal of soil; (b) the beads and soil block covered in thin plastic wrap, secured with a strip of masking tape, and then with aluminum foil as a barrier; (c) the block jacketed with plaster; (d) the pedestal cut at the base and the 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

Figure 13.2. A block-lifted deposit of fragile beads and bracelets, consolidated to strengthen them and preserve their positions (Photo: D. Strahan, SCMRE).

Figure 13.3. Fragile animal bones being faced with tissue in preparation for lifting (Photo: E. Robertson, SCMRE).

this technique risks damage to the strata immediately below, so it should be chosen as a strategy with this in mind.

<u>Surface consolidation:</u> 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 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

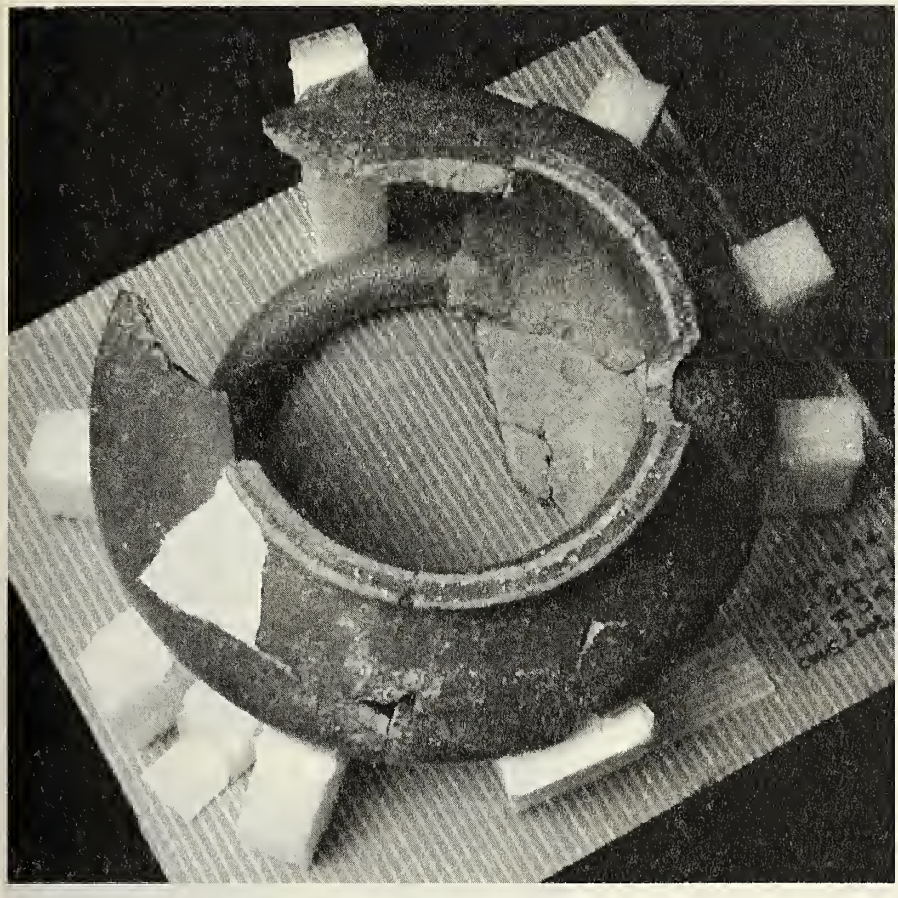

Figure 13.4. Reassembled ceramic vessel with minor fills and customized storage mount (Photo: K. Martin, SCMRE).

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

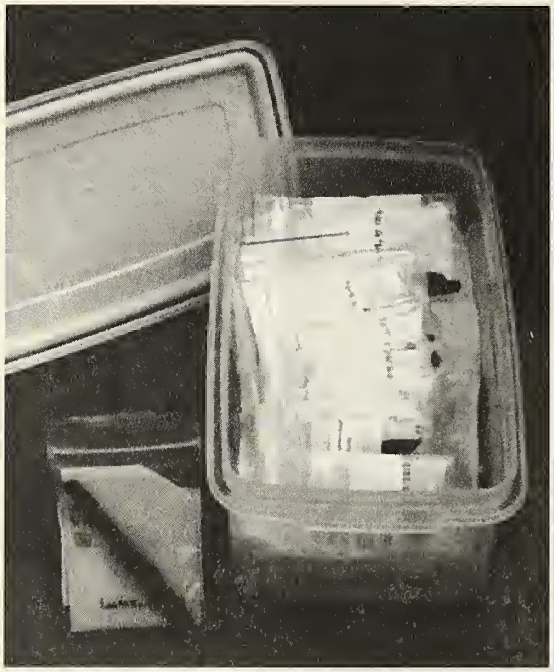

Figure 13.5. Small metal artifacts, bagged and stored in a container with desiccated silica gel (Photo: H. Beaubien, SCMRE).

Figure 13.6. Monitoring the salt levels during desalination of ceramic sherds (Photo: J. Lauffenburger).

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

Figure 13.7. Fragile skeletal remains stored for protection in customized housing (Photo: J. Boyer, SCMRE).

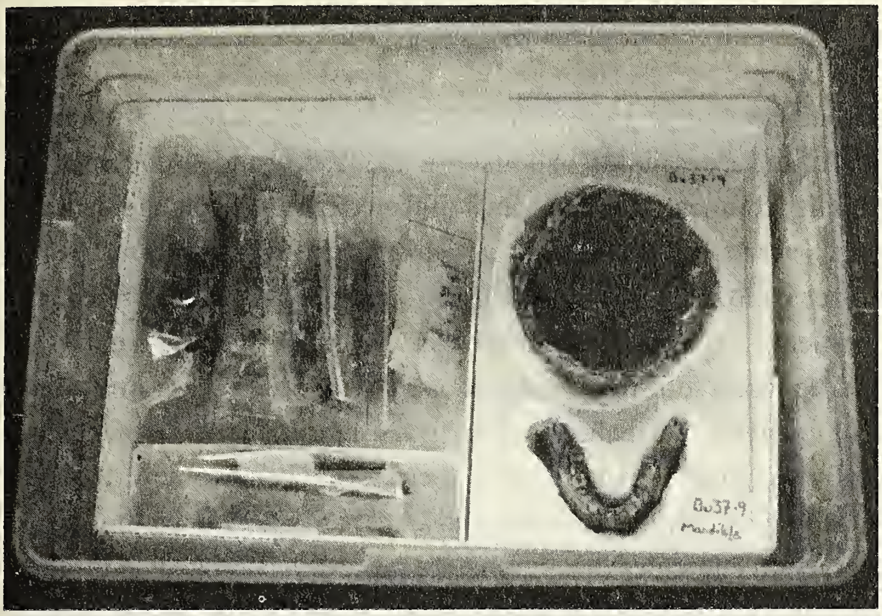

Figure 13.8. . Steatite seal with a silicone rubber mold; the seal's surfaces were first consolidated to protect them (Photo: M. Shah, SCMRE)

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.

Contact address: Harriet F. Beaubien, Smithsonian Center for Materials Research and Education, Smithsonian Institution, Museum Support Center, 4210 Silver Hill Road, Suitland, MD 20746-2863 USA; e-mail: *beaubienh@si.edu.*

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Археологийн хадгалалт ба цуглуулгыг газар дээрээс нь музейд шилжүүлэх хүртэл хамгаалах нь:

Хариет Ф Бөйбейн
Смитсонийн Материал Судлал ба Боловсролын Төв
Смитсонийн Институт

Танилцуулга

Түүхэн баримт сэлт нь өөрийн уг мөн чанар болон өөр бусад археологийн олдвортой хэрхэн уялдаж холбогдож байгаагаасаа хамааран болж өнгөрсөн цаг хугацааны талаар бидэнд өгүүлж байдаг билээ. Нарийн хянамгай үйлдлээр ухаж малтлагаа хийж гаргаж авсан олдворууд нь түүхэн үнэ цэнээ хадгалж, малтлага хийсний дараа ч гэсэн өөрчлөлт гараагүй байдаг гэх мэт тодорхой давуу талуудыг агуулж байдаг. Гэвч малтлага хийж олдворыг байрнаас нь хөдөлгөсний дараа эх үүсвэртэйгээ холбогдож байсан уялдаа нь нэгэнт үгүй болж, малтлагын үйл ажиллагааг харуулсан бичгэн эсвэл графикан баримт гэх зэргийг нэмэлт болгон зүүснээр мэдээллийн эх сурвалж нь баяждаг. Олдвороос дээж болгон авсан зүйлсийн цуглуулга зэргийг багтаасан материалын бүртгэл нь бидэнд байгаа цорын ганц өнгөрсөн үетэй холбогдох шууд хэлхээ холбоо болж өгдөг.

Эдгээр нөөц баялагийн дахин орлуулахын аргагүй онцлог шинж чанарыг нь археологийн мэргэжил олж илрүүлэн өөрсдийн мэргэжлийн ёс зүйн хэм хэмжүүр болсон хадгалалт хамгаалалтын үүргийг хариуцлагатайгаар хэрэгжүүлэх хэрэгтэй болдог [Ротрофф 2001]. Гэвч энэ нь материалын бүртгэл хадгалалт нь ямар шалгуурыг шаардаж байгаад голчлон төвлөрсөн хадгалалтын нарийн мэргэжлийн үйлдэл юм [AIC 1994]. Малтлага явагдах үед тохиолдох зарим нэг сөрөг үр дагаварыг тооцоолж үзсэний дараа музейд үзмэр болгон байрлуулахад материалуудыг зөвөөр зохион байгуулснаараа музейн хадгалагч нар нь цуглуулгын өв баялгийн үнэ цэнийг өнгөрсөн цаг үеийнх нь мэдээлэлтэй нь авч үлдэхэд маш чухал үүрэгтэй байдаг билээ.

Хамгаалалтын зорилгууд

Бүх л олдворууд он цагийн турш элэгдэж өөрчлөгдөж байдаг. Үүнд хамгийн анх үүссэн цагаасаа эхлэн хэрэглэгдэж эхлэсэн үе мөн өнөөдрийн цаг үед оршиж байх хүртэл бүх л цаг хугацаа багтана. Эдгээр олон хүчин зүйлүүдийн чухам аль нь хамгийн чухал мэдээллийг багтаан уг зүйлийг хамгийн үнэ цэнэтэй болгож байгааг тодорхойлох нь хадгалалт хийх эхний үе шат бөгөөд энэ нь хадгалалтын хамгийн эн түрүүний хэсэг нь болдог. Зарим нэг эд зүйлсийн хувьд тэдгээрийн гадаад хэлбэр дүрс нь илүү чухал байхад бусад нь бүтэц элементийнхээ хувьд чухал байх нь олонтаа тохиолддог. Олдворыг хамгаалах гол зорилго нь олдворын үнэ цэнэтэй шинж чанарыг нь тодруулах, улмаар олдворын мөн чанарт сөргөөр нөлөөлөх өөрчлөлтийг аль болох хязгаарлан чанартай мэдээллээр хангахад оршиж байдаг.

Археологийн судлаач шинжээчдийн хамгийн их сонирхолыг татаж байдаг үндсэн шинж чанарууд нь олдворт хамгийн анх гардаг цар хүрээний өөрчлөлтүүд ялангуяа олдворыг ашиглах үед болон дахин ашиглах үеийн баримтны ул мөрнөөс үүдсэн өөрчлөлтүүд юм. Хүчилтөрөгч, чийгшилт, температурын түвшин, бичил биетүүд гэх мэт байнга тохиолдож байдаг хүчин зүйлүүдийн нөлөөгөөр материалууд нь байгалийн жамаар элэгдэл хорогдолд орох үед өөр бусад өөрчлөлтүүд бас гарч байдаг. Цаашлаад, олдворыг байсан газраас нь холдуулахад шинэ орчин нөхцөлд дасахын тулд өмнө байснаасаа өөр шинж чанарыг агуулж уг олдворт мэдэгдэхүйц өөрчлөлтүүд тохиолддог байна. Зарим нэг материалын хувьд эдгээр өөрчлөлтүүд нь археологийн бүртгэл биш болох хүртэл нөлөөлдөг байна. Бусдынх нь хувьд гарч буй өөрчлөлтүүд нь арай хязгаарлагдмал байж яваандаа олдвор тогтвортой хэвийн төрх байдалтай болдог байна.

Энэ тогтвортой байдал нь малталт хийж байх цаг үед төдийлөн тэнцвэртэй байж чаддагүй бөгөөд харьцангуй богино хугацаанд дахин өөр шинэ орчинд байрлуулвал олдворт дахиад л эрсдэл учрах боломжтой. Нүүлгэн шилжүүлэхэд үүсэх өөрчлөлтүүдийг олдвор тэсэж даван туулах чадвартай байж ч болно эсвэл энэ нь олдворын материалын тэнцвэрийг алдагдуулж үргэлжлүүлэн оршин тогтнох чадварт нь аюул учруулах ч боломжтой. Эдгээр өөрчлөлтүүдийн зарим нь тухайн үедээ шууд мэдэгдэж ил тодоор илэрдэг байхад, зарим нь далд чанартай байж удаан хугацааны дараа багагүй хор нөлөөтэй байсан нь мэдэгддэг. Байсан газраа үлдсэн олдворууд болон өөр тийшээ шилжүүлсэн эсвэл үзүүлэн буюу агуулахад хадгалагдсан олдворуудад өөр төрлийн өөрчлөлтүүд илэрдэг боловч аль аль нь шинэ орчиндоо дасан зохицох шаардлагатай болдог. Дандаа ил байдаг байсан олдворуудын (буган чулуу гэх мэт) хувьд газар дор булаастай байсан олдвор шиг эрс тэс өөрчлөлтөнд орохгүй боловч цаг агаар, бохирдолт болон биологийн хүчин зүйлүүд, хүний буруутай үйл ажиллагаа гэх мэт урт хугацааны турш үйлчилдэг байсан нөлөөнүүдэд гарсан өөрчлөлтийг туулах болно.

Хамгийн чухал нь, бид малталт хийх үеэс эхлэн өөрчлөлтийн явцыг хянан зохицуулах боломжтой байдаг. Олдворыг хэрхэн ухаж гарган янзалж, лабораторийн үйл явцад арчлан тордож, олдворыг ямар нөхцөлд хадгалж, үзүүлэнд тавих нь ямар нэг байдлаар олдворыг өөрчлөлтөнд, зарим тохиолдолд сөрөг өөрчлөлтөнд оруулдаг, гэвч эдгээр бүх үйл ажиллагаа нь анхаарал болгоомжтой хандвал сайнаар шийдвэрлэж болох асуудлууд юм [Cronyn 1990, Sease 1992, Pye 2001, NPS 2002]. Ингэснээр малталт хийхээс эхлэн олдворын хадгалалтанд анхааралтайгаар хандах нь тэдгээрийн эрдэм шинжилгээний бүтээлийн үнэ цэнэ болон ирээдүйд мэдээллийн эх сурвалж болоход нь чухал алхам болох юм.

Археологи дахь хадгалалтын бодлого зохицуулалт

Дэлхий дээрх ихэнх газрын хөрсний найрлаганд, хангалттай хэмжээний чийг болон хүчилтөрөгч хөрсний нүх сүвээр нэвчиж материалын органик хэсгийн үхжилтийг түргэсгэдэг, биологийн үйл ажиллагааг тэнцвэржүүлэх үүрэг гүйцэтгэж байдаг. Эдгээр материалуудын нотлох баримт нь ихэнхдээ далд хэлбэртэй байдаг. Жишээ нь: Хөрсөн дээр бүдэг зурагдсан ул мөр, вааран эдлэлийн гадаргуу дээр шаврыг шатаахаас өмнө гарсан ором, метал хэсэг хүрсэн хэсэгт ул мөр гэх мэт. Хангалттай нягтрал буюу сайн чанар бүхий модон материалд хадгалагдсан гэх мэт зарим орчин нөхцөл нь органик биетийн хадгалалтанд сайнаар нөлөөлж болох юм. Гэвч тэдгээр нь ямар нэг байдлаар элэгдэж хорогдож байдаг.

Археологийн олдвор цуглуулганд дийлэнхдээ тааралддаг материал нь органик бус байдаг ба үүнд төрөл бүрийн метал эдлэл, шавар вааран эдлэл, чулуу, яс, хуяг хясаа болон зааны ясаар хийсэн эдлэл гэх мэт багтана. Газарт булаастай байх явцдаа эдгээр материалууд нь химийн найрлагынхаа хувьд хөрсөн дэх чийг, хүчилтөрөгч, давсны орцны нөлөө болон биеийн бүтцийнхээ хувьд дээрээс хүчтэй дарах даралт мөн бусад цаг агаарын нөлөөний аль альнаас нь шалтгаалан өөрчлөлтөнд орж байдаг.

Малталтын үеэр материалыг ил гаргаснаар эмзэг материалтай харьцаж байгаа болон хүнд нөхцөлд ажиллаж байгаа тохиолдолд гэмтэлд өртөх магадлалыг ихэсгэх төлөвтэй байдаг. Ийм учраас материал өөр орчинд шилжсэнээр гэнэтийн цочмог өөрчлөлтөнд орохоос сэргийлэн хадгалалтын бодлогыг боловсруулах нь хамгийн чухал байдаг. Жишээ нь: бороооноос хамгаалсан саравч босгох, чийгнийх нь ууршилтыг бууруулахын тулд олдворын эргэн тойронд хөрс шороогоор хучих гэх мэт арга хэмжээнүүд байж болно. Олдвор байсан газраасаа хөдөлсөн цагаас эхлэн тухайн олдворыг байрлуулах газар буюу музейн нөхцөл байдалд дасган тааруулсан хадгалалтын бодлого зохицуулалтыг заавал боловсруулах хэрэгтэй. Үүнтэй холбоотой зарим нэг хэрэглүүштэй аргуудаас доор тоймлон хүргэж байна.

Булшин (газарт булагдсан эд зүйлс) дахь биет нөлөөнүүдээс дурдах нь

Булшин дахь биет нөлөөллүүдийн элбэг тохиолдох хувилбарууд нь олдворыг бүрдүүлж буй хэсгүүд тарж бутрах болон хоорондоо холилдох гэх мэт юм. Ихэнхдээ жижиг хэсгүүдийг гаргаж аван, бүртгэж цуглуулаад, эрэмбэлэн уут саванд хийж лабораторит шинжлэх зорилгоор авчрахдаа чухал мэдээллийг алдах эрсдэлийг хамгийн бага байхаар тооцоолж авчирч болдог. Гэвч зарим тохиолдолд эх олдворыг эвлүүлэн нийлүүлэхэд нэлээн бэрхшээлтэй байдаг бөгөөд бутрамтгай жижиг хэсгүүдийг тус тусад нь цуглуулсан үед эвдрэх гэмтэх явдал их гардаг.

Баглаж өргөх: Олдворын эх бүрдэлүүдийг байсан байдлаар нь лабораторид байрлуулж нарийн системчилсэн аргаар харьцахын тулд маш олон төрлийн бүтнээр нь баглаж өргөх арга техник бий болж хэрэгжсээр ирсэн байна. Өргөн хэрэглэгддэг аргуудын нэг нь олдворын хажуу талаар нь мөн доогуур нь тойруулан эргэн тойрон хамгаалалт хийж суурьлуулсны үндсэн дээр аль болох бага багаар хөндөөлөн ил гаргах арга юм. Ийнхүү нэг цул бүхэл хэсэг болон гаргаж авахын тулд заримдаа хажуу талаас нь даавууны өөдсөөр ивээс болгон тулгуур хийж болдог. Хэрвээ ингэж тулгуур болж байгаа материал нь олдворын гадаргуутай наалдаж байвал жийргэвч болгон олон давхар хамгаалалт хийж өгөх нь чухал байдаг. Энэ нь ивээс хийсэн материалыг сүүлд нь олдвороос салган авахад давхар хамгаалалттай байх зорилготой юм. Шүрээр хэлхсэн хүзүүний зүүлтний олдворыг хамгаалалттайгаар авахын тулд баглаж өргөх аргыг хэрэглэсэн бөгөөд эхлээд нимгэн хуванцар уутаар дараа нь тугалган цаасаар ороогоод эцэст нь ивээс хийж бүрсэний дараа сая малталтыг найдвартай нөхцөлд явуулж лабораторид шилжүүлж байсан билээ [Зураг 11.1]. Гэхдээ энэ арга нь дараах дэд хэсэгт дурдсанчлан үе давхаргад гэмтэл учруулах эрсдэлтэй байдаг учир энэ аргыг сонгохдоо тохиолдох эрсдэлийг тооцоолж үзэхийг анхааруулж байна.

Гадаргыг хатууруулах нь: Газарт булаастай байсан олдвороос наалдсан шороог нь салгаж цэвэрлэж байх явцад зарим нэг олдворын гадаргуу нь их эмзэг байх тохиолдол гардаг. Иймд малталтын үеэр болон малталтын дараа олдвортой харьцахтай маш болгоомжтой байх хэрэгтэй болдог. Ийм үед хатууруулах үйл явц буюу хатуу болгох чадвар бүхий материалыг шингэн хэлбэрээр хатахаас нь өмнө олдворт шингээх аргыг хэрэглэх нь ашигтай байж болох талтай. Энэ үйл явцаар эртний материалаас бүрдсэн эд зүйлсийг орчин үеийн материалтай нийлүүлэх шаардлагатай болдог учир олдворт муугаар нөлөөлөх улмаар судалгаа шинжилгээнд болон дараа дараагийн арчилгаанд бас нөлөлөх байдлыг нь харгалзан үзээд энэ аргыг хэрэглэх нь ашигтай эсэх дээр үлтай бодож шийдвэр гаргах ёстой. Бэхжүүлэгчийг сонгох нь бас л ярвигтай асуудал бөгөөд зөвхөн нарийн туршилтын явцад батлагдан шалгарсан, өөрөөр хэлвэл хатуужиж чаддаг дараа нь хуулж болдог материалыг сонгох нь зүйтэй. Жишээлбэл: шавар вааран саван дээрх үелсэн гоёлын шигтгээг батжуулахын тулд хатууруулагч ашигласан бөгөөд энэ нь үйрэмтгий материалыг бат бөх болгож, эмзэг хагарамтгай гадаргууг гэмтэхээс нь өмнөбатжуулах зорилготой байсан [Зураг 11.2]. Ерөнхийдөө энэ арга нь эд зүйлсийн хэлбэр бүтэц зэрэг гол шинж чанарыг хамгаалах нэн тэргүүний зорилготой байдаг боловч энэ аргын талаар тооцож үзүүштэй сул тал нь техникийн судалгаа шинжилгээний үеэр учирч болох муудалт болон саатлууд юм.

Хоёр талаас нь түших: Хатууруулахаас гадна нэмэлт болгож хагарч гэмтэж болзошгүй хэсгийн ард урд хоёр талаас нь түшиж эсвэл хэсгүүдийг хамтад нь барьж хамгаалж болно. Нимгэн цаас буюу даавууг наалдамтгай бодис ашиглан тааруулах аргыг өргөн хэрэглэдэг. Даавуу болон наалдамтгай бодисын аль алийг ашиглах энэ төрлийн зарчмыг хатууруулах зорилгоор бас хэрэглэж болно. Хамгийн гол нь эдгээр нь даалгавартаа тохирсон тогтвортой мөн түүнээс гадна суурь материалаа гэмтээхгүйгээр амархан хуулж авах боломжтой байх хэрэгтэй. Мөн дараагийн алхамд хадгалалт болгон ашиглах гэж байгаа материал болон арчилгаанд харш нөлөө үзүүлэхгүй байх шаардлагатай. Иймэрхүү арга техникийг салангад байрлалтай амьтны яснуудыг хамтад нь гэмтээхгүйгээр өргөх үед хэрэглэж байсан [Зураг 11.3].

Сэргээн засварлах: Хэсгүүдийг хооронд нь эвлүүлэн нийлүүлснээр эд зүйлийн тогтвортой байдлыг нэмэгдүүлж, хэсэг бүрийг сул хадгалсанаас үүдэн гадаргууд болон булан тохойд нь үүсэх гэмтлийг бууруулдаг. Түүнээс гадна эд зүйлийн талаар бүрэн гүйцэд мэдээлэл авах боломжтой болдог. Эд зүйлсээс энд тэнд зарим нэг хэсэг дутах нь ярвигтай болгодог учир хэлбэрийг бүрэн бүрэлдэхүүнээр авч үлдэх нь мэдээлэл өгөх байдлаараа ч гэсэн бүтцийн хувьд ч гэсэн илүү тус нэмэртэй байдаг. Наалт хийх ба зай нөхөх материалуудын аль алийг нь хадгалалт хийх явцад удаан тогтвортой байх чадвар болон хуулахад амархан байх чанарыг нь харгалзан үзэж маш болгоомжтойгоор сонгох нь зүйтэй. Чухал агуулал бүхий шавар эдлэл гэх мэт олдворууд нь хадгалалтын лабораторит байнга дахин сэргээгдэж байдаг. Гэвч цаг хугацааны хүчин зҮйлээс шалтгаалан зөвхөн үнэхээр тогтвортой бат байлгах шаарлагатай тохиолдолд л зай завсарыг нөхөх ажиллагааг гүйцэтгэх нь зүйтэй [Зураг 11.4].

Булшин (газарт булагдсан эд зүйлс) дахь химийн нөлөөнүүдээс дурдах нь

Булшны химийн өөрчлөлтөнд метал олдворууд өртдөг бөгөөд анхны байсан орчин нь солигдоход шинж чанар нь хувирч исэлдэх гэх мэтээр өөрчлөгддөг. Заримд нь өөрчлөлт хортойгоор нөлөөлж байхад заримд нь харьцангуйгаар бага нөлөөлдөг. Гэвч зарим нь угийн өртөмтгий шинж чанартай байдаг бөгөөд өөйр орчин нөхцөлд ил гаргаж тавьсанаар энэ шинжийг ньөдөөж идэвхжүүлдэг. Жишээ нь зэсийн баяжмалаас бүтсэн зүйлсийн гадаргуу нь исэлдэж ногоон өнгөтэй болж бүдэг ногоон толботой харагдаж болно. Үүнийг ихэвчлэн "хүрлийн халдвар" гэж нэрлэж заншсан бөгөөд биетийн дотоод байдалд бас аюул учруулах боломжтой.

Химийн арчилгаа: Метал зүйлсийг зарим тохиолдолд химийн аргаар цэвэрлэж тогтворжуулж болдог бөгөөд энэ химийн арчилгаа нь метал зүйлсийн бүрэлдэхүүнд байнгын өөрчлөлт оруулж цаашдаа биетийн бүтцэд муугаар нөлөөлж болзошгүй тул энэ талаар тооцож үзэх нь хамгийн чухал байдаг. Электролик болон электро химийн гэх мэт арга техникээр металтай харьцах үед нимгэн бүрхэвч нь урвалд орж исэлдэх боломжтой. Археологийн метал олдвор нь бүхлээрээ урвалд орж зэвэрсэн байх нь элбэг тохиолддог учир зарим нэг химийн бодисоор арчлах явцад олдвор гэмтэж эвдрэх магадлал өндөртэй байдаг. Ерөнхийдөө урвалд орж зэвэрсэн зүйлтэй харьцахдаа аль болох гэмтээхгүй аргыг хэрэглэх нь зүйтэй байдаг. Үүнд зарим нэг механик аргууд орох бөгөөд энэ нь урвалд хүчтэй орсон явцыг тогтворжуулах чадвартай байх албагүй юм.

Орчин нөхцөлийг нь тогтворжуулах: Металыг урвалд оруулахгүй байх хамгийн үр дүнтэй бөгөөд хамгийн хор хөнөөл багатай арга нь хадгалах орчин нөхцлийг нь анхааралдаа авч бүрдүүлэх явдал юм. Хүчилтөрөгч ба чийг хоёрын нэгдэл нь урвалд орж зэврэх явцыг идэвхжүүлдэг учир археологийн метал олдворыг хамгаалахдаа битүүмжилсэн хуурай бичил орчинд байрлуулах нь хамгийн шалгарсан арга юм. Хамгийн өргөн дэлгэрсэн арга нь метал биетийг зориулалтын багажаар бичил дуран авайны тусламжтайгаар цэвэрлээд дараа нь дээрээс нь тусгай хамгаалалтын бүрхэвч түрхээд (шаардлагатай тохиолдолд буцааж хуулж авч болохуйц) битүүмжилсэн уут саванд хадгалах арга юм. Ингэсний дараа маш сайн таглагддаг саванд хадгалдаг бөгөөд савны дотор талд хатаасан цахиур чулууны тосон бэлдмэл байрлуулснаар савны доторх чийгшилтыг тэнцвэржүүлдэг [Зураг 11.5]. Энэ цахиурын хатаамлын тосон бэлдмэлийг үе үе шинэчлэн сольж байх шаардлагатай. Хуурай орчныг бүрдүүлэхийн тулд тогтмол арчилгаа хийх нь маш чухал асуудал юм. Хэрвээ савны битүүмжлэл сайн биш, цахиурын тосон бэлдмэлийг байнга солихгүй бол агаарын чийгшилт шингээгдэж хадгалалтын орчин нь чийгтэй болж хувираад зэврэлт болон урвалд орох үйл явцыг үүсгэнэ.

Давснаас үүдэх үр дагавар

Зарим нэг археологийн олдворт тохиолдох, хадгалалттай холбоотой бэрхшээлтэй асуудлуудын нэг нь газарт булаастай байх үеэс хөрсөнд шингэсэн давснаас үүдэлтэй асуудал юм. Энэ давстай хөрс нь геологийн хөрсжилтийг бүрдүүлж, удаан хугацаанд бий болсон хөдөө аж ахуйн бордооны хэрэглээнээс эхлэн ус шингээх чадвар гэх мэт шинж чанарыг бий болгодог. Усанд сайн уусах шинж чанар нь борооноос үүссэн гадаргууны усыг болон газарт шигэсэн усыг хөрсөнд жигд тараахад нэмэртэй байдаг. Энэ үед хөрсөнд булагдаастай байгаа сийрэг материалын бүтцэнд давстай хөрс нөлөөлж, химийн урвал явагдах нөхцлийг (метал олдворын зэврэлт гэх мэт) бүрдүүлдэг. Ус сайн шингээдэг чанарын үр нөлөөгөөр хүйтэн чийгтэй хөрсөнд булаастай байсан эд зүйлс хуурай халуун агаарт ил гармагц усны ууршилт явагдан хатуу талст үүсэх нөхцөл бүрддэг. Жишээ нь шавар материалын гадаргуу дээр давсны хатуужиж талст үүсгэсэн нунтаг илрэх боломжтой. Үүнээс гадна жилийн бороотой болон хуурай улирлын эргэлтийн нөлөөгөөр давс ингэж талсжих бас боломжтой байдаг. Урт хугацаанд давс энэ байдлаар сийрэг материалд биет хохирол үзүүлэх аюултай бөгөөд ихэнхдээ гадаргуу нь нунтаг бүрхэвчтэй болж гэмтдэг.

Давсыг шингээж уусгах үйл явц: Малталтын үеэр олдворыг ил гаргахад чийгийг ууршуулах аюулаас сэргийлэхийн тулд эхний ээлжинд сүүдрэвч хийж хамгаалах буюу эсвэл эмзэг мэдрэмтгий материалыг халхалж хамгаалж болдог. Гэвч энэ нь зөвхөн түр зуур тогтоох арга юм. Ихэнх сиймхий материалуудын хувьд хамгийн үр дүнтэй арга нь хайгуулын газар дээр хэрэгжүүлэх давсгүйжүүлэх үйл явц буюу давсыг шингээж уусгах арга юм. Энэ үйл явцыг хэрэгжүүлэхийн тулд өдөрт дор хаяж хоёр удаа нэрсэн усаар (эсвэл давсны нягтжилт багатай усаар) угаах хэрэгтэй бөгөөд давсны концентраци аюулгүйн түвшинд хүрэх хүртэл угаах явцыг байнга хянан шалгаж байх хэрэгтэй [Зураг 11.6]. Зарим материал нь энэ дэвтээлтийн үйл явцыг тэсэж чадахгүй байх магадлалтай гэдгийг анхаарч үзэх нь чухал бөгөөд зарим нэг нэмэлт урьдчилан сэргийлэх арга хэмжээ авах шаардлагатай байж болох юм. Зарим материалууд усанд хүргэж болохгүй эмзэг байдаг учир эдгээр материалуудыг давс идэвхжих боломжгүйгээр хуурай орчинд тогтвортой хадгалах нь хамгийн оновчтой арга байдаг.

Гэмтлээс урьдчилан сэргийлэх нь

Цуглуулгын бүх материалуудыг лабораторид шинжилж дууссаны дараах хамгаалалт нь хэрхэн боож баглах, судалгааны ажлын үеэр яаж харьцах, ямар нөхцөлд хадгалахаас хамаардаг. Ихэнх биет зүйлсийг тогтвортой битүүмжилсэн хуванцар уутанд хийж бөх саванд хадгалах нь биет байдлаар нь сайн хамгаалахаас гадна судалгааны үед харж шинжлэхэд хялбар дөхөм болгож өгдөг. Сайн нөхцөлтэй байранд байрлуулж, хөдөлгөхгүй байх ивээс, тогтвортой байдалд туслах хэрэгслүүд, харьцах үед учрах гэмтлээс урьдчилан сэргийлэх хамгаалалт ашиглах нь нэмэлт ач холбогдолтой. [Зураг 11.7]. Биет зүйлсийг өөр байрлал руу шилжүүлэн тээвэрлэх шаардлагатай бол тээвэрлэлтийн явцад үүсэх гэмтлээс хамгаалж савыг тусгай материалаар жийргэвч болгож тоноглосон байх хэрэгтэй ба эд зүйлсийг ивээс ашиглан байрлуулах хэрэгтэй. Үзүүлэнгийн зориулалтаар үзмэрийн танхимд байрлуулах гэж байгаа болон хэрэглэх гэж буй материалуудыг тодорхой тэмдэглэх хэрэгтэй ба ингэснээр санамсаргүйгээр гэмтэл авах аюулаас зайлсхийх болно. Гэвч ихэнх тохиолдолд цуглуулгын материалууд агуулахад хадгалагддаг ба тогтвортой аюулгүй байранд хадгалсанаар урт хугацаанд хамгийн чухал хамгаалалтын нөхцөл болдог [Rose and Torres 1992]. Материалаа хянамгайгаар сонгож анхан шатны сургалтанд хамруулах юм бол хадгалалтаар мэргэжээгүй хүн ч гэсэн эдгээр үйл ажиллагааг явуулах боломжтой бөгөөд энэхүү үйл ажиллагааг мөрдсөнөөр зөвхөн зардал хэмнээд ч зогсохгүй музейд байрлуулахад болон газар дээр нь байлгахад тохирсон хамгийн үр дүнтэй бодлого зохицуулалтын хэлбэр болох юм.

Баримт хөтлөх: Хайгуулын газар дээр баримт хөтлөх гэдэг нь археологийн олдворын цуглуулганд багтсан эд зүйлс бүрийг нарийвчлан тодорхойлж бүтцийн агуулгыг зохиохыг хэлдэг бол бусад төрлийн баримт хөтлөлт нь судалгаа шинжилгээний ажлын үнэ цэнийг нэмэгдүүлэх мөн нэг чухал алхам юм. Үүний дотор явцын дунд, хадгалалтын үед болон судалгааны ажлын үед хийсэн бүх бүртгэлүүд багтана. График аргаар болон гар бичмэлээр хийсэн хадгалалтын бүртгэл нь анх олдвор олдсон байдлын талаарх нарийвчилсан ажиглалтыг өгч, олдвортой харьцах үед илэрсэн шинэлэг шинж чанаруудыг харуулж, мөн түүнчлэн олдвортой анх ямар аргаар хэрхэн харьцаж, ямар материалуудыг ашигласан талаар дүрслэн харуулдаг билээ. Олсон олдворын алийг нь ч эрдэм шинжилгээний ажилд хэрэглэх шаардлагатай болоход эдгээр мэдээллүүд нь бэлэн байдаг учир баримт хөтлөх нь ялангуяа чухал зүйлийн нэг юм.

Олдворын эх хувьтай адилхан биетийг чанарын өндөр түвшинд хувилан бүтээх нь бас нэг төрлийн баримт хөтлөлт болох бөгөөд энэ нь маш ашиглалт сайтай юм. Энэ төрөлд судалгааны ажлын зориулалтаар буюу үзүүлэнгийн зорилгоор хэв цутгах арга нь багтаж болно, ялангуяа эх олдвор нь дээрх зориулалтаар байрнаасаа хөдөлж тээвэрлэгдэх боломжгүй тохиолдолд энэ арга нь хамгийн хэрэглүүштэй арга юм [Зураг 11.8]. Ингэж хувилсан баримтыг элэгдэж хуучирсан материалын үндсэн эх баримт болгон ашиглаж болох талтай.

Баримт хөтлөх энэхүү аргыг амьдралд хэрэгжүүлсэн нэг тохиолдол нь Монголын буган чулуун хөшөө юм. Эдгээр нь удаан хугацааны турш хээр гадаа оршиж байсаар ирсэн бөгөөд тухайн хөшөөг ямар чулуугаар (чанар сайтай эсвэл чанар муутай) босгосноос шалтгаалан элэгдэл хорогдлын түвшин нь өөр өөр байсан. Байрнаас нь хөдөлгөж болдог олворуудын нэгэн адилаар уг хөшөөнүүдийг хамгаалалттай орчноор хангах нь тэдгээрийн урт хугацаанд оршин тогтнох нэг нөхцөл нь болж байсан боловч бодит амьдрал дээр хэрэгжүүлэхэд бэрхшээл учирч болзошгүй. Зарим нэг элэгдэж хорогдож муудсан хөшөөнд тухайлан зориулж хадгалалтын тал дээр илүү дорвитой алхам хийх шаардлагатай ч байж магадгүй. Иймэрхүү хамгаалалтыг хэрэгжүүлэх баталгаа байхгүй энэ мэтчилэнгийн тохиолдолд баримтжуулах үйл ажиллагаа нь хамгаас чухал байдаг. Зөөж шилжүүлж болдог олдвортой нэгэн адилааар чулуун хөшөөнөөс авсан сайн чанарын хэв нь судалгаа шинжилгээнд болон үзүүлэнгийн зориулалтаар хэрэглэгдэж болно. Тэр ч байтугай урт хугацааны хамгаалалтын зорилгоор устаж үгүй болох аюул тулгарсан хөшөөг найдвартай газар уруу нүүлгэн шилжүүлсэн тохиолдолд энэ хэвийг хөшөө байрлаж байсан газар орлуулан хэрэглэж бас болно.

Буган чулуу эсвэл зөөж болох олдворыг аль алинд нь хэв цутгах ажиллагааны үеэр олдворын анхны хувилбарт нь газраас хөндийлөн ил гаргах, зөв материалуудыг сонгох гэх мэтээр анхаарал болгоомжтой хандахгүй бол сөрөг өөрчлөлт учруулах боломжтой. Эх хувилбарын гадаргууг хэв цутгах материалаас хамгаалахын тулд олон давхар тусгаарлагч материалыг дандаа хэрэглэх хэрэгтэй ба энэ нь дараа нь хуулж болдог байх ёстой. Хэрвээ гадаргуу нь эмзэг бутрамтгай буюу элэгдэж хуурч эхлэсэн тохиолдолд тусгай зориулалтын хамгаалалтыг урьдчилан хэрэглэхгүй л бол хэв цутгах явцад гадаргууд нөхөж болшгүй гарз хохирол учруулж гэмтээх аюултай.

Дүгнэлт

Музейн зүгээс авч үзвэл олдвор цуглуулгын үнэ цэнэ нь хэр хэмжээ, хамгаалалтын байдал, эх материалын болон баримт бүртгэлийг ашиглах бололцоо зэргээс хамаарч тодорхойлогдож байдаг бөгөөд эдгээрийг яаж хариуцах нь цуглуулгын зохион байгуулалт болон хадгалалтын мэргэжлийн ур чадварт тулгуурлаж байдаг. Ерөнхий тохиолдолд сайн хадгалалт хийхийн тулд материалыг зөв хамгаалалтын талаар хөндөгддөг. Археологийн олдворын материалын хувьд хамгийн эмзэг үе буюу малталтын явцаас эхлэн түүний дараа олон жилийн турш хадгалах эсвэл үзүүлэнд тавих хүртэл тооцож үзэх шаардлагатай болдог. Зарим тохиолдолд хамгаалалт хийх зорилгоор явуулсан үйл ажиллагаа нь тохиромжгүй материал буюу арга зам сонгож хэрэглэснээс болоод шаардлагагүй буюу дараа нь нйхйж болшгүй гарз хохирол учруулж болно. Тийм учраас эдгээрийг хэрэглэхдээ болгоомжтой хандаж ямар нэг шинэ материалыг археологийн олдворт хэрэглэх гэж байгаа бол ялангуяа олдвор нь шинжлэх ухааны судлалд ашиглагдах бол урьдчилан нягтлах хэрэгтэй. Аюулгүй агуулахад хадгалах болон аль болох багаар харьцах дээр тулгуурласан хамгаалалтын бодлого нь хамгийн бага эрсдэлтэй бөгөөд археологийн материалыг урт хугацаанд хамгийн сайн аргаар авч үлдэх бодлогод хамаардаг. Цуглуулгыг амархан байрлуулж аль болох бага харьцаж судалгаанд хамруулах үйл явцтай хамтруулан хадгалвал энэ хэлбэр нь хамгийн зардал хэмнэсэн бөгөөд хамгийн ач холбогдолтой хамгаалалтын үйл ажиллагаа болох юм.

William Fitzhugh, A. Ochir, Paul Rhymer, Carolyn Thome, Ts. Ayush, and Paula De-Priest at the National Museum of Mongolian History in June, 2004, with the Ushkiin Uver deer stone cast made by Rhymer and Thome in 2003. (photo: Neighbors)

14

Model-Making and Casting

Paul Rhymer, Exhibits Specialist
Exhibits Department, National Museum of Natural History
Smithsonian Institution

Carolyn Thome, Model-maker
Office of Exhibits Central
Smithsonian Institution

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.

Contact address: Paul Rhymer, Exhibits Specialist, Exhibitions Department, National Museum of Natural History, Smithsonian Institution; e-mail: *rhymerp@si.edu*

Contact address: Carolyn Thome, Model-maker, Office of Exhibits Central, Smithsonian Institution; e-mail: *thomec@si.edu.*

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 хэсэг

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

Karolin Том, Хэв үйлдэгч
Смитсонийн Институтын үзмэрийн Төв газар

Загвар - Хэв үйлдэх ажлын хэсгийн гол зорилго нь 2002 онд Смитсонийн Институтээс Монголын Үндэсний Түүхийн музейтэй хамтран хийсэн буган чулууны хэвийг үйлдэхэд ашигласан материал болон үйл явцыг Монголчуудад үзүүлэх мөн зааж сургах байсан. Эдгээр өөр өөр арга техникийг бодит байдлаар нь харсанаар Монголчууд өөрсдийн музейдээ үзүүлэнгийн зориулалтаар хэв загваруудыг үйлдэхэд ашиглах боломжтой болно гэж бид нар найдаж байсан юм.

Ажлын хэсгийн үеэр буган чулууны хэв хийсэн үйл явцыг харуулсан мэдээлэл болон фото зураг бүхий гарын авлагуудыг оролцогчдод тараан өгсөн. Өөр бусад төрлийн төсөлд хэрэглэгдсэн хэв хийх аргыг тайлбарласан зураг болон материалуудыг мөн тараан өгсөн. Техникийн үг хэллэг орчуулгаас болон ойлгомжгүй байх тохиолдолд илүү ойлгомжтой байх болно гэж бодсоны үндсэн дээр хэв хийх загварын хэсгээс жишээ болгон бас авчирсан. Ер нь зураг мянга мянган үгнээс илүү сайн тайлбар болно гэдэг зарчмыг баримталсан юм.

Бид Монголд ирэнгүүтээ монголд худалддаг зарим нэг материалуудыг худалдаж авахаар хайж эхлэсэн бөгөөд зарим зүйлээ амжилттай бүтээсэн боловч зарим нь төдийлөн амжилттай байсангүй. Монголд нэлээн олон тооны уран бүтээлчид байдаг учир будаг, шавар болон хэвний их биенд ашиглах шаваас зэргийг хялбархан олж авч чадлаа. Гэвч нэлээн хэдэн өдрийн турш хайсан боловч шохой, фибер шил гэх мэт бусад материалуудыг (сайн чанарын, боломжийн үнэтэй, олон төрлийн үйл ажиллагаанд хэрэглэгдэхээр энгийн) олж чадсангүй. Эдгээр үгсийг орчуулахад тийм ч хялбархан байгаагүй нь хүндрэлтэй асуудал үүсэх шалтгаан болж байсан байх. Эдгээр зарим нэг материалуудыг Улаанбаатараас олж авах боломжтой байсан боловч бусад нь резинэн хэв гэх мэт хэрэгцээтэй материалуудтай хамт гаднаас импортоор орж ирдэг байсан байх.

Ажлын хэсгийг бид буган чулууны хэв цутгах үйл ажиллагааг тайлбарласнаар эхлэсэн ба энэ ажиллагаанд хэрэглэсэн арга техникийг зургаар үзүүлсэн нь их ойлгомжтой болгож байлаа. Хэв болон буган чулууны цутгамлыг харуулсан нь бидний заасан зүйлийг илүү тодорхой болгоход тус нэмэртэй байлаа. Энэ үеэр оролцогчдын үйл явцын талаар болон өөр бусад асуусан асуултанд хариулж байсан.

Хэв авах, цутгах мөн загвар анхан шатны явцыг үзүүлсний дараа өгөгдсөн материалаар загвар бүтээхэд хэсэг цаг зарцуулав. Музейн ажилтан, уран бүтээлч, эрдэмтэн судлаачид гэх мэт төрөл бүрийн мэргэжлийн хүмүүсээс бүрдсэн оролцогчид маань хэвийн резинэн дээрх будгийг ашиглан хэв хийж үзэхийг тэсэн ядан хүлээсэн харагдаж байлаа. Ихэнх нь хэв болгох чулууг шаваас, шохойтой нь хамт гартаа барин хэв хийж үзэхээр оролдож байлаа. Хуурай будагнуудыг хэвээ будаж өнгө оруулах зорилгоор Улаанбаатараас худалдаж авсан. Энд оролцогчид маань силикон, силикон шаваас, шохой гэх мэт өөр өөр төрлийн резинэн хэвнүүдээр туршилт хийж үзэцгээлээ.

Ийнхүү тус үйл ажиллагаа маань маш амжилттай болж өнгөрсөн. Оролцогчид маань бүгд маш идэвхтэй оролцож юу сурсанаа хэрхэн өөрсдийнхөө ажилд хэрэгжүүлэхээ бидэнтэй хуваалцахаар мэрийж байлаа. Тэдний гол санааг нь зовоож байсан зүйл нь хэрэглэгдэх материалаа олох байсан бөгөөд монголд худалдаалагддаг материал болон орлуулж хэрэглэх материалууд нь тус үйл ажиллагааны үеэр хэрэглэснээс өөр байж болох талаар байлаа.

Энэ ажлын хэсгийн дараа бид Монголын үндэсний Түүхийн Музейн ажилтанууд болон чихмэл хийдэг хүмүүстэй албан ёсны бус энгийн уулзалт зохион байгуулсан. Музейг өглөө үзэж сонирхсоны дараа үдээс хойш маргааш нь хэрэглэгдэх чихмэлийн үзүүлэнд ашиглах жижиг шувууг олж авав. Одоогийн байдлаар Монголд хэрэглэгдэж байгаа чихмэлийн үйл явц нь нэлээн хуучирсан арга бөгөөд орчин үеийн чихмэл хийх бүтээгдэхүүн материал олж авах бэрхшээл нь тэдний чихмэл хийх арга техниктээ дэвшилт гаргах явдалд саад болж байсан байна. Ганцхан өдрийн дотор тэдгээр хүмүүсийг сургах нь хангалттай биш байсан боловч энэ нь тэдэнд бидний өөрсдийн бүтээлийг танилцуулах ховорхон аз завшаан байсан бөгөөд улмаар энэ нь хоёр талын аль алинд нь ирээдүйн ашиг тусаа өгсөн үйл байсан нь дамжиггүй.

Figure 14.4. Paul Rhymer demonstrating molding and casting at the workshop. (photo: Fitzhugh)

Workshop participants at the National Museum of Mongolian History. (photo: Hunt)

15
Integrated Pest Management in Museums

Jeremy Jacobs
Department of Vertebrate Zoology, National Museum of Natural History
Smithsonian Institution

Deborah Bell
Department of Botany, National Museum of Natural History
Smithsonian Institution

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.

<u>Chemical treatments</u> 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, CO_2, 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 CO_2. CO_2 acts in a different way than the two inert gasses. You need only maintain a 60% CO_2 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. CO_2 is preferred by some users in that it is easier to maintain a 60% atmosphere of CO_2 than it is to maintain a 99.7 % atmosphere with argon and nitrogen. It is also cheaper and easier to procure CO_2.

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.

Contact Address: Jeremy Jacobs, Department of Vertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington DC; e-mail: *jacobsj@si.edu.*

Contact Address: Deborah Bell, Department of Botany, National Museum of Natural History, Smithsonian Institution, Washington DC; e-mail: *belld@si.edu.*

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Mongolian Translation

Музей дэх хортон шавьжийг устгах нэгдсэн ажиллагаа

Жереми Жакобс
Смитсонийн Институтын Байгалын Түүхийн үндэсний Музейн
Амьтан судлалын Тэнхим

Дэбора Белл
Смитсонийн Институтын Байгалын Түүхийн Үндэсний Музейн
Ургамал судлалын Тэнхим

Музейн үзмэрт хохирол учруулж хортойгоор нөлөөлдөг хүчин зүйлүүдэд: биет гэмтэл учруулах, хулгай дээрэм хийх, гал усны аюул, бохирдолт, хорт утаа, өрөөний дулааныг хэт халаах эсвэл хэт хөргөх, чийгшилтийн тэнцвэр алдагдах болон хортон шавьж зэрэг багтдаг. Энэ дотроос хортон шавьжтай хэрхэн тэмцэж устгах талаар энэ илтгэлд онцгойлон тусгасан юм. Хортон шавьжийг зайлуулах нь шавьж үржиж улмаар музейн эд хөрөнгө, аюулгүй ажиллагаа, үзмэрийн өнгө төрх, ажилтнуудын эрүүл мэнд аюулгүй орчинд нөлөөлөхөөс хамгаалж сэргийлэн тэмцэх системтэй арга хэмжээ юм.

Музей дэх хортон шавьжид музейн үзмэр цуглуулгийг гэмтээж хохирол учруулагч төрөл бүрийн шавьжнууд, мэрэгч амьтад болон музейн гадна талыг бохирдуулан шавьж үржих нөхцлийг бүрдүүлэгч шувуу зэрэг амьтад багтана. Ийм музейн хортон шавьжтай тэмцэх үйл ажиллагааны хүрээнд хохирол гарахаас зайлсхийх, хаалт хийх, эрж хайх, илрүүлэн устгах, хариу үйлдэл хийх, сэргээн засварлах (хэрвээ ямар нэг хохирол учирвал) гэх мэт байнгын урьдчилан сэргийлэн хамгаалах ажиллагуунууд хийгдэх нь зүйтэй.

Зайлсхийх – Шавьж амьтад байшингийн дотор орох эрсдэлийг багасгах

Хаалт хийх:

Хаалгануудыг лав хаах

Цонхонд торнууд байрлуулах

Шинээр авчирсан дээжийг сайн шалгах

(Заримыг нь тогтмол үзэж шалгах)

Дээж болгон авчирсан үзүүлэнг зөв хадгалах

Эрж хайн илрүүлэн устгах:

Нүдээр шалгах

Илрүүлэх (наалддаг хавхаар)

Бүртгэл хөтлөх

Шавьжны талаар сайн мэддэг байх (хаана амьдарч хийдэг зүйлүүд, амьдрах хугацаа гэх мэт)

Хариу үйлдэл хийх: (Нөөц боломжоо тэнцвэртэйгээр ашиглах)

Байшингийн өөрчлөлт

Орчин нөхцөлүүд

Агаарын температур

Чийгшилт

Ариун цэвэр

Хянаж шалган ариутгах

Хамгаалан арчлах

Химийн

Хөлдөөх

Аноксик аргууд

Сэргээн засварлах:

Бохирдлыг цэвэрлэх

Дээжийг цэвэрлэх

Дээж бохирдсон эсвэл гэмтсэн байвал тэмдэглэх

Дээжийг аль болох сэргээн засварлах

Хянаж шалгах

Хортон шавьж амьтнаас урьдчилан сэргийлж тогтмол хугацаанд үзмэр дээжист шалгалт хийх нь зүйтэй. Гэгээтэй өнгөтэй гадаргуу дээр үлдээсэн шавьжны толбо мөр нь энгийн нүдээр харахад амархан байдаг учир бараан өнгийн шүүгээг цагаан цаасаар бүрэх нь шавьжний ул мөрийг ялгаж танихад хялбар дөхөм болгодог.

Хортон шавьжтай тэмцэх үйл ажиллагаанд хавхыг хэрэглэх нь хамгийн гол түлхүүр элемент болдог. Наалддаг хавхыг тавьснаар музейд олноороо үүрлэсэн амьтдын байршилыг илрүүлэх тааралдсан үед нь барьж авах давуу талтай. Хавхыг хэрэглэн музейг хортон шавьж амьтдаас сэргийлснээр музейн үзмэрт ноцтой хохирол учруулж болзошгүй аюулыг музейн ажилтнуудад дохио болгон сэрэмжлүүлэх боломжтой болдог. Феромин хавхыг зөвхөн музейн барилга дотор агааржуулагч ажилладаг тохиолдолд хэрэглэх нь зүйтэй байдаг. Хэрвээ цонхнууд онгорхой байвал энэ төрлийн хавхнуудаас болоод гаднаас шавьж болон амьтад цуглах хандлагатай байдаг.

Хамгаалан арчлах

Арчилгаа бол хамгийн тодорхойлоход хэцүү элемент юм. Олдвор эсвэл биологийн үзмэрийн онцлог шинж чанар болон арчилгааны цаашдын үр дагаварыг нарийн тооцоолон авч үзэх шаардлагатай болдог. Музейн хадгалагч нь эд зүйлсийг буюу үзмэрийг арчлах үйл ажиллагаа эхлэхийн өмнө заавал урьдчилан лавлаж зөвлөлдсөн байх ёстой.

Химийн бодис хэрэглэн арчлах нь тухайн цаг үедээ нөлөөлөл нь мэдэгдэхгүй боловч урт хугацааны дараа илрэх сөрөг үр дагавартай байх магадлалтай. Жишээлбэл, 18-р зуунаас эхлэн маш олон тооны байгалын түүхийн музейнүүд өнгөгүй мөнгөн усны хлорийн уусмалыг усанд буюу спиртэнд найруулан шавьж болон мөөгөнцөрөөс хамгаалахын тулд үзмэрт хэрэглэдэг байсан байна. Гэвч, мөнгөн усны хлорын уусмалын толбо нь үзмэрт толбо үлдээдэг нь тогтоогдсон учир ихэнх оронд үүнийг хэрэглэхийг зогсоосон байна. Эдгээр толбо нь орчныхоо температурт ууршин мөнгөн ус ялгаруулж, хадгалалтын битүү саванд хуримтлагдаж эрүүл мэндэд ноцтой хор учруулах боломжтой бөгөөд бусад үзмэрүүдийг мөн хордуулах магадлалтай. Түүнээс гадна, мөнгөн усны хлор нь үзмэрийн өнгийг харлуулах хар саарал толбо үлдээх мөн үзмэрийн зүүлт бичиг дээрх тоо баримтыг тэр чигээр нь бүдгэрүүлэх гэх мэт сөрөг үр дагаварыг удаан хугацааны дараа үүсгэх аюултай (Hawks, C. & Bell, D. 1999)

Зарим нэг химийн бодисыг сайтар нягталсны үндсэн дээр шалны хөвөөг дагуулан хэрэглэснээр хортон шавьжтай тэмцэх бодит үр дүнд хүрсэн тохиолдлууд бас байдаг.

Краёфюмигайшн буюу хөлдөөх нь ургамлын хатаамал үзмэрийн ургамалд үүрлэдэг шавьж амьтдыг бүхий л шатанд нь устгахад хэрэглэх найдвартай арга юм. Т.Ж.К. Стран (1997) бичихдээ хөлдөөхөд тэсвэртэй шавьжнууд нь мөсийг биедээ шингээж уургийг ялгаруулдаг бөгөөд энэ нь биеийнх нь шингэн болж хувирдаг. Эдгээр хөлдсөн шавьжнууд нь хэдэн сарын турш хөлдүү байдаг боловч хайлах үедээ буцаж амьдардаг талаар дурджээ. Тийм учраас Монголд энэхүү хйлдйих арга нь тийм ч үр дүнтэй арга биш гэж хэлэх хүн гарч ирж болох юм. Гэвч Стран цааш нь хэлэхдээ хэрвээ амьдрах орчин нь харьцангуйгаар дулаан байх юм бол эдгээр шавьжнууд нь ихэнхдээ бодисийн солилцооны системийн улмаас хүйтнээс өөрийгөө хамгаалж чаддаггүй. Шавьжны хүйтнээс өөрийгөө хамгаалах системийг байхгүй болгохын тулд нэг сарын турш тасалгааны температурт шавьжийг байлгах хэрэгтэй гэж зөвлөсөн байна. Хамгийн гол нь аль болох хурдан хугацаанд температурыг аль болох хүйтэн болгож аль болох урт хугацаагаар байлгах хэрэгтэй гэж тэр үзсэн байна. Хөлдөөхөд шаардлагатай хугацаа нь температурын хэмжээнээс шалтгаалдаг бөгөөд–20 хэмийн хүйтэнд нэг долоо хоногийн турш байлгах (Strang 1997) эсвэл –30 хэмийн хүйтэнд 4 хоногийн турш байлгах нь (Strang 1992) хамгийн үр дүнтэй гэж тэр зөвлөсөн байна. Хайрцаг дотор байгаа зүйлийг хөлдөөхөд, давхар жийргэвч гэх мэт зүйл ашиглан байрлуулдаг учир 16 цаг шаардлагатай байдгаас шалтгаалан дахиад нэг хоногийг нэмж тооцоолоход илүүдэхгүй (Shchepanek 1996).

Аноксик (хүчилтөрөгчийн дутагдал буюу агаарыг өөрчлөх) арчилгаа нь химийн аргаар болон температурыг өөрчлөх аргаар хорхой шавьжийг устгах нь үзмэрт сөргөөр нөлөөлж байгаа тохиолдолд хэрэглэж болох бас нэгэн арчилгааны хэлбэр юм. Дээр дурдсан химийн аргаар устгал хийх үед үзмэрийн өнгө хувирах, уураганд өөрчлөлт орох гэх мэт хортой үр дагавар учирч болзошгүй байдаг. Мөн зарим нэг антропологийн үзмэрүүдийн орчны температур өөрчилж болохгүй байх тохиолдол ч бас гардаг. Энэ мэтчилэнгээр тухайн үзмэрийн онцлох шинж чанараас шалтгаалан дээрх хоёр аргаар устгал хийх боломжгүй тохиолдолд аноксик аргаар устгал хийх нь шалгарсан арга бөгөөд аноксик устгалын арга нь нэлээн олон төрлийн хорхой шавьжийг устгах үр дүнтэй арга юм. Ажиллах зарчим нь тун энгийн бөгөөд, хэрвээ амьтны амьдрах орчны агаараас хүчилтөрөгчийг сорон авбал амьтан амьдрах чадваргүй болдог онол дээр тулгуурласан юм. Аноксик устгалд CO_2, аргон болон азот гэсэн гурван төрлийн хийг ашиглаж болох бөгөөд аргон болон азотын аль аль нь идэвхгүй амьгүй төрлийн хийнүүд юм. Устгал хийхийг хүссэн эд зүйлсийг агаарыг нь соруулсан битүү уутанд (ихэвчлэн Teflon буюу Mylar –аар хийгдсэн уут) хийгээд агаарын оронд дээр дурдсан гурван хийний аль нэгээр нь дүүргэвэл хорхой шавьж болон бусад амьд биетүүд амьдрах чадваргүй болно. Хэрвээ энэ аргыг зохих журмын дагуу зөв хийж гүйцэтгэвэл үзмэрт ямар ч гэмтэл хохирол учруулахгүйгээр устгал хийх сайн үр дүнтэй арга юм. Ойролцоогоор 30 хэмийн дулаантай орчинд 99.7% ийн аргон хийгээр дүүргэсэн орчинд устгал нь 5-8 өдөр болох бөгөөд азотын хийгээр дүүргэвэл арай удаан буюу 7-10 өдөр, харин CO_2 ийг хэрэглэвэл бүр удаан буюу 15 өдөр тус тус шаардлагатай болно. CO_2 нь нөгөө хоёр хийг бодвол арай өөрөөр үйлчилдэг бөгөөд агаарын зөвхөн 60% -ийг л CO_2 оор дүүргэхэд хангалттай бөгөөд RH түвшинг 40% -аас доош хадгалах шаардлагатай болдог. CO_2 ийг хэрэглэж байх үед хорхой шавьж буюу ямар нэг амьд биет хүчилтөрөгчийн дутагдалд орж хүчилтөрөгчийг авахаар мэрийх боловч шингэний дутагдалд орж амьдрах чадвараа алддаг байна. Агаарын 99.7% -ийг аргон буюу азотын хийгээр дүүргэх боломжгүй тохиолдолд агаарыг 60% -ийн CO_2 оор дүүргэж CO_2 хийг хэрэглэх нь хэрэглэгчдэд ашигтай байдаг. Түүнчлэн CO_2 –ийг хэрэглэх нь арай хялбар бөгөөд хямд үнэ өртөг зарцуулдаг байна.

Аноксик устгалын аргыг хэрэглэхийн бас нэгэн уян хатан шинж чанар нь зориулалтын төхөөрөмжийг ашиглан бараг л бүх төрлийн том жижиг хэмжээтэй үзмэр болон үзмэрүүд энэ аргаар хамрагдаж болох юм. Хамгийн эн түрүүнд шаардлагатай багаж төхөөрөмжид Mylar буюу Teflon хуванцар уут (эсвэл өөр ямар нэгэн нэвтэрдэггүй хуванцар уут), халуун агаар битүүмжлэгч, дамжуулах хоолой, агаарын нягтрал хэмжигч, чийгшил хянагч, цилиндр савтай хий гэх мэт зүйлс багтана. Хуванцар уут сав болон халуун агаар битүүмжлэх төхөөрөмжний тусламжтайгаар ямар ч хэмжээний сав үүсгэх боломжтой: Европт ганцхан номонд устгалжуулалт хийж байсан бол Германд бүхэл бүтэн сүмийн байранд энэ аргаар устгал хийж байсан байна. Эд зүйлсийг битүүмжилсэн хуванцар уут саванд байрлуулсны дараа устгал хийх зарчим нь эд зүйлсийн хэмжээнээс үл хамааран адилхан байдаг. Битүүмжилсэн савныхаа аль нэг үзүүрт нь жижигхэн нүх гаргаад хийг нэг үзүүрээс нь эхлэн нөгөө үзүүр хүртэл оруулах хэрэгтэй. Хий уутыг дүүргэх явцад агаарын нягтралыг хэмжигч нь хийний хэдэн хувь нь ялгарч байгааг тогтооно. Ингэж хяналт хийсний үр дүнд зохих түвшний хий савны хоёр үзүүрт хүрсний дараа савыг битүүмжилж тогтоосон хугацааны турш байлгах боломжтой. Энэ аргыг хэрэглэх үед өөр бусад шинэ санаануудыг бас ашиглаж болно. Хэрвээ хий дэндүү хуурай байвал чийгшүүлэгч багаж төхөөрөмжийг нэмж суурьлуулж болно. Саван дахь хүчилтөрөгчийн хэмжээг багасгахын тулд хүчилтөрөгч илрүүлэгчийг (Мицубиши –ээс гаргасан Ageless илүү тохиромжтой) бас хэрэглэж болно. Гэх мэтчилэнгээр маш олон төрлийн хувилбарууд энэ аргаас урган гарсан бөгөд Selwitz болон Maekawa энэ талаар дэлгэрэнгүй тайлбарласан байгаа. Энэ аргыг хэрэглэх зардал өртөг нь ямар төрлийн хий хянагч ашиглахаас мөн устгалд хамрагдаж байгаа эд зүйлсийн том жижгээс шалтгаалан янз бүр байдаг. Жишээ нь, жижиг оврын үзмэрийг гар аргаар устгалд хамруулбал тун бага зардлаар хийж болно. Том оврын битүүмжилсэн савыг (3.5 куб метр хэртэй) автомат машинтай нь хамт худалдан авбал $20000 ам.доллараар АНУ –аас худалдан авах боломжтой.

Энэ аргыг хэрэглэхийн сул тал бараг байхгүй гэж хэлж болох боловч энэ аргыг хэрэглэхэд зарцуулагдах зардал өндөр бөгөөд цаг их шаарддаг. Аноксик устгал нь температурын өөрчлөлтөөр устгал хийх аргатай адилаар нэгэнт үзмэр устгалд хамрагдаж дуусаад битүүмжлэлээс гарсан бол өмнө байсантайгаа нэгэн адилаар шавьж үржих нөхцөлд хамгаалалтгүйгээр оршиж байдаг.

Үзмэр цуглуулгын ирээдүй бидний гарт байдаг

Цуглуулгийг нүдлэн хамгаалагчийн хувьд музейн баялаг өв нь бидний хойч ирээдүйд дамжин очихын тулд зохих журмын дагуу тэдгээрийг арчлах хамгаалах нь бидний эрхэм чухал үүрэг юм. Музейн орлуулж боломгүй биологийн болон түүхэн үзмэрүүдийг, богино хугацааны дотор хөнөөл учруулж болзошгүй хортон шавьж амьтдаас хамгаалахын тулд бид байнгын сонор сэрэмжтэй байх нь зүйтэй. Бидний нүдлэн хамгаалдаг үзмэр болон эд зүйлсийг бүрэн бүтнээр нь байлгахад хортон шавьжны устгалын ажлыг төлөвлөн мөрдөх нь чухал ач холбогдолтой.

David Hunt demonstrating processing of human remains. (photo: Neighbors)

16

Field and Laboratory Collections Management for Artifacts and Human Remains

David R. Hunt
Department of Anthropology
National Museum of Natural History
Smithsonian Institution

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 curatoral 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.

Contact Address: David R. Hunt, Ph.D., Division of Physical Anthropology, Department of Anthropology Smithsonian Institution, Washington DC; e-mail: *huntd@ si.edu*

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Mongolian Abstract

Хүний шарилыг хайгуулын ажлын үед болон лабораторит цуглуулах менежментийн үйл ажиллагаа

Доктор Давид Р. Хант (Шинжлэх ухааны доктор)
Смитсонийн Институтын Антропологийн тэнхмийн
Физикал Антропологийн Салбар

2003 оны 6 сард болсон хурлын үеэр тавигдсан илтгэлүүдийн хамгийн амин чухал асуудлуудыг энэ илтгэлд хураангуйлан нэгтгэсэн бөгөөд ажлын хэсгийн үеэр тараан өгсөн материалууд болон гарын авлагуудыг ард нь хавсаргасан болно. Эдгээр тарааж өгсөн гарын авлагуудын ихэнх нь Бассын (1995:329-338, Хавсралт 2) бүтээлүүдээс хураангуйлагдан бүрдсэн юм. Зарим нэг нь Убелакерийн (1999) бүтээлээс нэмэлт болон энэ гарын авлагуудад багтсан байгаа. Энд илтгэл нь эртний хүний шарилыг хэрхэн малтлага хийж гаргах, энэ явцын талаар тэмдэглэглэл хөтлөн, малтлагын үед гаргаж авсан материалуудыг лаборатор руу зөөж аваачих бүх л үе шатыг тайлбарлан таниулах зорилготой байсан билээ. Түүнээс гадна энэ илтгэл нь лабораторийн үйл явцын талаар ерөнхий ойлголт өгч хадгалалт хэрхэн явагдах тухай зарим нэг зөвлөгөө өгөх давхар зорилготой байлаа. Хэдийгээр энэ илтгэл нь эртний хүний шарил дээр тулгуурласан байсан боловч, энд дурдагдаж байгаа хадгалалт нөөцлөлтийн үйл явц нь удаан хугацаагаар хадгалах шаардлага бүхий бусад археологийн олдворууд дээр бас хэрэглэгдэж болох юм.

Уг илтгэлд дурдагдаж буй хайгуулын болон лабораторийн үйл явц нь Смитсонийн археологичдын өнгөрсөн хэдэн арван жилийн турш хэрэглэсээр ирсэн арга барил юм. Эдгээр үйл явцын системчилсэн арга хэлбэр нь бидний олдвор цуглуулгуудыг хадгалах каталогжуулахад маш тус нэмэртэй байсаар ирсэн бөгөөд эдгээр олдворуудыг нь хайгуулын талбараас музей хүртэл тодорхой эрэмбэ дараатай зохион байгуулалттайгаар зөөвөрлөж авчирдаг. Гэхдээ зарим тохиолдолд бид бусад институт болон их сургуулиудын авчирсан хайгуулын материалуудыг бас хүлээн авдаг. Мэдээж эдгээр нь малтлагын дараа өөр өөр аргаар эрэмбэлэгдэж, хаяг тайлбар наалттай болж, хадгалагдсан байдаг. Ийм учраас музейн болон лабораторийн мэргэжилтнүүд болон ажилтнууд нь өөр

аргаар бүртгэгдсэн материалуудыг зөвөөр ялган судалгааны ажилд хэрэглэгдэх зохих журмын дагуу хүлээн авч шилжүүлэх нь хамгийн чухал байдаг. Үүнээс гадна эдгээр гаднаас ирсэн олдвор дахь мэдээллүүд нь Смитсонийн бүртгэл хийх систем болон үйл явцтай нэгэн ижил хэлбэрээр бүртгэгдсэн байх ёстой. Иймд энэ үйл явц нь тохируулан тааруулах үйл явц юм.

Тохируулан тааруулалт

Тааруулалт гэдэг бол археологи болон антропологийн аливаа ажилд хамгийн чухал ойлголт юм. Зөвхөн дээр дурдсан өөр байгууллагын бүтээл дэх мэдээллийг өөрийнхдөө тааруулан авахад энэ ойлголт нь чухлаас гадна хайгуул судалгааны ажилд тэр чигээрээ энэ ойлголт нь уялдаж байх ёстой юм. Хайгуулын ажлын зохион байгуулалт, хяналтаас гадуурх нөхцөл байдлууд нь олдворт хэрхэн малтлага хийх, бүртгэл хөтлөх зэрэгт нөлөөлдөг. Хайгуулын ажлын үеэр тогтоосон цаг хугацаа (зарим нэг нийгмийн болон шашны шалтгаанаар тогтоож өгсөн зөвшөөрлийн хугацаа), ажиллаж байгаа хамт олны дадлага туршлага, цаг агаарын болон орчны байдал (бороо орох, хэт хүйтэн байх), багаж тоног төхөөрөмжийг авч явах бололцоо (хадгалдаг сав буюу уут, цаас цөөн тоогоор байх), зөөвөрлөлт тээвэрлэлтийн асуудал (жийп, тэмээн хөсөг) гэх мэт бүхий л хүчин зүйлүүд нь хайгуулын ажилд болон ажлын явцаас шаардагдах үр дүнд нөлөөлж тодорхой хэмжээгээр үүссэн нөхцөл байдалд тохируулж тааруулах хэрэгтэй болдог.

Бүртгэл хөтлөлт

Хайгуулын ажил болон лабораторийн ажлын үеэр дагах хамгийн эн тэргүүний зөвлөмж нь байнга бүртгэл хөтлөх явдал юм. Үүнд тэмдэглэл, фото зураг, тайлбар зүүлт зэргийг тодорхой, дэлгэрэнгүйгээр хөтлөх багтана. Хэзээ ч өөрийнхөө ой тогтоолт санамжинд найдаж болохгүй! Дээрээс нь нэмж хэлэхэд, ганцхан хувь хөтлөсөн тэмдэглэлд бас найдаж болохгүй. Хөтлөсөн бүртгэл болон тэмдэглэл санамсаргүйгээр арилах буюу алга болох тохиолдол гарч болно. Тэмдэглэл болон бүртгэл хөтлөсөн дэвтрээ хуванцар уут саванд хийгээд, тайлбар хаягийг уутныхаа гадна болон дотор талд нь давхар тавих хэрэгтэй. Мөн түүнчлэн уутнуудаа дугаарлаад, дугааруудыг нь тэмдэглэлийн дэвтэрт тэмдэглэн хадгалах нь ихэнх тохиолдолд ач холбогдолтой өргөн хэрэглэгддэг арга юм. Ингэж уутнуудаа дугаарласнаар хайгуул шинжилгээний ажлаа дууссаны дараа дугааруудаа хаалтын тэмдэглэгээ маягаар бас ашиглаж болно. Фото зурган тэмдэглэл нь дараа эргүүлэн ашиглахад тус дөхөм арга бөгөөд, ялангуяа сүүлийн үед дижитал аппарат ашиглан зураг авах боломжтой болсон учир хэрэглэхэд улам амар болсон билээ.

Олдворын хамгаалалт

Олдворыг бүртгэл хийн, тайлбар тавьж тусгай савнуудад хийхийн гол шалтгаан нь хамгаалахад оршино. Эд зүйлс болон олдворын үүсэл гарлыг үнэн зөвөөр ялгаж таних нь зайлшгүй хийх алхмуудын нэг юм. Хэрвээ олдворын гарал үүслийн талаарх мэдээлэл хаягдаж гээгдвэл уг олдворыг эрдэм шинжилгээний бүтээлд ашиглах үнэ цэнэ нь алга болно гэсэн үг. Иймд бүртгэлийн илүү хувиуд нь малтлага хийх явцад, малтлага хийж дууссаны дараа, мөн лабораторит уг олдворыг судлан шинжилж байх бүхий л хугацааны турш хамгаалагдаж тэмдэглэл хөтлөж байх ёстой. Хайгуул шинжилгээний ажлын бүх үйл явц, гол гол олдворууд, тэдгээрийн байрлал болон бусад холбоотой зүйлүүдийг ойлгомжтойгоор харуулсан тодорхой схем зургийг үйлдэх хэрэгтэй.

Эд зүйлсийн хамгаалалтын горим нь малталтын янз бүрийн үе шатуудад мөрдөгдөх ёстой байдаг. Олдворыг бат бөх тогтвортой байлгах нь байгаа газраас нь ухаж гаргахаас өмнө ч гэсэн маш чухал асуудал болж байдаг. Улмаар малтлагын газар дээр ажиллахад, газраас лаборатори буюу институт уруу зөөвөрлөхөд уг олдворын тогтвортой байдлыг тодорхойлж байх хэрэгтэй. өмнө дурдаж байсанчлан ихэнх тохиолдолд олон зүйлээс хамаарч энэ бүх шийдвэрүүдийг гаргах болдог. Жишээ нь, цаг агаарын байдал, тухайн өдрийн цаг, малтагч машин буцаж газар уруу эргэж ирэх боломжтой эсэх гэх мэт олон зүйлүүдээс олдворыг газраас ухаж гаргахад цаг хугацаа нь хамаарч болно. Ялангуяа амархан хагарч гэмтдэг биетийн (газраас хөндийрүүлж ухаж гаргахад үйрч бутардаг эсвэл малталт хийж байгаа урт хугацааны турш гэмтэл авах боломжтой олдворууд) хувьд хамгаалалт нь амин чухал асуудал болж байдаг.

Материалуудыг газар дээрээс нь зөөх тээвэрлэлтийн асуудал нь олдворын бүрэн бүтэн байдалд эрсдэлтэй байж болох талтай. Тээвэрлэлтийн үед эд зүйлсийг огт гэмтэхгүй гэсэн баталгаа гаргах ямар ч боломжгүй байдаг, ялангуяа олдворыг тээвэрлэх үед хамгаалах баглаа боодол буюу бусад хамгаалалтын хэрэгслүүд хязгаарлагдмал байсан тохиолдолд бүрч баталгаа гаргахад хэцүү юм. Гэхдээ, хэрэв хамгийн болгоомжтой аргуудыг хэрэглэн эд зүйлсийг хамгаалвал, олдворыг газар дээрээс нь лаборатори хүртэл гэмтээлгүйгээр тээвэрлэх боломж бас бий.

Олдворыг тухайн оршиж байсан газар дээр нь тээвэрлэх явцад мөн лабораторит ирсэн хойно нь гарал үүслийх нь хувьд гэмтэлгүйгээр байлгахын тулд эд зүйлсийн болон хадгалж буй уут саван дээр хаяг тайлбар зүүх нь хамгийн гол алхам юм. Олдворын хаяг тайлбар буюу дагалдах зүйлс нь гээгдэж үрэгдвэл уг олдвор нь судалгааны ажилд хэрэглэгдэх үнэ цэнээ алдана гэсэн үг. Тайлбар хаяг нь гэмтэж болзошгүй учир гаднах уут саван дотор болон олдворын дотор тавьсан тайлбар хаяг нь мэдээллийг хамгаалан батжуулах болно. Олдворыг байрнаас нь хөдөлгөхийн өмнө тайлбар хавсаргасан фото зураг нь мэдээллийг хамгаалах нэмэлт арга хэрэгсэл юм.

Бүх уут савны сүүлчийн бүртгэлийг эд материалыг газар дээрээс нь шилжүүлэн тээвэрлэхийн өмнө зайлшгүй хийх ёстой алхам юм. Дараа нь давхар шалгахын тулд лаборатори уруу шилжүүлэх уут савны бүртгэлтэй ижил төстэй бүртгэлийг хийх нь зүйтэй. Хайгуулын ажлын үер хийгдсэн, лабораторит шинжлэх эд зүйлсийн талаарх бүх төрлийн тэмдэглэл болон бүртгэлүүдийг дахин нэг хувь үйлдээд лабораторийн ажилд зориулан хадгалах хэрэгтэй. Хайгуулын талбар дээр хийсэн тэмдэглэлийн эх хувийг лабораторийн ажлийн үеэр хэрэглэх хэрэггүй. Учир нь тэмдэглэл гэмтэж бүртгэл алга болох магадлалтай.

Олдворыг лабораторит янзалж цэвэрлэх болон катологжуулах явцыг бүртгэн шалгахад олдворын хаяг тайлбар нь ойлгож танихад амархан байх шаардлагатай. Олдворыг хоорондн нь холилдуулахгүйн тулд аль болох хурдан хугацаанд катологжуулах хэрэгтэй. Катологжуулах үйл явцад дараах зүйлүүд багтана. Үүнд: бүртгэлийн дэвтэрт оруулах, байнгын каталогны карт бэлтгэх, компютер дээр бүртгэлд оруулах, мөн мэдээж эд зүйлс дээр байнгын хаяг тайлбарыг зүүх. Компютерийн бүртгэлийг цорын ганц бүртгэлдээ тооцож найдаж хэзээ ч болохгүй. Компютерт хадгалсан бүртгэл нь гэмтэл авч устгагдах аюултай ба компютер болон программ хангамж нь байнга хуучирч байдаг. Харин цаасан дээрх бүртгэл (катологны карт, бүртгэлийн дэвтэр, болон бүртгэлийн цаасан дээрх хуулбарууд) болон хэвлэсэн фото зурагнууд (эсвэл фото хальс) нь хамгийн найдвартай юм.

Хадгалалт ба Цуглуулга хөтлөх

Цуглуулгыг хадгалах явцад хоёр гол зүйлийг анхаарах нь зүйтэй–1) хамгаалалтын аюулгүй байдал болон 2) байрлалыг зохих журмын дагуу тогтоох (өөрөөр хэлвэл, олдвор хаана хадгалагдаж байгааг). Олдворыг хамгийн зөвөөр хадгалж хамгаалахад битүүмжилсэн шүүгээ нь хамгийн найдвартай хамгаалах хэрэгсэл юм. Олдворыг гадаад орчны нөлөөнөөс тусгаарлан, хамгаалж улмаар хялбархан авч хэрэглэж байхад шүүгээнүүд нь хамгийн тохиромжтой байдаг. Модон хайрцаг гэх мэт сав нь хамгаалалтын хэрэгсэл болж чадах боловч эд зүйлсийг авах хийхэд илүү их үйлдэл шаарддаг. Онгорхой шүүгээ буюу тавиур дээр олдворыг хадгалах нь тийм ч зохимжтой арга биш, гэхдээ хэрэв энэ нь цорын ганц боломжит арга бол эд зүйлсийг найдвартай хамгаалахаар хайрцганд байрлуулах нь зүйтэй. Боломжтой бол хамгаалалттай материалаар (хүчил гэх мэт химийн бодис нэвтэрдэггүй) хийгдсэн хайрцаганд эд зүйлсийг байрлуулан хайрцагны дотор талыг ч мөн адил материалаар бүрэх нь зүйтэй. Хадгалах агуулахын өрөөг орчныг нь тохируулж болдог буюу температур чийгшилт зэргийг хянаж тохируулж болдог байхаар сонгож авбал илүү нийцтэй.

Эд зүйлсийг зохих журмын дагуу хадгалахын тулд өөр өөр чийгшилтийн түвшинд хадгалах хэрэгтэй болдог. Иймд хадгалалт хариуцаж буй хүн нь хамгийн тохиромжтой аргыг сонгох хэрэгтэй болдог. Гэвч хамгийн үндсэн асуудал нь богино хугацаанд чийгшилт болон дулааны хэлбэлзлийн аль алийг нь зохицуулахад оршдог. Түүнчлэн эд зүйлсийн материалууд хоорондоо химийн урвалд орж бэрхшээлтэй асуудлыг үүсгэдэг. Зарим нэг метал болон ширэн материалын хооронд урвалд орох гэх мэтийн хэцүү асуудлууд үүсэж болох учир эд зүйлсийг бие биетэй нь ойролцоо зайнд байрлуулахын өмнө энэ талаар нягтлан шалгах нь зүйтэй.

Цуглуулгыг хадгалахад маш их том хэмжээний зай шаардагддаг нь няцаашгүй үнэн бодит зүйл билээ. Том зайтай байр нь илүү их үнэтэй байдаг гэдгийг бид бүгдээрээ мэднэ. Ялангуяа энэ нь заавал орчин нөхцлийг нь хянаж тохируулах, аюулгүй хамгаалалттай байх шаардлагатай бол бүр ч их зардал гардаг. Өмнөө байгаа нөөц боломжоо ашиглан мөн боломжит аргуудыг хайж хослуулан хэрэглэх нь бидэнд байгаа гол түлхүүр юм. Хамгийн сайн хамгаалалттай орчин нөхцлийг нь хянаж тохируулж болохуйц газрыг хайж олон хамгийн үнэ цэнэтэй цуглуулгыг удаан хугацааны турш хамгаалахаар хадгалах нь зүйтэй.

Эд зүйлсийг хадгалж байх явцад журмын дагуу хянаж шалгах явц нь ажилтнаас мэргэжлийн хувьд чадварлагаар эд зүйлсийг хичээнгүйлэн бүртгэж, хадгалж буй агуулахыг байнга эргэж тойрч, зарим нэг өөрчлйлтүүдийг дор дор нь хийж шинэчлэж байхыг шаарддаг. Цуглуулгыг зөв хэлбэрээр хадгалах цорын ганц баталгаатай арга зам нь энэ юм. Өнөөдрийн байдлаар компютерээр бүртгэл хөтлөх нь эд зүйлсийг хянаж шалгахад нэн шаардлагатай арга хэлбэр болсон бөгөөд аль болох боломжтой цагтаа үүнийг хэрэгжүүлэх шаардлагатай болоод байна. Энэ бүртгэлийн хэлбэр нь мэдээллийг шинэчлэхэд хялбар байдгаас гадна эд зүйлсийг хайж олоход нэг бол хадгалсан байрлалаар нь, эд зүйлийн төрлөөр нь эсвэл материалаар нь, гарал үүслээр нь эсвэл байрлаж байсан газарт бүртгэсэн ангиллаар нь гэх мэтчилэн боломжит бүх л хэлбэрээр хайлт хийх нөхцлийг бүрдүүлдэг. Гэхдээ бүртгэлийн хэлбэрийг зохиохдоо дэндүү олон хүчин зүйлийг хамруулахаас зайлсхийх нь зүйтэй. Бүртгэл хэдийчинээ олон зүйл хамруулсан байна төдий чинээ баримтны талаарх мэдээнүүд өөр хоорондоо давхцаж будилах магадлал өндөртэй. Мөн мэдээ баримтууд маань ашиглахад хүндрэлтэй ярвигтай болно гэсэн үг. Ингэж учрыг нь олох гэж мэрийх нь ашиг тус авчрахын оронд харин ч хүндрэл бэрхшээл учруулдаг.

Хадгалалтын хаяг болон байрлал заасан тайлбар зүүлт нь хэн ч ажиглахаар энгийн хялбар байх хэрэгтэй. Хадгалагдаж буй эд зүйлсийг байрлуулахдаа өрөөн дотор тодорхой эрэмбэ дараатай байрлуулах нь зүйтэй. Ингэснээр зөвхөн тухайн хэсгийг хариуцсан ажилтанд ч биш бусад ажилтанuудад ч гэсэн эд зүйлсийг олоход амархан байх болно. Агуулахын дотоод бүтцийн бүдүүвч зураг нь хадгалагдаж буй зүйлсийг байрлуулахад хүмүүст тус болох нь дамжиггүй. Цуглуулгыг сайн нүдлэн хамгаалж бүртгэл хөтлөх явц нь ажилтнаас ур чадвар шаардсан ажил байдаг. Дадлага туршлагатай, чадварлаг, найдвартай, Үнэнч шударга ажилтанууд маш их үнэ цэнэтэй хүчин зүйл юм. Хамгийн их ур чадвар шаардсан ажлын байран дээр хамгийн шилдэг тэргүүнйи ажилтанаа ажиллуулах нь сайн зохион байгуулалттайгаар ажиллахын түлхүүр юм.

Судалгааны ажил болон үзүүлэнд хэрэглэх, олдворыг хадгалах

Цуглуулгыг хадгалалтынх нь хувьд хамгаалан бататгаж тогтвортой байлгах болон судалгааны ажилд зориулан нээлттэй байлгах хоёрын хооронд байнгын салшгүй зөрчилдөөн үүсч байдаг. Энэ нь музейн цуглуулгыг зохион байгуулахад тулгарч байгаа ирээдүйд ч тулгарах хоёрдмол шинжтэй асуудал юм. Цуглуулгыг бүрэн бүтнээр гүйцэд хамгаалахын тулд агаар гэрэл гэх мэт гадаад орчны нөлөөнөөс бүрэн тусгаарлах хэрэгтэй болдог. Эсрэгээр нь цуглуулгыг судалгаа шинжилгээний ажилд хэрэглэхийн тулд гаргаж авч үзэх, гэрэл тусгах, орчны өөрчлөлтөнд оруулах, тэр ч байтугай хэсэгчлэн тасдаж аван судлах зайлшгүй шаардлагатай болдог. Эд зүлсийг үзүүлэнд дэлгэн тавих үеэр байнга гаргаж хэрэглээд байхгүй ч гэсэн, хичнээн бага ч гэсэн ямар нэг байдлаар гэрэл тусч, гадны нөлөөгөөр үзүүлэн урт хугацааны туршид элэгдэл хорогдолд орж муудах боломжтой. Музейн хадгалалт хариуцсан мэргэжилтнүүд, удирдах албан тушаалтнуудын хувьд, цуглуулгыг ямар арга замаар судалгаанд буюу үзүүлэнд ашиглах нь хадгалалтанд сайнаар нөлөөлөх тал дээр шийдвэр гаргах нь хамгийн хэцүү байдаг. Ихэнх байгууллагын хувьд тулгарч байдаг эрсдэлтэй алхам нь эд зүйлсийг зээлдүүлэх, зээлдэх, үзүүлэнд тавихад мөрдөх ёстой тэмдэглэл хөтлөлт болон хадгалалт юм. Ихэнх тохиолдолд хэн нэг музейн ажилтан буюу судлаачид эд зүйлсийг түр хугацаагаар зээлдэн авахад тэмдэглэл хөтлөж бүртгэдэггүй. Ийнхүү тухайн эд зүйлсийн музей буюу институтид байрлаж байгаа газар нь зөвхөн хэн нэг хүний ой тогтоомжинд хадгалагдсанаар тодорхойлогддог. Гэвч бид ой тогтоомжинд найдах ёсгүй. Эд зүйлс үзүүлэнгийн зориулалтаар ашиглагдах тохиолдолд байрлалын код нь оффис, лаборатори болон үзүүлэнгийн хэсэгт тэмдэглэгдэх ёстой. Хаяг буюу тайлбар зүүлт нь эд зүйлсийн байнгын хадгалагддаг газарт нь үлдэх ёстой. Ингэснээр тухайн эд зүйлс хаана байрлаж байгааг мэдээд ч зогсохгүй дараа буцааж байрлуулахад байнга байрладаг газар нь хоосон байж байрлуулахад бэлэн байх ёстой.

William Fitzhugh opening the 2004 U.S.-Mongolian Deer Stone conference at Mongolian National University lecture hall. (photo:Marsh)

17
Excavation and Treatment of Skeletal Remains[1]

David R. Hunt
Department of Anthropology
Natinal Museum of Natural History
Smithsonian Institution

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

1. Derived and paraphrased from Bass (1995:329-338, Appendix 2) with additions

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 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 loose 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-metalic) 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 loose 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

Bass, W. M., 1995: *Human Osteology: A Laboratory and Field Manual*, 4th ed. Columbia, Missouri: Archaeological Society Special Publication #2.

Ubelaker, D. H., 1999. *Human Skeletal Remains: Excavation, Analysis, Interpretation*, 3rd ed. Washington: Taraxacum.

Шарилд малталт хийх ба шарилтай харьцах нь[1]

Доктор Давид Р. Хант (Шинжлэх ухааны доктор)
Смитсонийн Институтын Антропологийн тэнхмийн
Физикал Антропологийн Салбар

Хайгуулын талбар дээр малталт хийх

Шарилыг ил гаргах ба бүртгэх ажиллагаа

Араг ясны эргэн тойрноос газрын хөрсийг цэвэрлэхдээ жижиг хүрз буюу нийвийгээр тойрог хөдөлгөөнийг хий. Ясыг ил гаргах явцыг сайн харж мэдрэхийн тулд гадна наалдсан шороог сойз ашиглан цэвэрлэ. Ясанд гэмтэл учруулахгүйн тулд эргэн тойронд нь наалдсан шороог хулсан буюу өөр ямар нэг төмөр биш материалаар цэвэрлэ.

Араг ясны бүх яснуудыг гүйцэд малтаж дуустал бүх ясыг хамгийн сүүлд нь бүрэн бүртгэл хөтлйхийн тулд холбоотой ястай нь хамт байр байранд нь үлдээ.

Аль болох бүрэн гүйцэд бүртгэл хөтлө. Ой санамжиндаа найдаж болохгүй.

Малталт хийж байх үеийн фото зургийг авч бүртгэл хйтлйх нь хамгийн шилдэг арга мөн.

Малталт хийж дууссаны дараа яснуудыг газраас хөндийрүүлэхийн өмнө араг ясны зургийг авах шаардлагатай.

Малталтын явцын дундах болон дараах зургийг авч дууссаны дараа зураг дээр хаяг тавь. Доорх мэдээллүүд багтсан байх шаардлагатай: газрын нэр болон дугаар, онцлох шинж дугаар, хойд зүгийг заасан тал, метрийн хэмжээс, зураг авсан он сар өдөр.

Араг ястай холбоотой тодорхой мэдээ баримтууд, түүний байрлал болон бусад материалуудыг зөвхөн фото зургийг үндэслэж биш бас нэмээд цаасан дээр тэмдэглэл хетлөж цуглуул. Системчилсэн бүртгэл хөтлөж мэдээллийг эмх замбараатай байлгахын тулд стандарт хөтлөлтийн хэлбэр зохиож түүнийгээ хэрэглэ.

Шарилыг газраас холдуулан авах

Бүх бүртгэлийг хөтлөж дууссаны дараа ясыг газраас холдуулан авч болно. Хэрвээ араг яс нь газраас бүтнээрээ ил гараагүй бол яснуудыг газраас хөшөх буюу шорооноос хүчээр салгах гэж оролдсоны хэрэггүй. Энэ нь ясыг эвдлэх гэмтээж болзошгүй бөгөөд лабораторит янзлахад илүү их хүч хөдөлмөр

[1] *Басс (1995)–ийн бүтээлээс нэмэлт болгон авав*

шаардагдах болно.

Шороог гавлын ясны дотор талд хатахаас өмнө газар дээр нь ясыг шорооноос цэвэрлэж салгахыг хичээх хэрэгтэй. Шороо хэрэв гавлын ясны дотор талд хатвал агшилт буюу тэлэлтийн нөлөөгөөр араг яс цуурах аюултай эсвэл хатуу хөрс шороо гавлын ясан дотор өнхөрвөл ясыг цуулж хагалах болно.

Ясанд хөгц, мөөгөнцөр үүсэх боломжийг нь бууруулахын тулд тэдгээрийг саванд байрлуулахын өмнө агаарт хатаах нь хамгийн зөв арга юм. Мөн яс болон бусад эд зүйлсийг нарны гэрэл шууд тусахаар газар байрлуулахгүй байх нь шилдэг арга юм. Нарны туяа нь олдворт болон гадаргууд нь цууралт хагаралт үүсгэх шалтгаан болж өгдөг. Малталтын үеэр болон хатаах үедээ олдворуудыг сүүдэрт байлгахыг мэрийх хэрэгтэй.

Шарилыг савлах хураах

Яснуудыг хаяг тайлбартай уут буюу саванд байрлуул. Хаяг тайлбарт ясны бүртгэл, олдсон газрын дугаар болон нэр, шинж тэмдгийн дугаар болон түвшний дугаар, малталт хийсэн он сар өдөр, малтагч хэрэгсэл болон малталттай холбоотой бусад нарийн мэдээллүүд тусгасан байх ёстой.

Шарилаас хөл гарны ясыг салгаж байх явцад яс бүртэй холбоотой хэсгүүдээр нь гар хйл тус бүрийг тус тусад нь уут саванд хий. Энэ нь лабораторит эд зүйл бүрийг зөв хэсэгтэй нь ялгаж танихад тус дөхөмтэй болно. Хэрвээ ямар нэг хэсэг нь олдвороос илрэх юм бол өөр хооронд нь холбогдуулж уутлаж савласнаар лабораторит танихад амар хялбар байх болно.

Бүх яснууд болон түүнйи хэсгүүдийг аль болох хуучин хэвэнд нь байлга. Зарим нэг хэсгүүд нь лабораторит дахин засаж янзлах буюу ялгаж танихад хэцүү байж болзошгүй.

Хэд хэдэн сав болон уутыг ашигла, саванд дэндүү ихээр нь бүү байрлуул. Хэмжээ хэтрүүлж байрлуулсанаар материалд гэмтэл учруулж болзошгүй.

Хугарч гэмтэх, бяцрахаас зайлсхийж том хэмжээтэй, хүнд жинтэй яснуудыг савны ёроолд нь байрлуул.

Уут савны гаднах хаяг тайлбарыг харандаа буюу ус нэвтэрдэггүй үзгээр тэмдэглэ. Уут саван дээрх арилж бүдгэрч алга болсон мэдээлэл нь малтаж ав материалыг хожим лабораторит шинжлэхэд үнэ цэнэгүй зүйл болгон хувиргадаг.

Тээвэрлэхээр ачилт хийж байх явцад элемент болон олдворууд нь өөр хоорондоо харшилдаж бие бие гэмтээхгүй байх тал дээр анхаар. Боломжтой бол материал тус бүрийг тус тусад нь ороож зөөллөх хэрэгтэй эсвэл тээвэрлэх явцад олдворыг нааш цаашаа шидэгдэхгүй тогтвортой байлгахыг хичээ.

Хайгуулын талбар дээрээс лаборатори уруу шилжиж байгаа бүх уут савны жагсаалт хийгдсэн байх ёстой. Ингэж хянаснаар малтаж авсан материалуудыг үрэгдэж гээгдэх аюулыг багасгах чухал ач холбогдолтой ба хэрвээ ямар нэг байдлаар хоорондоо холигдож солигдвол ялгаж танихад дөхөмтэй байх болно.

Хайгуулын талбарт хийлийсийн тэмдэглэлийг хамгаалах

Бүх тэмдэглэл бүртгэлээ эмх замбараатай хөтлөх хэрэгтэй, үүнд дараах зүйлүүдээр ангилах хэрэгтэй: газраар нь, хэсгээр нь, онцлох шинжээр нь, түвшингээр нь зэрэг багтана. Эдгээр бүртгэлд цаасан дээр хөтөлсөн баримт, фото зургийн хуулбар болон хальс (бүгд арилдаггүй балаар онцлон ялгах тоо баримтыг агуулан хаяглагдсан), зөвшөөрлийн бичгийн хуулбар гэх мэт зүйлсүүд орно.

Лабораторит хийх ажлууд

Хайгуулын талбараас лабораторит ирсэн бүх уут савнуудыг бүртгэж аваад дагалдаж ирсэн жагсаалттай нь ирсэн бүх уут савыг тулган үзэж тааруулах хэрэгтэй.

Цэвэрлэх

Яс болон олдворуудыг уут савнаас нь салгах явцдаа ястай дагалдаж ирсэн хаяг тайлбарыг байнга хамт байлгаж байх хэрэгтэй эсвэл материал дээр ялгагдах онцлогийг нь алдагдуулахгүйн тулд нэмэлт тайлбар зүүлт хийж өгөх хэрэгтэй. Ой санамжиндаа найдаж болохгүй.

Эд зүйлсийг хамгаалах, лабораторийн нэг хэсгээс нөгөө уруу нүүлгэн шилжүүлэхэд хялбар байлгах, хэрвээ хэд хэдэн эд зүйлс хамтдаа байгаа тохиолдолд хамтруулах гэсэн зорилгоор материалуудыг тавиур буюу хайрцаганд байрлуулах нь хамгийн оновчтой арга юм.

Яс буюу эд зүйлстэй болгоомжтой харьцахын тулд гараараа тулах, хамгийн их жин ихтэй хэсгээс нь барих, эсвэл тэдгээрийг сав буюу тавиур дээр тавих хэрэгтэй.

Яснуудыг шинжлэх буюу хадгалахын өмнө заавал цэвэрлэсэн байх шаардлагатай. Эд зүйлийн онцлогоос шалтгаалан янз бүрийн цэвэрлэгээний хэлбэрийг ашигладаг. Гадна талд наалдсан шороо буюу бусад зүйлсээс цэвэрлэхийн тулд ихэвчлэн зөөлөн сойз болон төмрөөр биш өөр мод буюу хулсаар хийсэн багажийг ашиглах нь хамгийн сайн арга юм.

Хэрвээ эд зүйлс болон яс нь тогтвортой төлөв байдалтай (хэврэг биш, цууралтгүй, үйрмэг биш) бол шорооноос цэвэрлэхийн тулд усаар угааж болно. Угаах буюу дэвтээхээс өмнө хадгалалт хариуцсан хүнээр ясны тогтвортой байдлыг тодорхойлуулахаар туслуул.

Угаахдаа жижиг яснуудыг (чихний яс, шүд, хурууны үе болон хэсгүүд) урсгаж алдахгүйн тулд заавал шүүрэн саванд буюуу тавиур эсвэл саванд угаах хэрэгтэй.

Хаяг тайлбар зүүх ба катологжуулах

Яс болон эд зүйлсийг зохих журмын дагуу цэвэрлэж хатаасны дараа, яс тус бүрийг хоорондоо давхцахгүй дугаараар ялгаж дугаарлаад яс болон эд зүйлсийг ялгаж хянахад бэлэн байлгах ёстой. Эдгээр дугаарууд нь олдсон газар, онцлох шинж тэмдэг, булш, музейн каталог, болон бусад мөрдөх ёстой дугаар зэргийг илэрхийлсэн дугаар байж болно. Хэрвээ элемент эмх замбараагүй болох тохиолдолд ийнхүү дугаарлах нь маш чухал байх болно.

Ясыг хаяглахдаа арилдаггүй, усны хамгаалалттай бэх үзгийг хэрэглэх шаардлагатай. Ясан дээр шууд хаяг тавих нь хамгийн үлдэцтэй байх болно. Зарим институтууд хаяг тавихийн өмнө ясан дээр PVA гэх мэт суурь наалт хийхийг шаарддаг гэхдээ энэ нь хууларч унах сул талтай.

Эд зүйл бүрт каталогны дугаар олгож замбараатай болгох үүднээс каталогны дэвтэр хөтлөх хэрэгтэй. Катологны дугаар болгон тухайн эд зүйлийн талаарх дэлгэрэнгүй мэдээлэл ба эд зүйлийн дүрслэлийг агуулан бүртгэгдсэн байх шаардлагатай. Катологны картыг лавлагаанд зориулж хийх хэрэгтэй.

Катологийг компютерт оруулан бүртгэл хөтлөх хэрэгтэй ба энэ нь хяналт хийхэд мөн хайлт хийхэд тус дөхөмтэй байдаг. Энэ компютерт оруулсан мэдээллүүд нь материалын бүртгэл болон хадгалж байгаа байрлалыг бүртгэх зорилгоор ашиглагдаж болно.

Шинжилгээ хийх зорилгоор сэргээн засварлах

Олон бутархай хэсгээс бүрдсэн ясыг буцааж эвлүүлэх явцад аль болох удаан хугацааны турш тогтвортой байлгахын тулд цавуулаг наалдамтгай зүйлсийг хэрэглэ. Нэвт гэрэлтдэг наалдамтгай зүйлийг хэрэглэх нь хамгийн шилдэг арга учир нь засагдаж байгаа үенүүдийн эргэн тойрныг бүдэг балархай болгохгүй. Мөн ацетоноос бүтсэн уусдаг наалдамтгай зүйлийг хэрэглэх нь зүйтэй.

Ясыг засварлах явцад цуурсан хэсэг болон нүхийг нөхөх дүүргэх гэж оролдсоны хэрэггүй. Эдгээр нь судалгаа шинжилгээний ажлын үеэр хүний хөгжил, түүнйи өөрчлөлт, гэмтэл авсан шалтгаан зэргийг танихад чухал байж болох талтай.

Ясыг будгаар бүрэх буюу гадуур нь бүрж болохгүй. Энэ нь ясны хэлбэр бүтцийг балартуулж эд зүйлийн гадаргууг гэмтээх аюултай. Эд зүйл болон ясны гадуур бүрхэж байгаа үеийн суналт болон агшилт нь янз бүр байдаг учир гадаргууг нь гэмтээх цуулах нөхцөл болж болзошгүй.

Хадгалалт

Бүх материалууд хамгаалалттай хайрцаг буюу саванд зохих журмын дагуу хадгалагдсан байх ёстой. Эд зүйлсийг савнаас нь гаргах тохиолдолд хүний гар чөлөөтэй багтаж өргөж авч болохуйцаар хайрцаг буюу савны хэмжээ хангалттай том хэмжээтэй байх шаарлагатай.

Эдгээр хайрцаг сав нь эд зүйлсийн жинг найдвартай даах чадвартай байх хэрэгтэй ба эд зүйлсийг талууд уруугаа гулгахад бат бөх байлгаж хамгаалахын тулд таарсан зайтай байх шаардлагатай. Хайрцаг дотор дэмжлэг болгож доторлох нь хамгаалах хэрэгсэл болно. Хайрцаг буюу сав нь гаднах орчны нөлөөнөөс хамгаалах давхар үүрэгтэй байх ёстой. Гэвч сав нь агаар буюу ус үл нэвтрүүлдэг битүү байх шаардлагагүүй учир нь ямар нэг байдлаар дулааны болон чийгшилтэнд гэнэт өөрчлөлт гарвал чийг болон агшилт үүсэх магадлалтай. Битүүмжилсэн савыг эд зүйлсийг хадгалахад чийглэг орчин шаардлагатай тохиолдолд л зөвхөн хэрэглэх нь зөв.

Гавлын ясны эмзэг нүүрний хэсгийн яс болон шүдийг бусад ястай хавиралдуулан гэмтээж цохилдуулахгүйн тулд тусд нь хайрцагт хадгалах буюу бусад яснаас ханаар тусгаарлан хадгалах хэрэгтэй. Хэрвээ хайрцагт хангалттай зай байвал эрүүг гавлын ястай хамт байрлуулж болох ба гавлын ясыг гэмтээхгүйн тулд ороож хамгаалсан байх шаардлагатай.

Гавлын ясыг нэг дангаар нь байрлуулах нь хамгийн зөв арга гэхдээ энэ нь зайны боломж хязгаартай байдгаас шалтгаалан хэрэгжүүлэх боломжгүй байдаг. Яснуудыг үелүүлэн байрлуулахдаа хамгийн том хэмжээтэй хүнд жинтэй ясыг хамгийн доор нь байрлуулж, арай хөнгөн, хэврэгийг нь дээр нь тусдаа хамгаалалттай уутанд хийж байрлуулах нь зөв.

Ясны хэсгийг агуулсан уут савнууд дээр дор хаяж музейн катологны дугаарыг хаяглаж зүүх хэрэгтэй ба энэ нь ялгах таних мөн хянахад хэрэглэгддэг. Олдсон газрын нэр дугаар, онцлох шинж тэмдгийн дугаар, булшны дугаар зэргийг хаяглахдаа нэмж тэмдэглэх нь илүү нэмэр тустай.

Хадгалж буй савны гаднах хаяг дээр бүх тайлбарыг оруулахаас гадна нэмээд хадгалсан зүйлийг ялгахын тулд дотрох агуулгыг нь товч тайлбарлан бичих хэрэгтэй.

Хадгалах арга

Эд зүйлсийн төрөл, шаардагдаж буй зай хэмжээ, хадгалалтын харьцаа, бас мэдээжээр тоног төхөөрөмжийн ашиглалт болон олдоцоос шалтгаалан хадгалалтын арга хэлбэр нь янз бүр байна.

Битүү цоожтой шүүгээнүүд нь хадгалалтын хамгийн найдвартай аюулгүй хэлбэр юм. Энэ нь хамгийн үнэтэй бөгөөд хамгийн их зай шаардагддаг хэлбэр юм.

Онгорхой тавиурууд дээр хадгалах үед эд зүйлсийг хамгаалахын тулд бүгдийг нь хайрцагт савласан байх шаардлагатай байдаг. Зөвхөн зөвшөөрөлтэй хүмүүс л агуулах руу нэвтэрдэг тохиолдолд эд зүйлсийг онгорхойгоор тавиур дээр байрлуулж болно. Хайрцаг савыг тавиур дээр байрлуулах үед дээр дээрээс нь унагаж эвдлэхгүйн тулд хүнд хайрцгийг хамгийн доор нь байрлуулах хэрэгтэй.

Хэрвээ боломжтой бол хайрцагнуудыг аль болох дээр дээрээс нь давхарлахгүй байх нь зөв. Хэрвээ зайлшгөй шаардлагатай бол хайрцагнуудын ирмэг нь бат бйх байх ёстой ба ялангуяа доод хэсгээрээ сайн тулдаг мөн чийг болон усны нэвтрэлтийг даадаг байх ёстой. Хамгийн доод талын хайрцаг шууд газарт наалдсан байдалтай байрлаж болохгүй. Харин хайрцагны доод хэсгийг хүрээлсэн биет дээр хайрцаг байрлаж агаар чөлөөтэй солилцож мөн ус алдах болон хорхой шавьж гэх мэт аюулаас хамгаалагдсан байх ёстой. Хамгийн хүнд жинтэй хайрцаг хамгийн дор нь байрлаж хөнгөн хайрцаг дээр нь байрлах ёстой. 4 буюу 5 хайрцагнаас олныг дээр дээрээс нь давхарлах хэрэггүй, энэ нь аюулгүйн хувьд эрсдэлтэй байхаас гадна хамгийн доод байгаа хайрцагт ногдох ачааллыг ихэсгэдэг.

Хадгалалтын байршилтыг тэмдэглэж хөтлөх

Агуулахыг дөрвөлжин хэсгүүдэд хуваах буюу байршил тодорхойлох ямар нэг арга хэлбэрийг ашигла. Материалын бүртгэлийг тодорхой хэсэгт байрлуулсаныг ялгаж тэмдэглэл хөтлөхөд дөхөм болгох үүднээс байршилтууд нь өөр хоорондоо ялгагдах ёстой. Ингэснээр хадгалсан материалаа хожим эргүүлэн хайхад тусламж болно. Шүүгээ буюу тавиуруудыг тоон системээр дугаарлах хэрэгтэй бөгөөд шүүгээ буюу тавиуруудыг дээрээс нь доош нь дугаарла.

Катологжуулагдсан эд зүйлс болгонд хадгалалтын байршилт оногдож байх ёстой. Үүнд: дөрвөлжин хэсгийн дугаар, шүүгээний дугаар, тавиурны дугаар, хайрцагны дугаар. Эдгээр мэдээллүүд нь компютер дээр бүртгэл хөтлөхөд туйлын тохиромжтой бөгөөд нэг бол каталог ба бүртгэлийн нэг хэсэг маягаар эсвэл катологны дугаар хэлбэрээр орсон байдаг.

Компютер дээр бүртгэл хөтлөхөд зөвлөмж

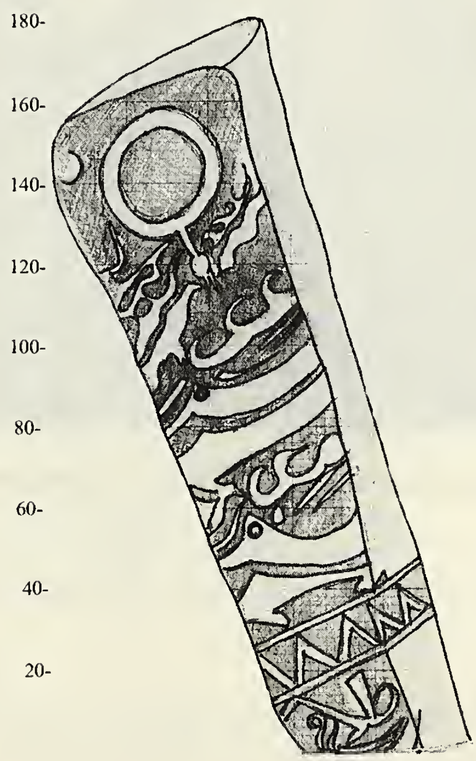
Каталогиний дугаар
Бүртгэлийн дугаар
Бүртгэлийн он, сар, өдөр
Олдсон газрын байрлал:
- Улс
- Муж буюу аймаг
- Сум
- Хот
- Газрын нэр

Газарзүйн Байршилтын Системийн координатууд
Газрын дугаар
Шинж тэмдгийн дугаар
Түвшний дугаар
Булшны дугаар
Малталт хийсэн он сар өдөр
Малталт хийсэн төхөөрөмж
Олдворын тодорхойлолт
Хадгалалтын байршилт

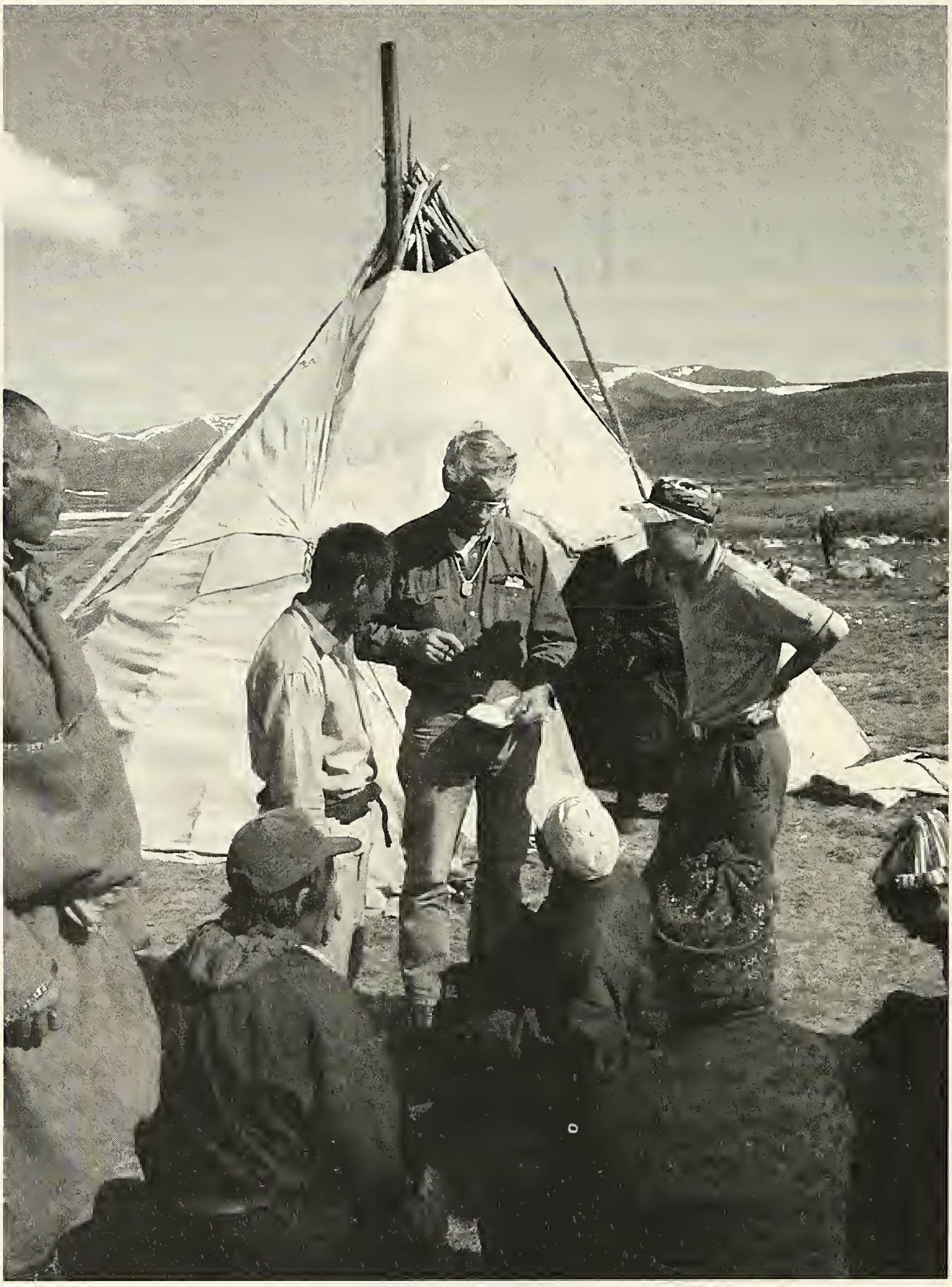
(Байгалын түүх болон археологи, амьтаны судлалын олдворуудын хувьд)
- Төрөл
- Өвөг
- Зүйл
- Үүлдэр

Part 3

Archaeological Field Reports



(illustr.: Andrea Neighbors)



Fitzhugh, Odbaatar, students, and Tsaatan at Menge Bulag in June 2004 (photo: DePriest).

18
Archaeological Reports from the 2004 Deer Stone Project

Jamsranjav Bayarsaikhan and Ts. Odbaatar
National Museum of Mongolian History

William W. Fitzhugh
Arctic Studies Center, Department of Anthropology
National Museum of Natural History
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 resarch 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. Odbaataar**, (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

Fitzhugh, William W., ed., 2002. *Mongolia's Arctic Connections: The Hovsgol Deer Stone Project, 2001-2002 Field Report*, edited by William W. Fitzhugh. Arctic Studies Center, National Museum of Natural History, Smithsonian Institution. Washington: Arctic Studies Center, 105.

Fitzhugh, William W., ed., 2004. *Hovsgol Deer Stone Project 2003 Field Report*. 169 pp. Arctic Studies Center, National Museum of Natural History. Washington DC: Smithsonian Institution.

Soyo Tolgoi, Khug River

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: Feature1, 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.

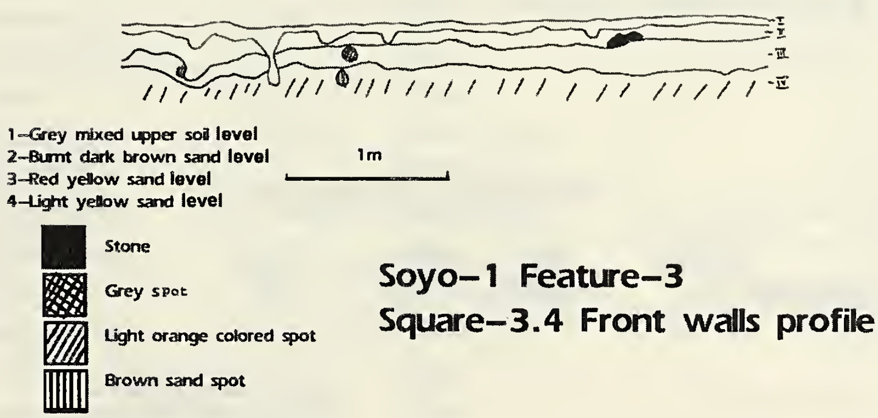


Figure 18.2. South wall soil profile in Square 3-4.

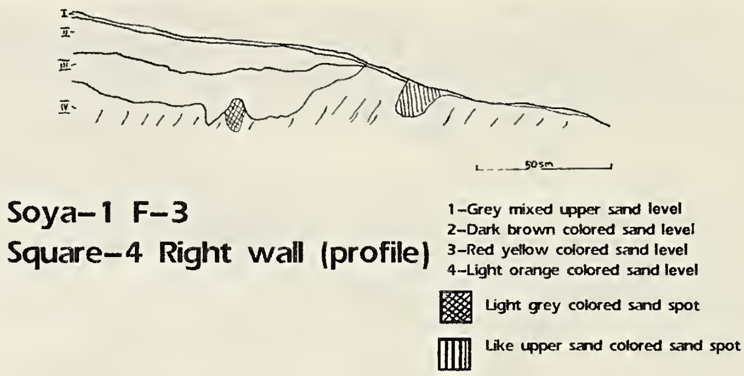


Figure 18.3. West wall of Square 4 at Soyo 1 (Feature 3).

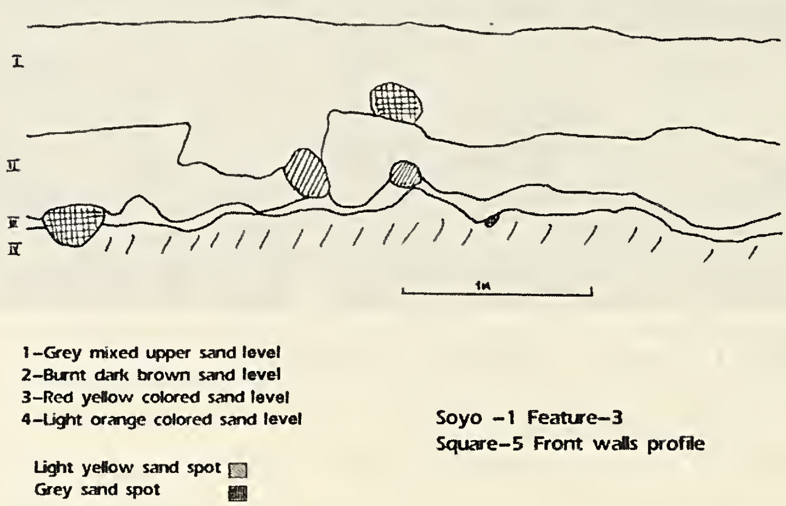


Figure 18.4. South wall profile of Square 5, Soyo 1/F3

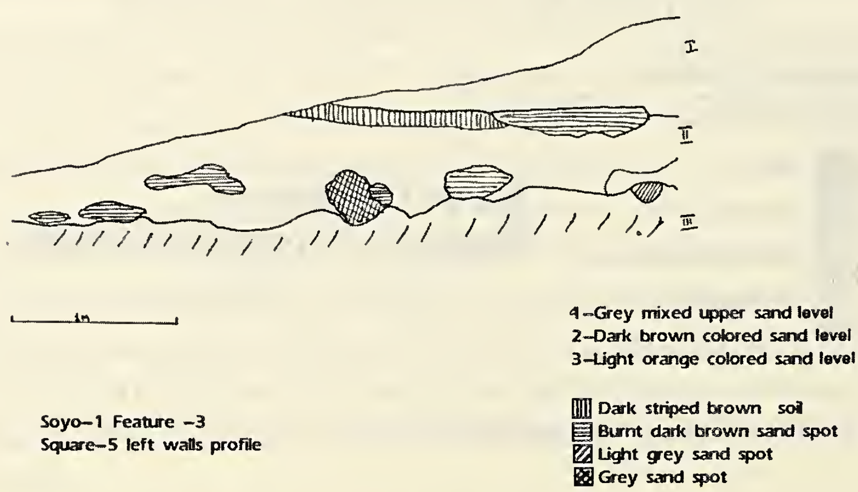


Figure 18.5. East wall profile of Square 5, Soyo 1/F3.

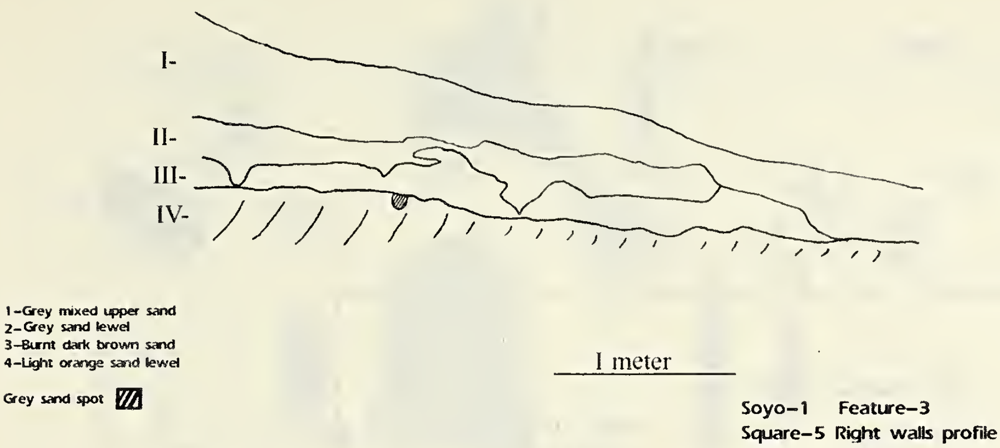


Figure 18.6. West wall profile of Square 5, Soyo 1/F3.

Table 18.1. Artifacts found in Soyo-1, Feature 3, Square 3

	Artifact type	QT	Depth below datum	Illustration
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	Mircoblade	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

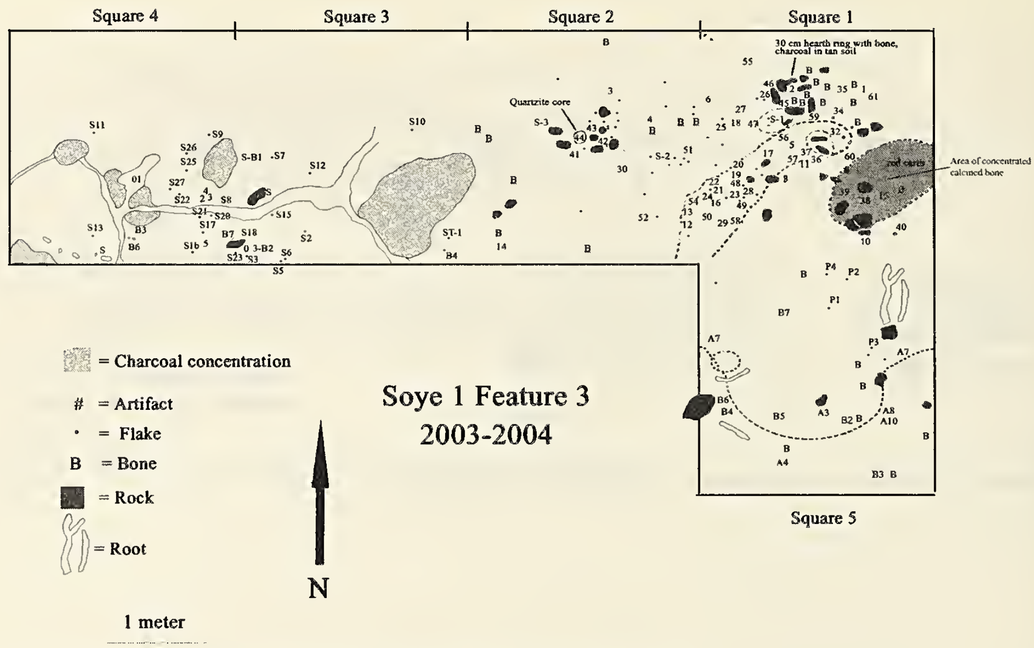


Figure 18.7. Soyo-1/F3 excavation plan map of Layers 2,3.

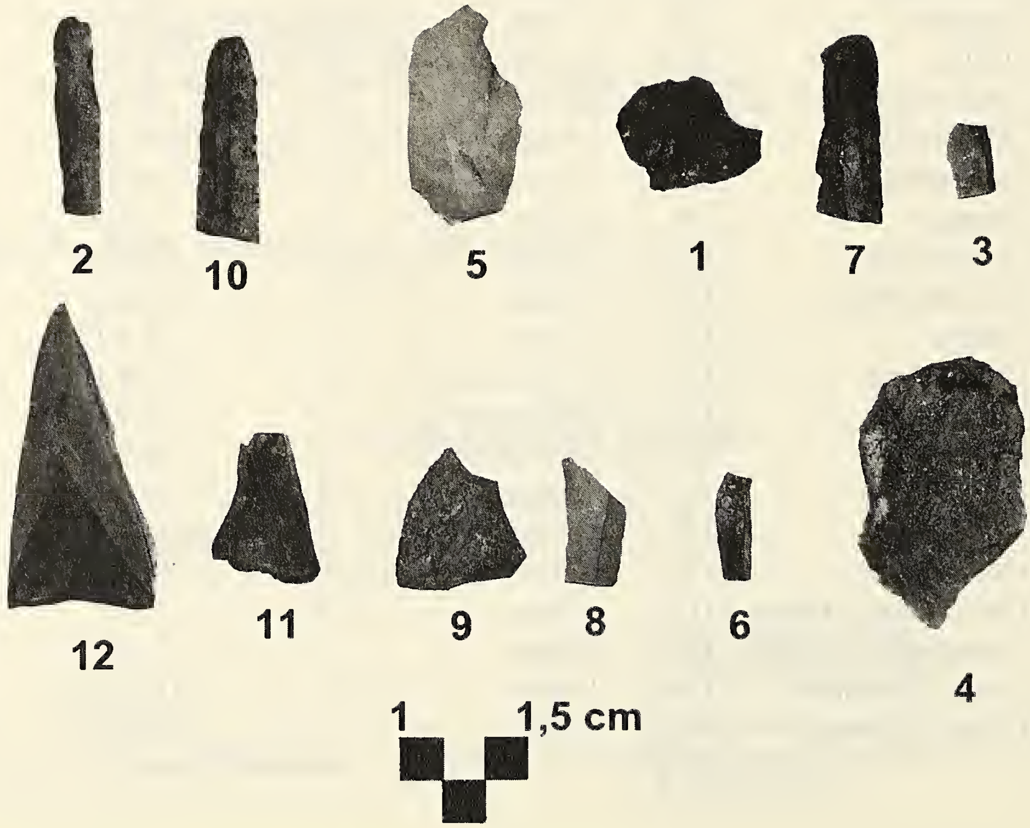


Figure 18.8. Soyo-1/F3 Square 3 artifacts 1-12.

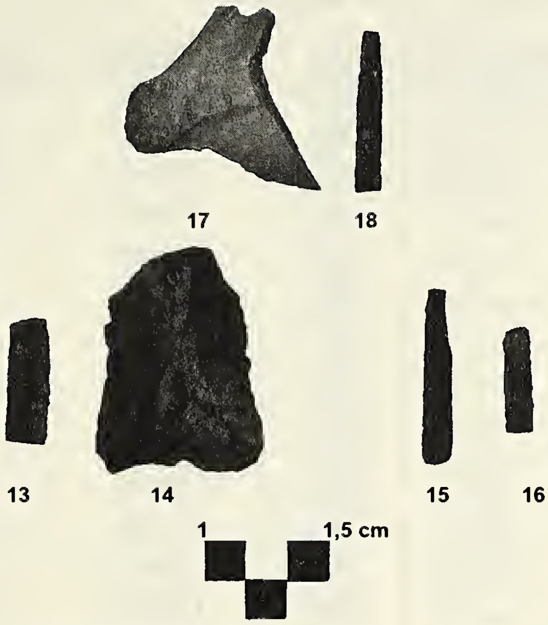


Figure 18.9. Soyo-1/F3, Square 3 artifacts13-18.

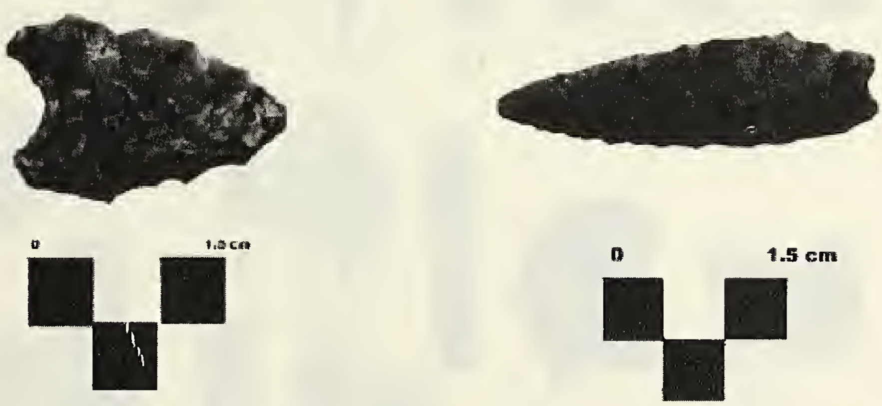


Figure 18.10. Soyo-1/F3, Square 3 artifacts no. 21, 22.

Table 18.2. Artifacts from Soyo-1/F3, Square 4.

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

Figure 18.11. Flint artifacts from Soyo-1/F3, Square 4.

Table 18.3. Artifacts from Soyo-1/F3, Square 5.

	Name of specimen	Qty	Depth	Illustration
1	Microblade	1PC	103cm	18.14.8
2	Biface fragment	1PC	104cm	18.14.9
3	Microblade	1PC	109cm	18.14.10
4	Microblade	1PC	114cm	18.14.11
5	Waste	1PC	111cm	18.13.6
6	Scraper	1PC	115cm	18.14.16
7	Scraper	1PC	111cm	18.14.14
8	Microblade	1PC	114cm	18.14.15a
9	Mieroblade	1PC	116cm	18.14.13
10	Microblade	1PC	116cm	18.14.15b
11	Ceramic	1PC	117cm	18.12.1
12	Ceramic	1PC	122cm	18.12.2
13	Ceramic	1PC	123cm	18.12.4
14	Ceramic	1PC	125cm	18.12.3
15	Waste	2PC	---	18.13.5
16	Waste	1PC	---	18.13.7
17	Bone fragment of large mammal	1PC	---	18.15.17
18	Burnt bone fragments	3PC	under sod	18.15.18
19	Mammal marrow bone	1PC	surface level	18.15.19
20	Mammal marrow bone	1PC	surface level	18.15.20
21	Bone fragment	1PC	surface level	18.15.21
22	Bone fragment	1PC	surface level	18.15.22
23	Horse tooth fragment	1PC	surface level	18.15.23
24	Bone fragment	1PC	surface level	18.15.24
25	Bone fragment	1PC	surface level	18.15.25
26	Bone fragment	1PC	surface level	13.15.26
27	Bone fragment	1PC	surface level	18.15.27
28	Bone fragment	1PC	surface level	18.15.28

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

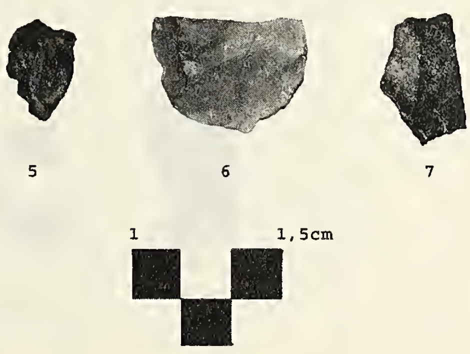


Figure 18.13. Lithics from Soyo-1/ F3, Square 5.

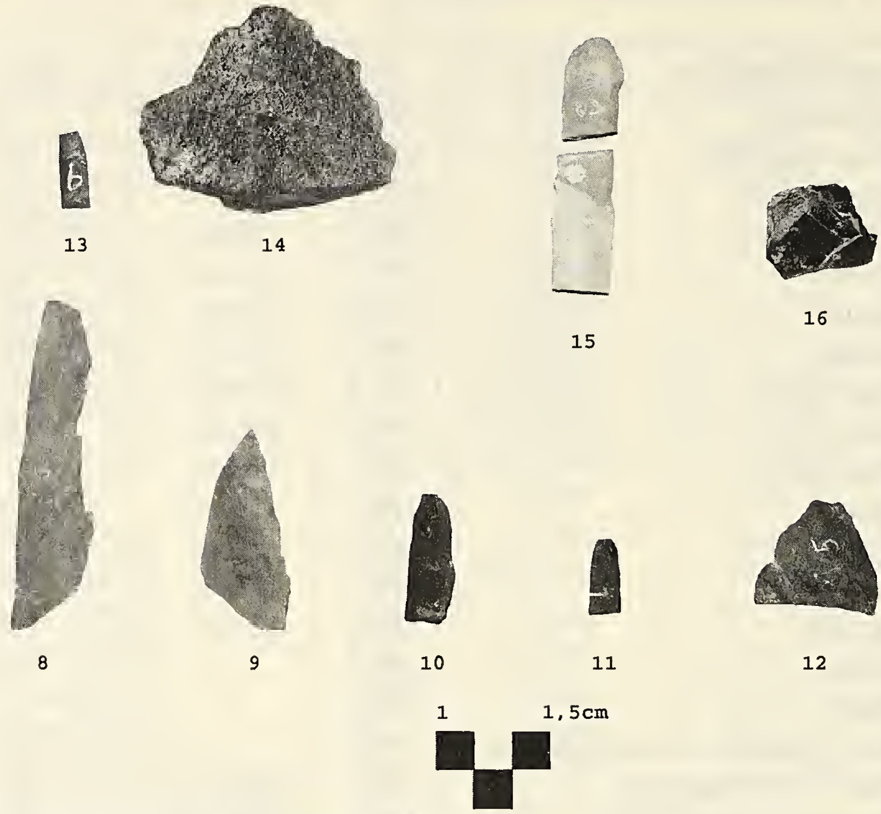


Figure 18.14. Lithics from Soyo-1/F3 Square 5

Figure 18.15. Bone fragments from Soyo-1/F3 Square 5.

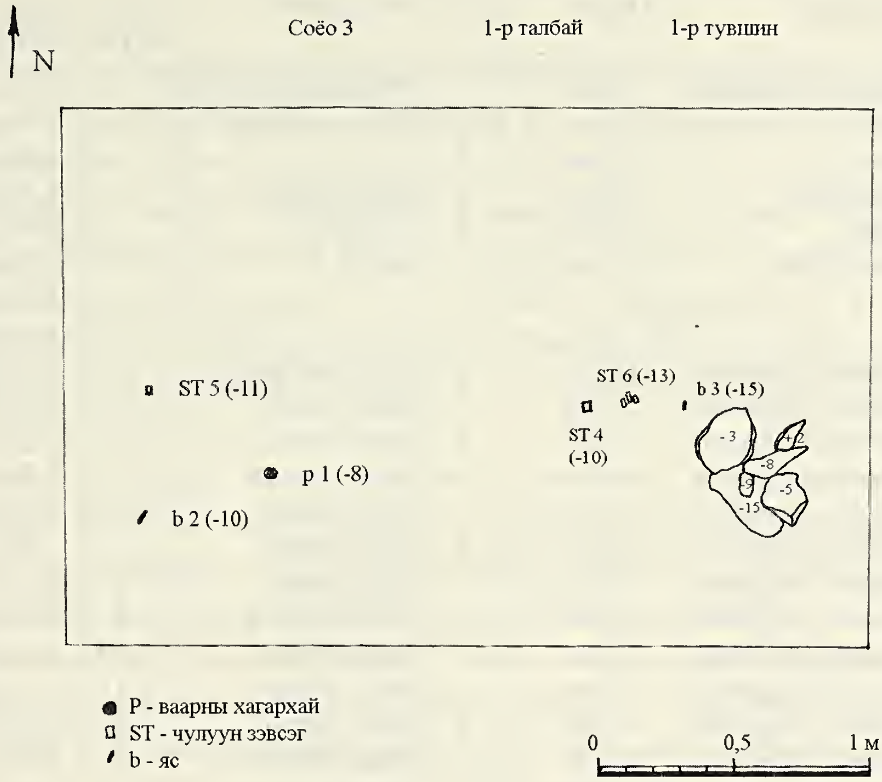


Figure 18.16. Soyo-1/F3, Square 5, Level 1 map.

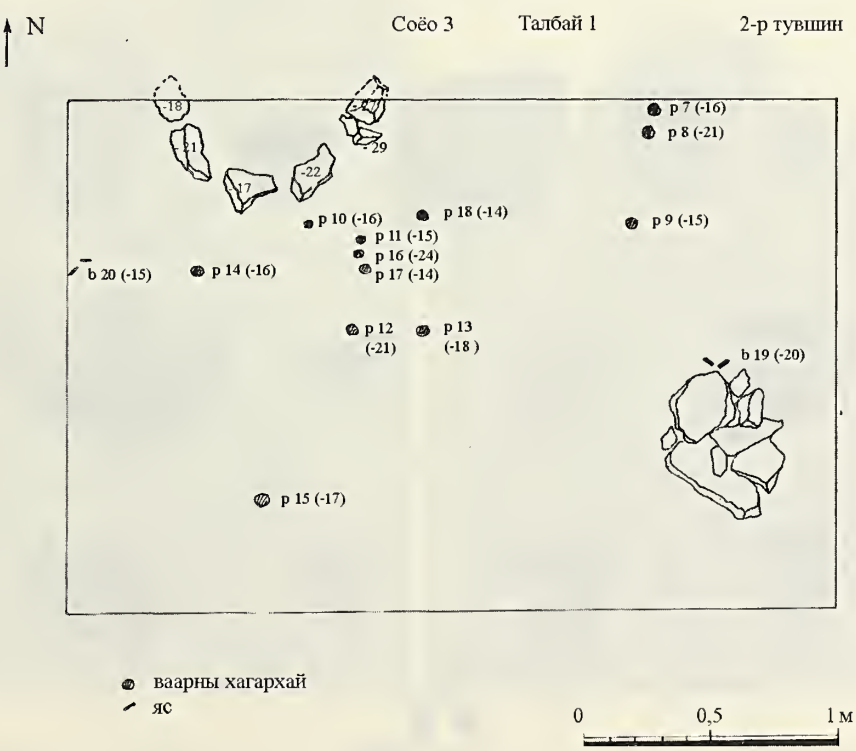


Figure 18.17. Soyo-1/F3, Square 5, Level 2 map.

Table 18.4. Archaeological artifacts found in Soyo 1/F3, Square 5

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

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

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 theives had illegally excavated a mound located at the center of the Hondiin bag (administrative district), in Renchinlhumbe sum, revealing an unusal-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.

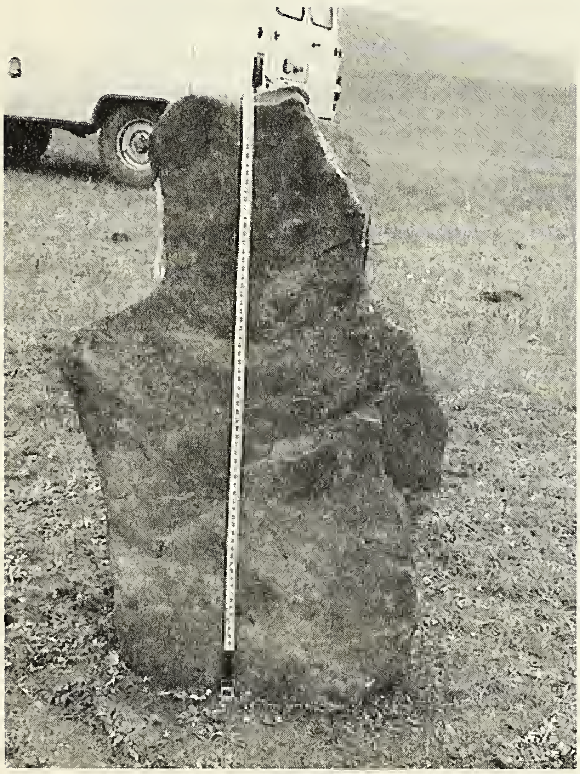


Figure 18.19a-b. The stone slab associated with the looted mound at Chodoriin Daraa.

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.

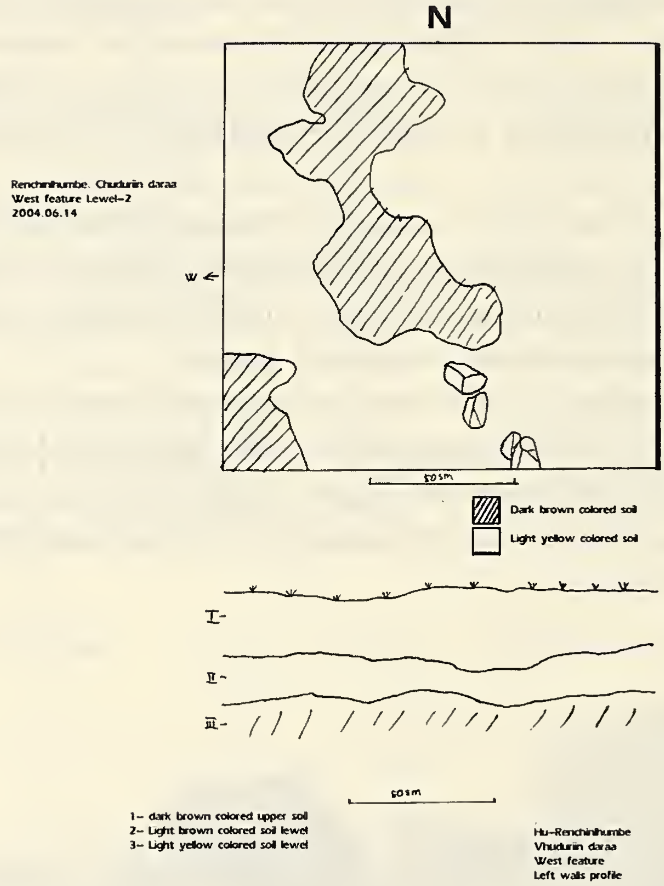


Figure 18.20. Chuduriin Daraa west feature excavation map.

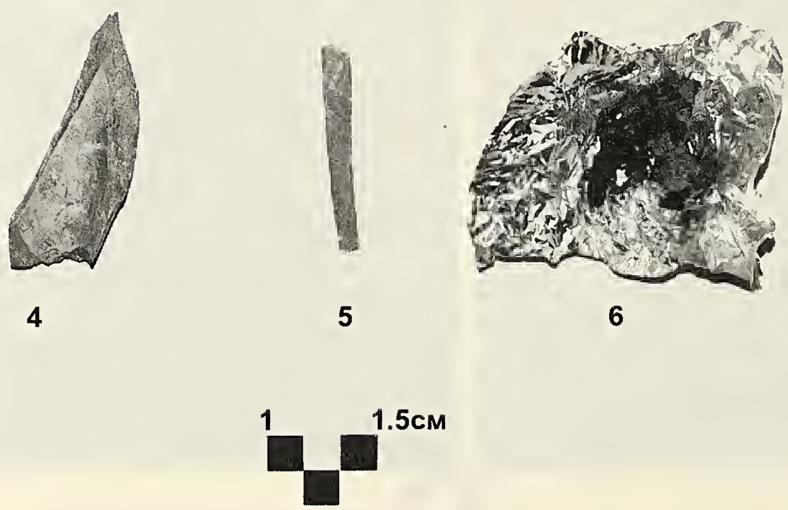


Figure 18.21. Bone finds from Chudriin Daraa

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.

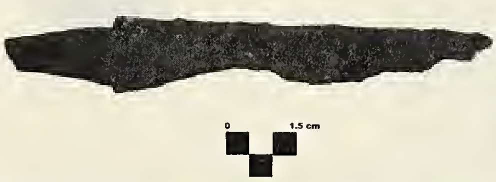


Figure 18.22 A small iron knife or blade.

Figure 18.23 A small bone object decorated with a triangle pattern on one side.

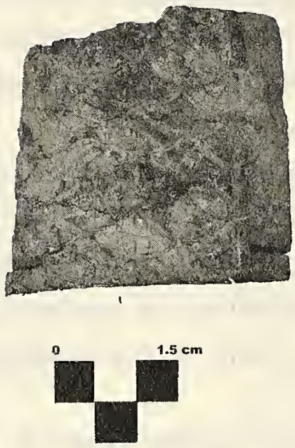


Figure 18.24. A piece of birch-bark with fish-scale decoration.

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 deposites 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.

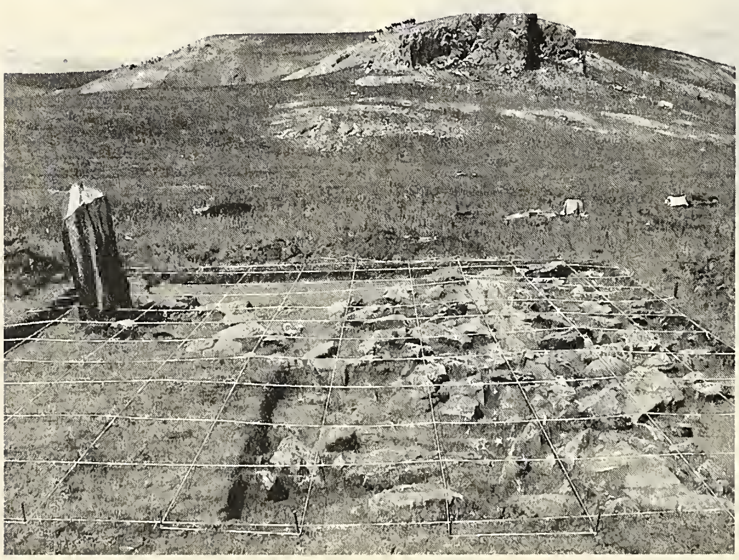


Figure 18.29. Tsatstain Hoshuu site cleared to the top of the rock deposit.

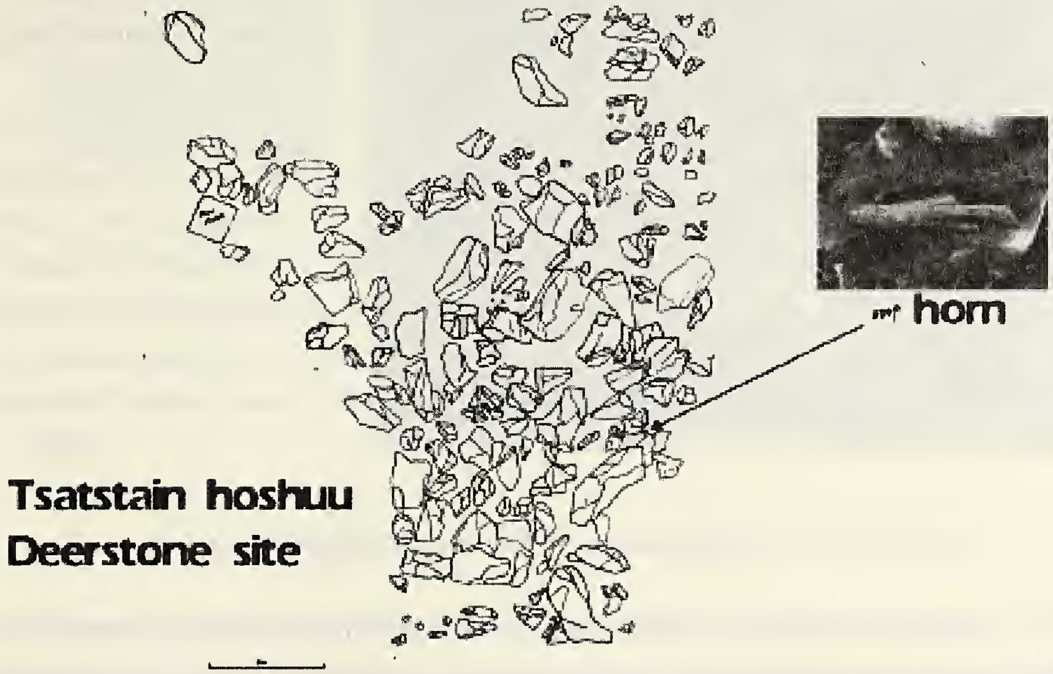


Figure 18.30. Tsatstain Hoshuu upper level finds with two horseheads and an antler fragment.

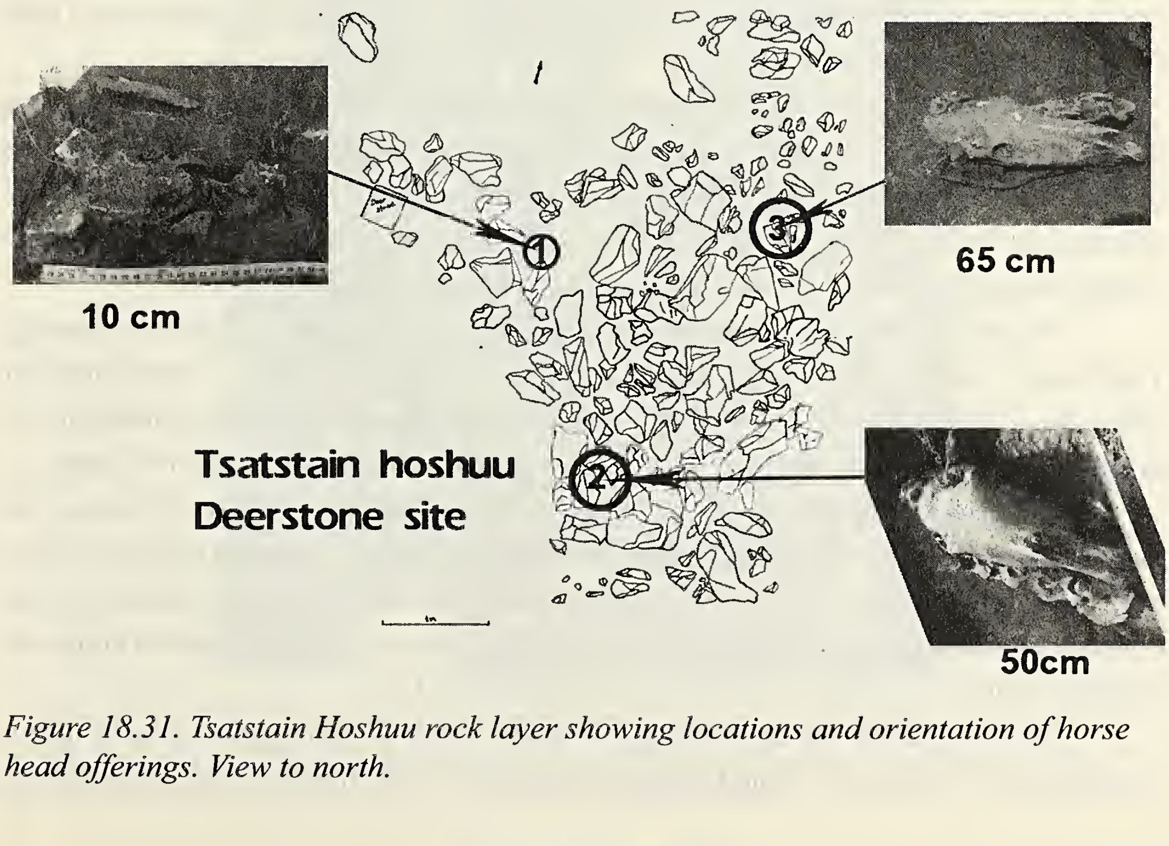


Figure 18.31. Tsatstain Hoshuu rock layer showing locations and orientation of horse head offerings. View to north.

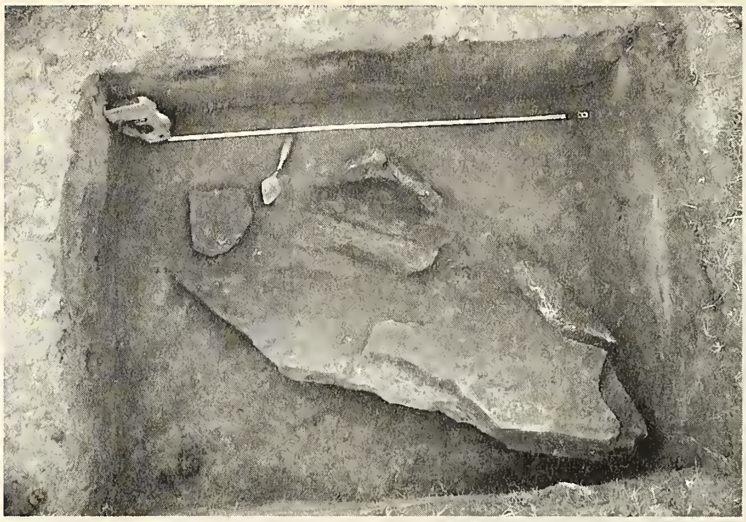


Figure 18.32. Tsatstain Hoshuu excavation showing large rock slab buried 1 meter north of the deer stone. View to south.

Research at Menge Bulag

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 archeaological 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 implment – 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 archeaological

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 musuem 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).

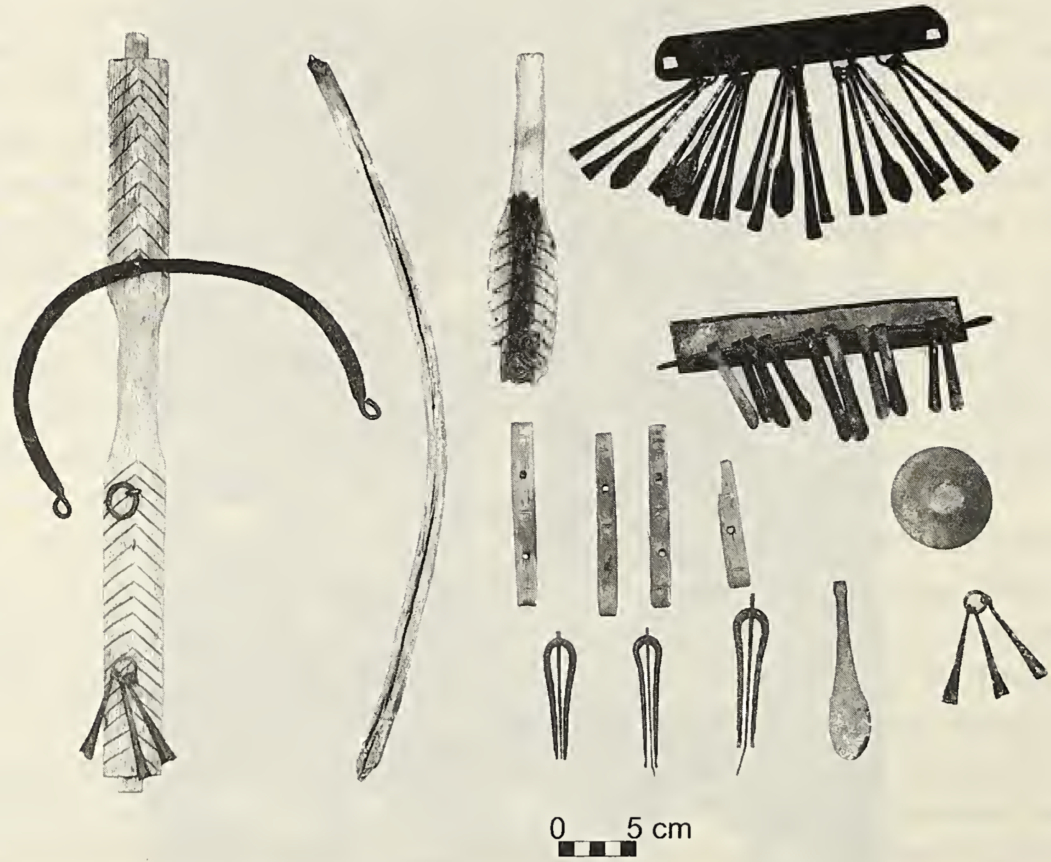


Figure 18.34. A selection of shaman's equipment recovered from the Angarkhai hill cache. Illustrated are a drum handle with rattles, a drum beater with rattlers, rattles for a shaman's robe or belt, mouth harps, and a small offering cup. (see also Figure 1.28)

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 recognizeable 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.

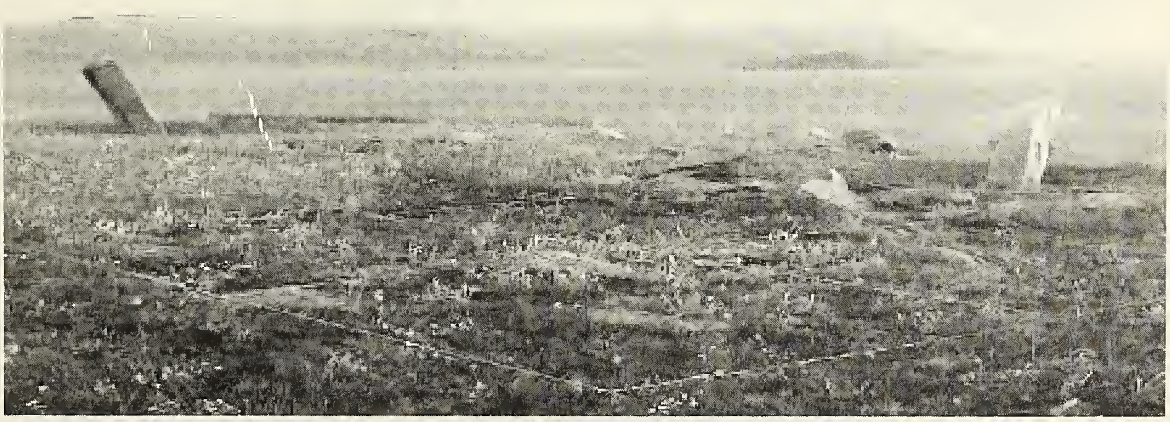


Figure 18.35. Ulaan Tolgoi deer stone site west of Erkhel Lake, showing Deer Stones 5 (left) and 4 (right). The western DS4 squares are shown here before excavation.

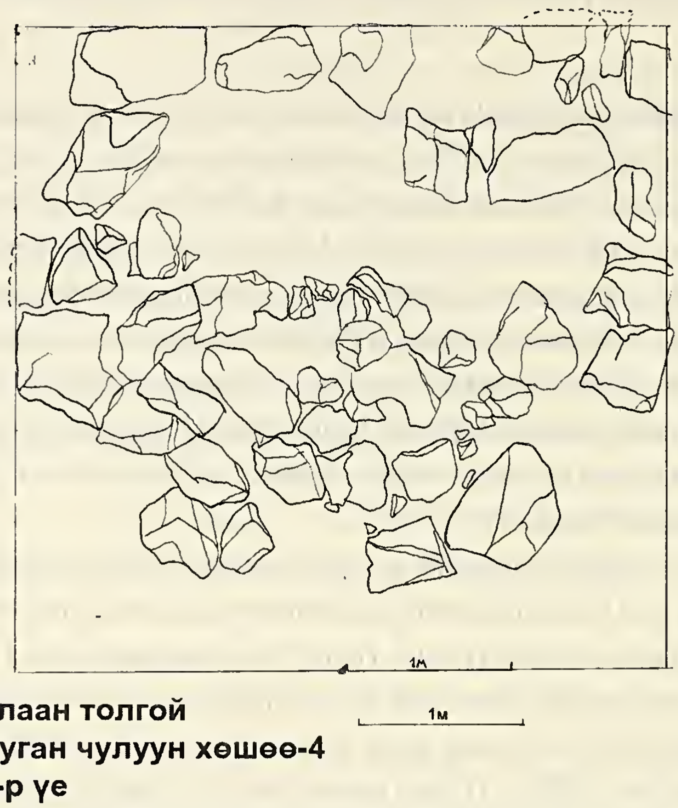


Figure 18.36. Ulaan Tolgoi (Erkhel) DS4, Feature 4 upper level rock structure.

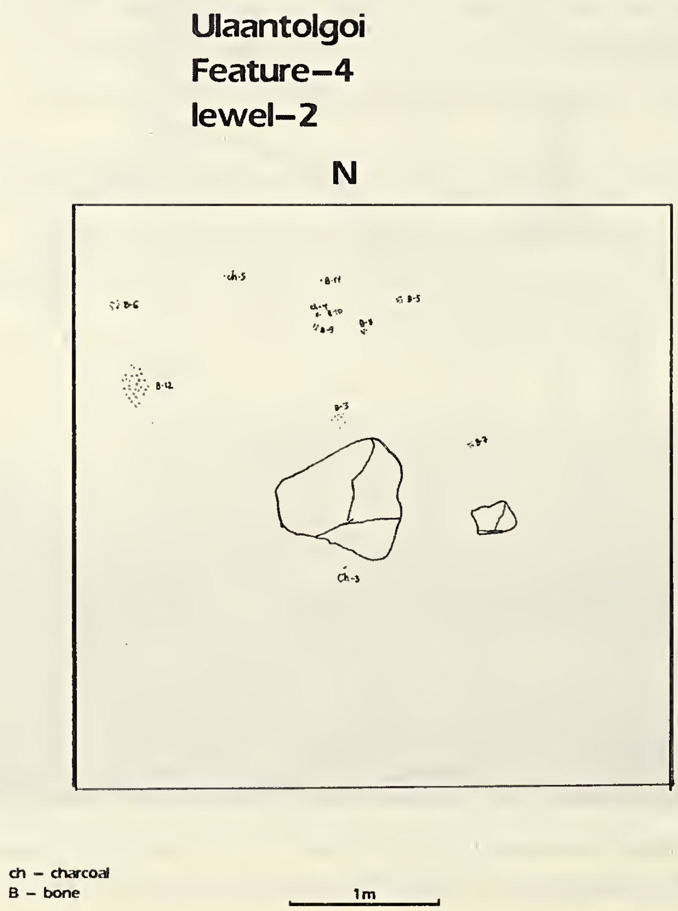
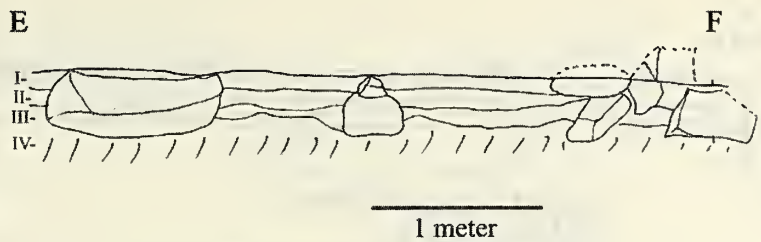
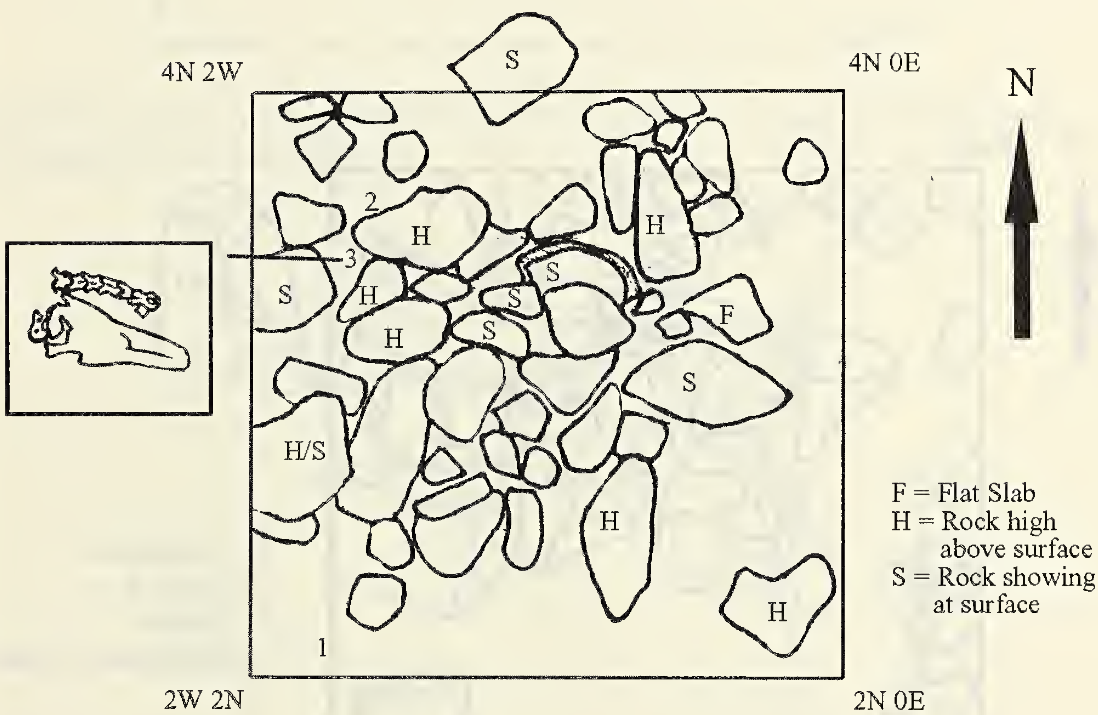


Figure 18.37. Ulaan Tolgoi DS4, Feature 4 lower level bone (B) and charcoal (CH) finds.



I- Brown surface soil
II- Grey sandy soil
III- Dark soil level
IV- Soil with grindstones level

Figure 18.38. Ulaan Tolgoi (Erkhel) soil profile of north wall of DS4, Feature 4 from 0S 8W to 0S 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 (Erkhel) Deer Stone 4, Feature 5, Square 4N 0E upper level rocks and finds with insert showing east-facing horse head burial in lower level.

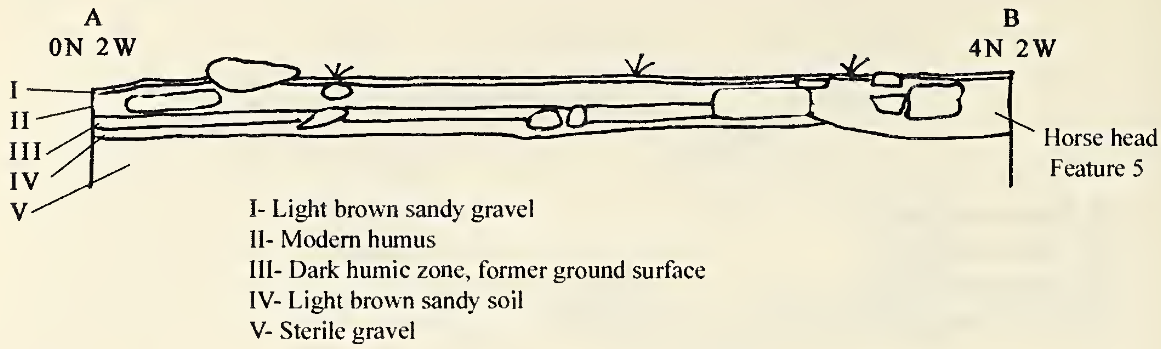
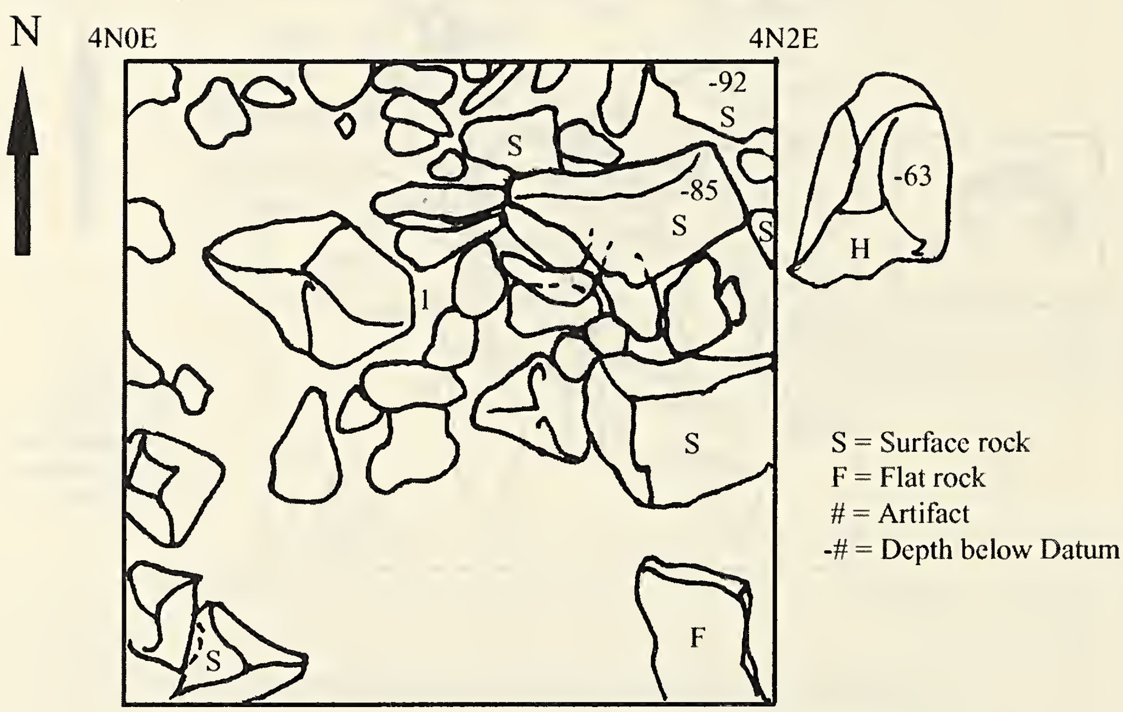


Figure 18.40. Ulaan Tolgoi (Erkhel) Deer Stone 4, Feature 5 west wall soil profile 0N 2W to 4N 2W.



1. Bone fragment (Metacarpal?) at -102, at ledge of a large rock in lower brown soil.

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

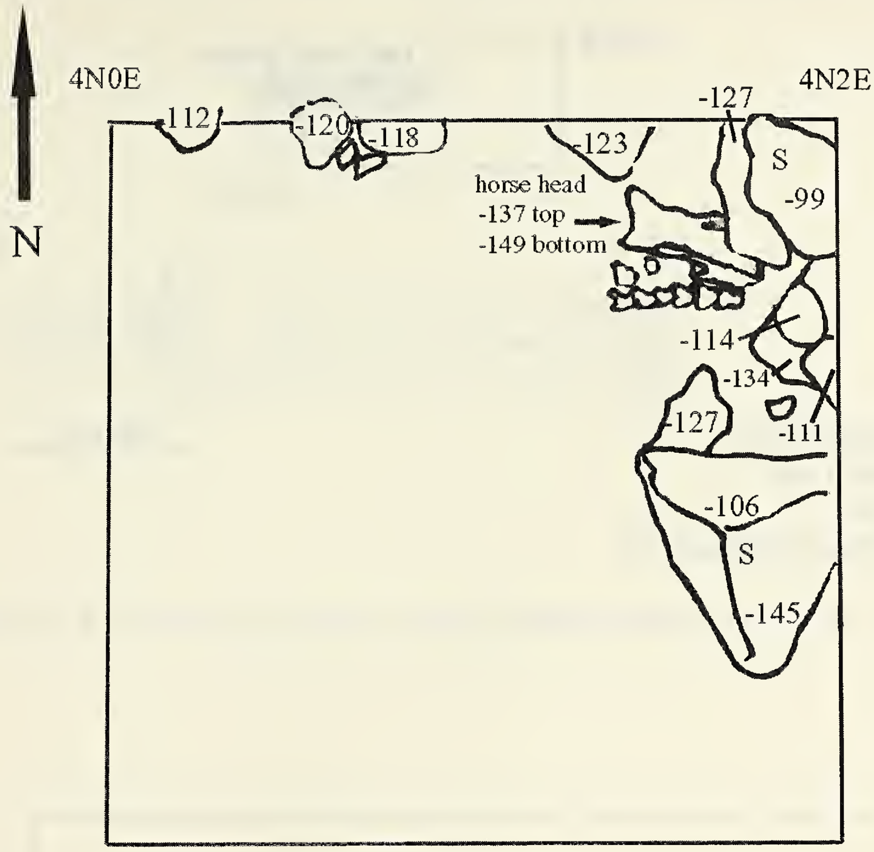
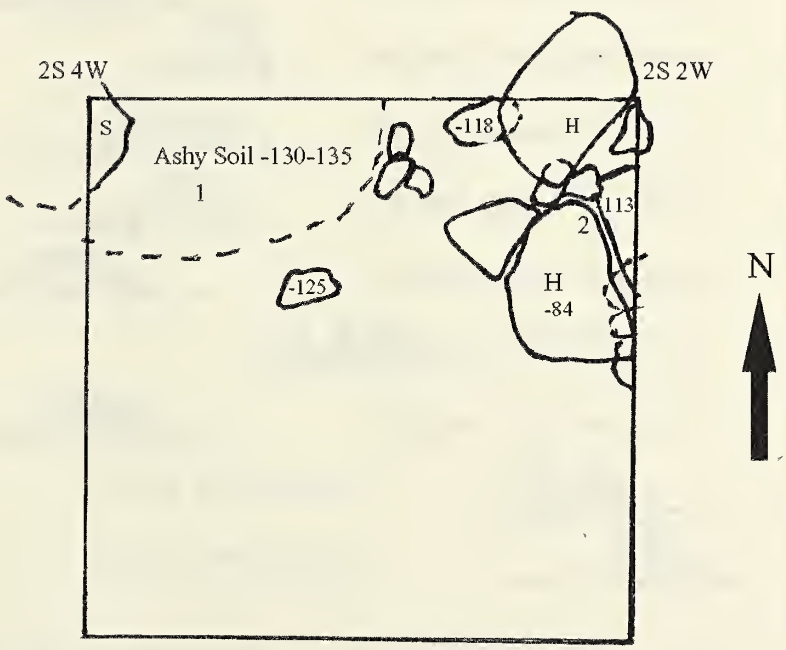


Figure 18.42. Ulaan Tolgoi (Erkhel) Deer Stone 4, Feature 6, lower level rocks and horse head burial in Square 4N 2E.



1. Charcoal sample starting at -130 to -135 in upper tan soil without gravel.

2. Horse vertebra - only one at -142cm. On top of sterile gravel.

Figure 18.43. Ulaan Tolgoi (Erkhel) Deer Stone 4 upper level map of Feature 7.

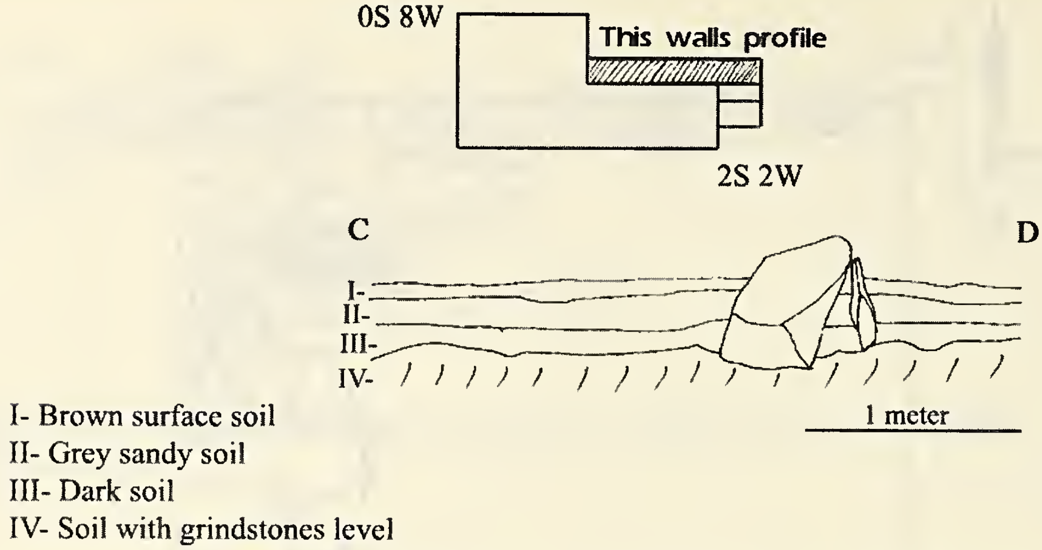


Figure 18.44. Ulaan Tolgoi (Erkhel) Deer Stone 4 wall profile from 2S/4W to 2S/1W.

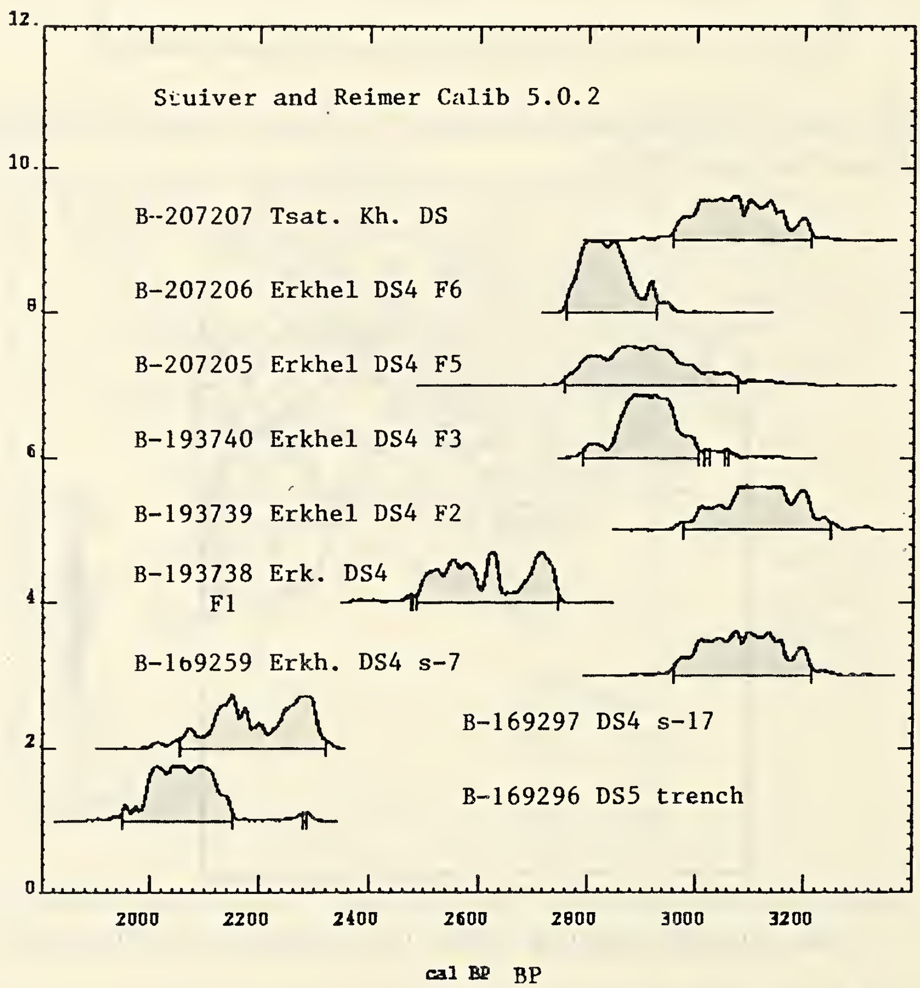


Figure 18.45 Calibrated plot of radiocarbon dates from deer stone sites (Stuiver and Reimers Calib 5.02) (reference Table 1.1 in this volume)

2004 Expedition with Tsaatan

National Museum of Mongolian History
Ulaanbaatar, Mongolia

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

Arctic Studies Center

Smithsonian Institution
National Museum of Natural History