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## Agriculture and herding in the early oasis settlements of the Oxus Civilization

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### Gonur tepe: excavations and samples

Collaborative research at the site of Gonur depe in Turkmenistan was initiated in 1989 to collect materials for palaeoethnobotanical and zooarchaeological research. Our goal was to reconstruct the systems of crop and animal production and distribution by examining remains from household and workshop refuse. Similar analyses have been carried out in other parts of Turkmenistan by Turkmen and Russian expeditions (Lisitsyna 1965; 1978; 1992; Ermolova 1970; Masson 1972). Our approach sought to combine these standard analytical techniques with different recovery techniques and rigorous attention to archaeological and chronological context.

Materials described in this paper were recovered by Moore and Hiebert during the spring 1989 season of excavation at Gonur depe, Turkmenistan (FIGURE 1), in cooperation with the expedition led by V.I. Sarianidi (Moore 1993; Miller 1993; Hiebert 1993a; Meadow 1993). Animal-bone remains were recovered by grab-sampling selected deposits from room fill, floors, and features. Small samples of feature fill and stratified midden deposits were screened through  $\frac{1}{8}$ -inch mesh to recover small bones. In addition, animal bones recovered by casual grab-sampling in previous seasons at Gonur were scanned for rarely occurring species. Remains were cleaned, sorted and prelimi-

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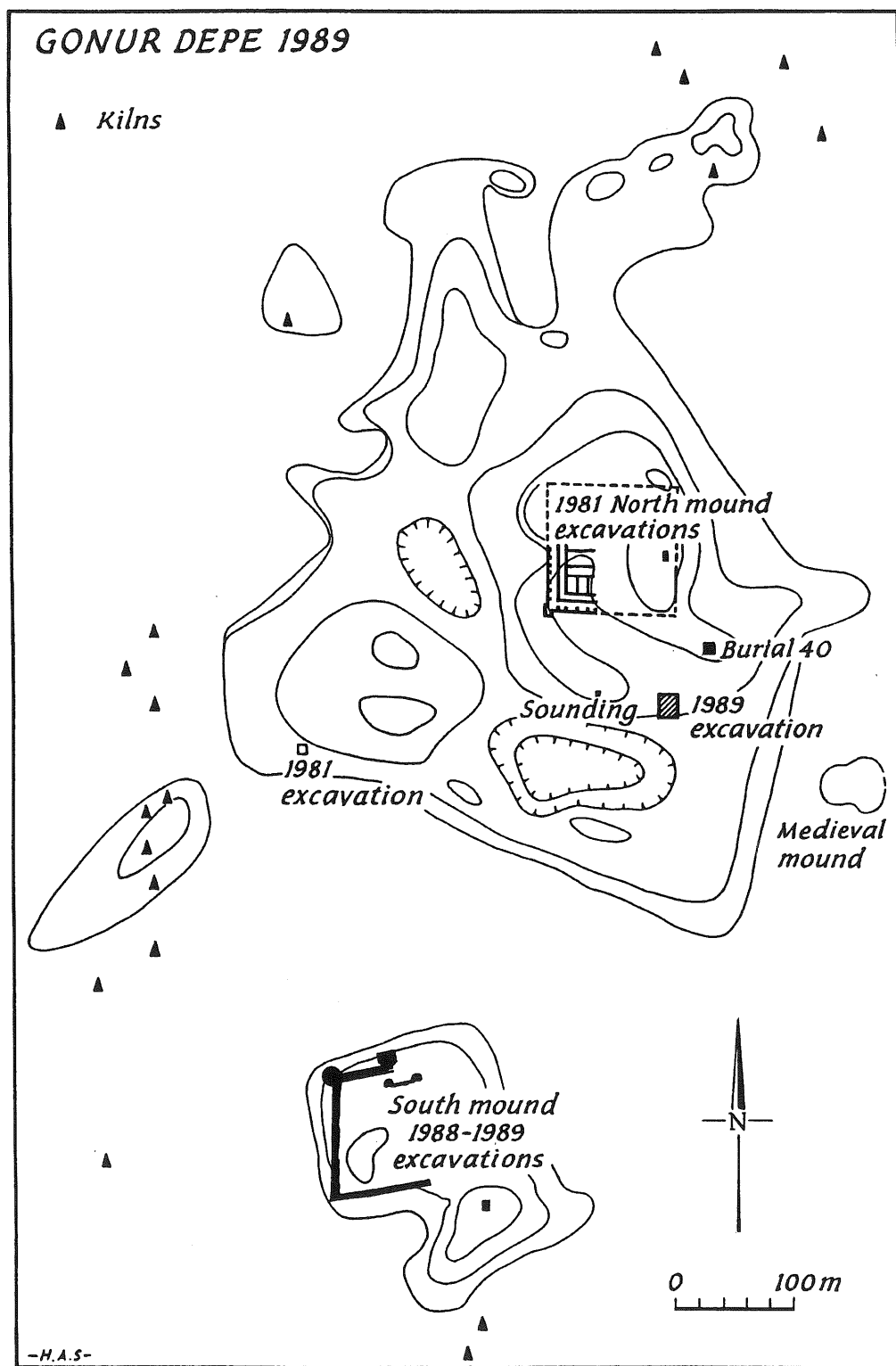


FIGURE 1. Gonur depe: plan of 1989 excavations.

narily identified in the field, with some bones removed from the field collection for further comparison and analysis. Comparisons were made with modern collections at the Museum of Zoology, Moscow State University and the Museum of Comparative Zoology, Harvard University. Charred plant remains were recovered by screening vessel and feature fill and midden deposits through 2-mm mesh. This sampling technique provided an adequate sample of larger-seeded taxa such as grains. Field conditions did not allow water flotation. Two samples were separated by bucket flotation, which provided our only adequate sample of small seeds. Charred seeds from the screened samples were analysed by Miller using comparative materials at the University Museum, Philadelphia.

#### **Contemporary and Bronze Age environments**

The area surrounding Gonur depe today is arid desert with scattered *saxaul* scrub and patches of low herbs and sedges interspersed with barren mudflats (*takyr*) and stabilized sand dunes. Several kilometres to the south, shallow seeps and springs are overgrown with tamarisk, and modern irrigation canals have provided water for tamarisk and poplar trees near herder campsites. At the outskirts of the nearest permanent settlements to the south, camelthorn forms low thickets around tamarisk and *saxaul* groves (Gel'dikhanov 1992). The largest wild animal common in the area today is the gazelle, but in the past the onager would also have grazed. There is a rich and varied rodent, lizard and snake fauna (Suslov 1961).

An examination of the historical and archaeological data allows us to reconstruct several distinct patterns in the past. Our evidence suggests that the oasis environment created at Gonur was different both from the current desert conditions and from the natural delta vegetation (*tugai* thickets) and fauna that would have confronted the first colonists from the Kopet Dag foothills. Rather, the oasis ecology represents a human-modified micro-climate and resource base (Suslov 1961: 509–12).

Traditional agricultural production in the oasis had two planting seasons (*Encyclopedia of Turkmenistan* 1984: 217), and this system may pre-date the regulation of river water through large-scale dams which modified the oasis environment from at least the 11th century AD (Le Strange 1905: 402). Palaeoethnobotanical results from 6th–7th centuries AD levels at Gyaur-kala in Merv indicate that both winter crops of wheat

and barley (sown in winter or early spring and harvested in early summer), and summer crops such as cotton and melons were grown in the oasis (Nesbitt 1993), probably without the aid of large dams to regulate the river water.

#### **Predictions from traditional economies**

We propose a picture of the earliest agriculture in the oasis based on a complex network of canals. In the initial occupation of the Murgab delta, the natural delta must have been cleared of the *tugai* thicket and drained with canals before crops could have been planted. Once it had been cleared, the limited raw material available in the oasis would have constrained the agricultural economy. The importation of many raw materials for construction and manufacture required substantial animal transport.

The earliest settlements of dispersed fortified building complexes (similar to *qala*) were built on either small natural rises or *takyr* flats where irrigation agriculture would not have been possible. This model suggests that the building complexes were surrounded by the fields and orchards of the *qala*. Irrigation water and river run-off formed salt-marshes and dry *takyr* with reeds, salt-adapted plants, and animals which were only seasonally resident, or seasonally active. Beyond the edge of the fields and *takyr* were stabilized dunes with groves of *saxaul* useful as seasonal pasture and as a source of wood. Small herder camp-sites would have been situated along these margins, in addition to the camps of traders and steppe nomads making short stays at the oasis. Along the banks of the Murgab River, *tugai* thicket would have supplied wood and cover for game. Beyond the core of the oasis, moving dunes would have channelled movement along the north–south gullies between the dunes, forming a conduit to the eastern foothill zone of the Kopet dag. The configuration of canals, orchards and field edges is a fragile system which requires constant, year-round attention. In the traditional oasis, when these features are not maintained, the man-made oasis environment is encroached upon by *tugai* thickets, salt pans and dunes.

This new adaptation in the Murgab delta oasis (Margiana) and its development are documented from recent excavations at Gonur. The initial settlement is dated to 2200–2000 BC (Gonur period 1, the late Namazga V period), and the establishment of the distinctive oasis culture forming the base of the 'Oxus Civilization' to 2000–1750 BC in Gonur period 2 (BMAC) (Hiebert 1993b).

### Sampling of archaeological contexts

The most important sample of systematically collected remains came from the 1989 deep sounding through stratified midden deposits on the southern slope of the north mound at Gonur. This 3-m deep trench was the focus of chronological analysis of Margiana ceramics and small finds (Hiebert & Moore 1993), and the complementary samples of animal and plant remains from this deposit are tied into radiocarbon dates (Hiebert 1993b). This deep sounding appeared to be the site of extensive repeated dumping of debris from hearths and kilns and domestic trash as well as from building activities. In addition, bone and plant remains were sampled from several features on floors of an area of domestic rooms on the north mound of the site. Apart from this, bone (but not plant) remains were studied from a variety of room fills, floor deposits and burials from the south mound at Gonur. None of this latter sample was collected by sieving.

### Botanical remains from Gonur deep

The analysis of charred seed and plant parts are summarized in TABLE 1. Samples recovered by dry sieving ('DS' numbers) do not include any seeds smaller than 2 mm. 'Loc. 43' is a flotation sample providing a glimpse of the seed remains smaller than 2 mm. Locus 43 is Hearth 1, directly on the floor of Room 2 of the north mound domestic architecture. This hearth was full of charcoal and seeds, presumably from cooking, while Hearth 2 was filled with burned bone fragments. TABLE 1 compares Locus 43 with the dry-sieved samples from the Gonur deep sounding. Despite differences in the proportions of seed, charcoal, and dung, the samples with the most material are relatively uniform. In particular, six-row barley, camelthorn, and an undetermined mustard ('Cruciferae 1') consistently dominate. The composition and percentages of the cultigen seeds and plant parts larger than 2 mm do not differ significantly between the floated and the dry-sieved samples. A significant difference is noted in the composition and numbers of weed remains recovered between the two recovery methods. Identification of the modern weed assemblages in the future will allow better reconstruction of the fields and crops.

### Cultivated plants

Crop remains from the Gonur samples include barley, wheat and pulses. Several forms of

wheat and barley have been identified from the Gonur samples. The Kopet dag foothills of Turkmenistan have natural stands of wild barley, although at the earliest agricultural sites of Central Asia (Jeitun culture), wheat dominated the cereal complex (Charles & Hillman 1992). At Gonur, barley is the dominant cultigen, found in all the samples. The barleys (*Hordeum vulgare* subsp. *hexastichum*) are all six-row, with naked and hulled forms. Both seeds and stem fragments of the barley have been identified (Miller 1993). Samples of measurable seeds were too small to compare to varieties of barley which have been found at other sites of Central Asia (Yaneshevich 1977). Free-threshing bread wheat (*Triticum aestivum*) was the most common wheat. The grains are small, more similar to club wheat (*T. compactum*). Only a few of the small-sized 'shot' wheat (*T. sphaerococcum*) and a few remains of emmer wheat (*T. diocum*) were recovered. This diversity of grain cultigens perhaps represents the attempts of ancient farmers to 'hedge their bets' against the possibility that one type might fail.

The possible presence of dwarf or shot wheat (*T. sphaerococcum*) in the upper levels (BMAC period) of the deep sounding is potentially significant because dwarf wheat is considered a south Asian variety (Costantini 1977a). Based on small finds, the BMAC period at Gonur has other evidence of interaction with south Asia through the sites of Mehrgarh and Sibri on the eastern margins of Baluchistan (Santoni 1984; 1988; Jarrige 1988). This identification should not be overemphasized, but if it is confirmed, it would be interesting that a drought-resistant crop had been introduced into this arid environment (Vishnu-Mittre & Savithri 1982). No sorghum, rice or millet, associated with the 'second agricultural revolution' of double-cropping (Hutchinson 1977; Meadow 1989), have been found in the Bronze Age sites of the Murghab delta.

Apart from the remains of the grains, other charred parts of the wheat and barley plant attest to grain-processing at Gonur (TABLE 1).

Other cultigens found in the Gonur samples are several pulses (lentils, chickpeas, grass peas and peas), recovered in small numbers. Both grape (*Vitis vinifera*) pips and stems were found in the Gonur samples. Grapes, well adapted to the oasis environment, bear fruit with renowned flavour and sweetness. Remains of probable apple and plum indicate that these

sample designation	locus 43	ds 2	ds 3	ds 4	ds 5	ds 6	ds 7	ds 8	ds 9	ds 9-1	ds 10
charcoal (wt., g)	1.9	2.9	>4.2	5.8	5.8	7.1	4.6	3.7	9.6	?	7.1
seed (wt., g)	0.8	0.4	0.2	2.0	0.1	0.1	0.9	0.1	1.7	2.3	0.2
dung (wt., g)	1.2	1.2	+	2.5	-	-	3.9	-	6.9	0.1	+
<b>cereal</b>											
<i>Hordeum vulgare</i>	105	30	14	112	5	4	25	4	116	139	16
<i>Triticum aestivum/durum</i>	2	3	1	27	1	-	11	-	23	21	2
<i>Triticum</i> cf. <i>sphaerococcum</i>	-	-	-	-	-	-	-	-	8	4	-
<i>Triticum</i> cf. <i>dicoccum</i>	-	-	-	2	-	-	-	1	-	8	2
<i>Triticum</i> sp.	-	-	-	-	-	-	-	-	-	21	2
cereal	34	6	-	20	2	+	8	4	22	42	12
<b>pulse</b>											
<i>Cicer</i>	-	-	-	1	-	-	-	-	-	-	-
cf. <i>Lathyrus</i>	-	-	1	-	-	-	4	1	-	-	-
<i>Lens</i>	5	-	-	12	-	-	11	2	18	15	1
cf. <i>Pisum</i>	-	-	-	2	-	-	-	1	-	-	-
other large legume	1	1	-	-	-	2	6	-	+	-	-
<b>fruit</b>											
cf. <i>Prunus</i>	+	-	+	+	-	-	+	-	+	2	-
cf. <i>Malus</i>	-	-	-	-	-	-	-	-	-	1	-
<i>Vitis</i>	2	-	-	2	-	-	9	-	9	1	1
<b>wild and weedy</b>											
Cruciferae	44	-	-	26	-	-	4	2	103	83	33
cf. <i>Alhagi</i>	9	57	56	-	2	9	53	10	115	9	13
other	-	6	2	4	-	1	3	-	16	6	4

Note: Locus 43 seeds smaller than 2 mm include:

*Hordeum vulgare* (34), *Triticum* cf. *dicoccum* (1), Cereal (54), Cruciferae (663), cf. *Alhagi* (52), cf. *Trigonella* (116), other (103)

TABLE 1. Charred seed remains from Gonur depe. Taxa from Locus 43 and deep sounding samples. (After Miller 1993.)

Bronze Age inhabitants carefully tended permanent orchards or gardens.

#### Field weeds

Weedy plants from the archaeological levels indicate the utilization of environmental zones with distinctive flora. The field weeds such as *Rumex* (dock) are typical of fairly moist irrigated fields, sedges (*Cyperaceae*) of the salty marshes which surround the edges of the delta branches and of the canal margins. The herbaceous species identified, such as the Cruciferae, as well as *Adonis*, *Salsola*, *Suaeda*, *Setaria* and *Phalaris*, are typical of the Central Asian shrub desert steppe (Miller 1993; Walter & Box 1983: 200). The most ubiquitous wild plant is camelthorn (*Alhagi*), which would have been found outside the cultivated areas, between and beyond the fields as well as in over-grazed areas immediately around the site. Camelthorn,

a thorny plant which inhibits grazing, is usually found where over-grazing has occurred. Seeds of camelthorn in sheep dung probably indicate that the sheep had been grazing on the oasis edge and in the desert.

#### Fuel

It is likely that the source of some of the charred seeds from the deep sounding was dung fuel preserved by partial burning (cf. Miller & Smart 1984). Other plant material appears to have been burned as a whole stalk, given that the seeds and pods were intact. In particular, stalks of an unidentified herb of the mustard family (Cruciferae 1) was burned in quantity as suggested by the flotation sample from Locus 43. It has no woody parts, so it is unlikely that it would have been gathered as fuel, but it could have been harvested as animal bedding or fodder and subsequently burned.

None of the wood charcoal from these samples has been analysed, for a lack of comparative material from the region. Charred wood was abundant in some samples, indicating easier access to wood in the Bronze Age than would be possible today. Lisitsyna's (1968) research on carbonized wood remains from the Kopet dag foothills suggests Bronze Age wood resources there not significantly different from those of today. Common trees of the contemporary oasis and desert environments such as poplar and tamarisk were common fuels at Shahr-i Shokhta (Costantini 1977a; 1977b). Observations of wood use in Bayram-Ali and on the farms of the modern oasis show that wood fuel could come from desert shrubs, old wooden implements, fruit trees and vines. Access to wood resources in the Margiana oasis would have been important since there appears to have been considerable need for fuel for ceramic, metal and gypsum-plaster production in addition to household cooking-fires.

#### **Animal-bone remains**

Only a small portion of animal bones in this study were recovered by screening, a standard control for the representativeness of the sample. When screened remains were compared with grab samples from similar deposits, it appeared that the grab samples are adequate for a basic reconstruction of animal use at the site. Bones from the domestic area near the north mound, the deep sounding through north mound midden, and several of the early rooms at the south mound of Gonur from the basis of this synthesis (TABLE 2). Additional material has been reported from several probably late room contexts from the south mound (Meadow 1993: 72-3).

#### *Wild animal exploitation*

Wild boar, gazelle, onager, hare and some birds were hunted and eaten as a small complement to the domestic animals which were the mainstay of the meat diet at Gonur. The economic importance of hunting at Gonur was minor compared to that seen in some contemporary settlements of the Kopet dag foothill region. Ermolova (Masson 1972: figure 1) reported that wild animals, in particular onager, were a significant component of the meat diet, in several cases matching or exceeding the importance of sheep, goat and cattle. Gonur apparently depended on domestic animals to a far greater extent, suggesting that there was no possible 'natural' way to make a

living in this environment.

Wild-animal remains in the deposits from Gonur never exceed 5% of the bones sampled, but provide some of the most interesting information about the relationship of humans to the desert environment. Remains of hedgehog, small rodents and tortoise were also recovered; it is difficult to evaluate their role as food as all these animals burrow into the site today. Rodents gnawed on a significant number of larger animal bones in waste deposits at Gonur.

Wild pigs (wild status determined on basis of tooth size, see Moore 1993: 166-7) and gazelle and onager (identified from features of the teeth) represent two different environments where hunting took place: the boar inhabited the natural *tugai* thickets along the banks of the river branches, while the gazelle and onager are typical of the Karakum desert. Evidence for hunting of wild pig comes primarily from the initial settlement of the oasis (2200-2000 BC), suggesting that areas of the deltaic thicket still existed. By the time of Period 2 at Gonur (the BMAC period 2000-1750 BC), the frequency of wild pig bones is less than 1%, perhaps indicating that the thickets of the natural delta had been transformed into agricultural areas.

#### *Domestic animals*

Domestic sheep and goat bones were the most common of all animal finds at Gonur, with sheep being more common than goat in all samples. Small samples indicate that the herd represented by the Gonur remains contained older individuals typical of an economy emphasizing secondary products (milk and wool) in addition to meat (Moore 1993: 165). Remains of very young sheep and goat from Gonur indicate that some sheep and goat would have been kept near the settlement, similar to the ethnographic situation in the traditional oasis. Dung was collected for fuel for use in household, and perhaps, workshop fires. In addition, a soil sample from a courtyard area on the south mound of Gonur depicts animal bedding or fodder, showing that animals were kept within the walls.

The archaeological context of sheep and goat remains suggest that they were common parts of domestic consumption and disposal. In addition, an offering of most of one sheep was found with other domestic equipment in Burial 40.

There are no differences in the frequency of animals or proportions of different aged animals between the initial settlement and the

		deep sounding — north mound			rooms — south mound	
		period 1	mixed	period 2	period 1	period 2
medium mammal		375	509	135	27	49
	%	65.4	63.6	74.5	36.0	43.7
sheep/goat		106	128	28	24	54
	%	18.8	16.0	15.4	32.0	48.2
gazelle		3	1	—	—	5
	%	0.5	0.1	—	—	4.5
wild boar		6	9	3	11	—
	%	1.0	1.1	1.7	14.6	—
large mammal		63	78	13	8	1
	%	10.9	9.7	7.2	10.6	0.9
cattle		17	31	—	4	1
	%	3.4	3.8	—	5.3	—
onager		—	2	—	—	—
	%	—	0.2	—	—	—
canid		—	—	—	1	—
	%	—	—	—	1.3	—
bird		—	—	—	—	2
	%	—	—	—	—	1.8
tortoise		—	1	—	—	—
	%	—	0.1	—	—	—
unidentifiable		11	41	1	—	—
	%	1.9	5.1	0.6	—	—
<i>total</i>		592	800	181	75	112

TABLE 2. *Animal remains at Gonur depe by period. (After Moore 1993.)*

BMAC period (i.e. throughout the Bronze Age occupation at Gonur).

*Traditional pastoralism of sheep and goat*

Herding formed an important component of the Bronze Age oasis economy. K. Niyazklychev (1973) describes the traditional annual herding cycle of the Turkmen before the 19th century. These farmers were also herders. Turkmen living in the Murgab River delta (Margiana oasis) traditionally farmed and herded *karakul* and fat-tailed sheep with some goats. Camels were herded separately. One important difference between this traditional system and that of the Bronze Age is the greater importance of horses in recent practices. Herders (*chovdur* in Turkmen) covered an area around the oasis to the north. Each *chovdur* knew the wells, the temporary summer camps (*yazlag*) and the winter houses or camps (*gyshlag*) which were

grouped in villages in the oasis. The *gyshlags* were all located in the cultivated areas, where herders could find late forage and reeds for shelters.

In the spring the herders went north and northwest searching for pasture and water. Some sheep and goat were left behind in the *gyshlag*. Usually the summer camps were located near desert wells, 3 to 10 days travel (24–60 km) from the winter camps. Three to five men from one family went out to the summer camps. They would leave the winter camp at the end of May and return about five months later at the end of October. The period to return is said to have been marked by the beginning of the southern migration of birds. Herders tended to collect outside the oasis at traditional places, at hills or hollows where water collects and wells were dug. One traditional *yazlag* is in an area today irrigated by the Karakum ca-

nal. Yaz depe (type-site of the Iron Age in the Murgab delta oasis) formerly was one of the closest major summer camps to the traditional oasis. Old maps and descriptions show that Yaz depe was about 15–20 km north of the edge of cultivation (34 km north-west of the area of Bayram-Ali).

We observed several herding camps in the desert surrounding Gonur depe in the spring of 1989. The camps were used for 2 to 5 days, and only a few bones and campfire debris were left behind. The sheep were herded into an unfenced hollow in the dunes, and a small look-out camp-site made above for the herders. The location and duration of the station depended upon the forage and availability of water at a near-by small *takyr*. Isolated dense scatters of sheep/goat bone fragments have also been found in the desert (Sarianidi 1990: 14); these may be former *yazlag* camps.

#### *Cattle*

Domestic cattle (*Bos*) were the most common large animals at Gonur. Cattle, traditionally not pastured in the desert, could have been kept in the oasis sheltered within the building complexes, as is typical in the modern oasis *qala*, where they are provided with forage and water.

In the excavations at Gonur, *Bos* remains were rare compared to those of sheep and goat, probably reflecting the actual low number of these large animals. (The size of the bones would lead them to be over-represented in grab samples.) The specific type (humped vs. unhumped) of domestic cattle found in the excavations could not be determined from the bones, but cattle figurines show clear humps.

Most of the cattle remains were found in midden deposits from domestic debris. Cattle bones are also found in ritual contexts, interred together with ceramic vessels in isolated cenotaphs. In one case, the type of meat left in the cenotaph is determinable: two hindquarters and a forequarter were found, representing the meaty part of a mature animal. In another case, an entire bull or cow was interred in the large (although robbed out) burial at Togolok-1 (Sarianidi 1991).

Sarianidi and Masson have both written about the prominence of cattle in the symbolism of the Bronze Age of Central Asia and about its Mesopotamian origins. Masson, relating a gold bull's head from Altyn depe to bull's heads found in Mesopotamia, sees an imported Meso-

potamian 'bull cult' in the foothill zone of Central Asia (Masson 1976). A similar small white stone bull's head from Togolok 21 has been interpreted as connecting Zoroastrian bull symbolism to Central Asian Bronze Age symbolism (Sarianidi 1990: 97). However, such a diversity of animal forms in figurines come from the Central Asian Bronze Age sites that there is no special significance in the occurrence of a bull or cow figurine.

#### *Camel*

The other important large domestic animal at Gonur was the camel (*Camelus* sp.). Grab-sampling did not reveal remains of camels from the excavations of 1988 and 1989 reported in this study. A scan of bones excavated in past seasons and stored in the Gonur pottery yard did not turn up any camel bones. No identifiable camel bones were found in the collections from Togolok 21 or Togolok 1 from excavations carried out between 1983 and 1986, where the bones have been stored in the open for more than four years (teeth but not many bones were still identifiable). However the latest phase of construction at Gonur south, excavated during the 1990 field season, yielded camel phalanges and limb bones from Rooms 231, 252 and 254, all part of the later (Phase 5) Central Building (Meadow 1993). The significance of the late appearance of the camel bones in the Margiana oasis is not yet clear. The camel would have been a key animal for the transport of the large amount of stone and metal materials imported to the desert oasis. The Bactrian (two-humped) camel is clearly shown in several figurines and amulets from Margiana and from Bactria. If camels were restricted to specialized long-distance transport during the Period 1 and 2 occupation of Gonur, it is entirely possible that our sampling of domestic contexts would never indicate that the animals had been in the settlement.

#### *Equids*

Remains of the true horse, *Equus caballus*, have been eagerly sought in Central Asian Bronze Age sites. This interest stems in part from the myths of the *Rg Veda* which describe the 'chariot-riding' Aryan-speakers from the north and in part from a recognition of the need for long-distance transport beyond the oasis. However, horses are not necessarily good for long-distance transport, and carts could be pulled by cattle.



Figurines of wheeled carts, found in both Periods 1 and 2 of Margiana, have been part of the Central Asian tradition since the early 3rd millennium (Namazga IV). The animal figurines connected with the carts always have humped torsos, indicating either camel or a humped cow (Kuzmina 1980). At Gonur, wild equids (onager) have been found in both room and midden deposits. These would have been hunted in the desert along with gazelle and not used for transportation.

Meadow (1993) identified several bones of domestic donkey (*Equus asinus*) from the south mound excavations at Gonur in 1990. The stratigraphic context of these remains is presently unclear (architectural phase 3–5, ranging from BMAC Period to late Bronze: see Hiebert 1994). The BMAC Period has steppe nomadic ceramics (Andronovo type), and Andronovo nomads were familiar with the domestic horse.

#### **Bronze Age pastoral economies**

It is likely that the ancient farmers of the Murgab delta also carried out seasonally nomadic pastoralism, following a pattern of movement to temporary summer pastures at a distance from the walled settlements. The implications of this are two-fold. First, the desert served not as a barrier but as a bridge between regions linked by these herders. Seasonal pastoralists such as these may have been the original colonizers of the Margiana oasis, as well as being traders between the foothill zones and the desert oases.

In addition, there is evidence for a second type of pastoral adaptation, based on finds of Andronovo steppe nomadic ceramics and metal objects in Period 2 buildings, and from camp-sites surrounding the oasis. One camp-site in the dunes on the outskirts of Gonur was a discrete scatter of hand-made Andronovo sherds mixed with a few local, wheel-made sherds (Kuzmina *et al.* n.d.). No bones or other organic remains were preserved.

The question of interaction with distant nomadic peoples by Period 2 at Gonur is a key to understanding the interaction of the Central Asian oasis of Margiana with the larger world. The underlying factor in the development of the BMAC is the ability of the Bronze Age inhabitants of the oasis to bring in raw materials from distant areas. If these long-distance con-

tacts were made by pastoral peoples, as is suggested by the ceramic parallels from vastly different areas, then nomads may have played an important role in the development of the oasis economy.

#### **The oasis adaptation and the BMAC style**

Wild animals are more commonly featured than domestic animals in the locally produced designs on metal and stone objects. Snakes, scorpions, birds, tigers, wild sheep and other less distinctive animal depictions are found. It has been suggested that the artistic motifs must have come from beyond Central Asia (Sarianidi 1990: 74–89; Masson 1989: 175). While Bukhara tiger, snakes, scorpions, etc. are also part of the Central Asian desert and river ecology, their remains have not yet been found in the archaeological deposits. Mountain-goat designs are more common on artefacts from the related Bactrian oases, close to mountain resource areas. While few bird bones were found from sieved deposits at Gonur, bird motifs are common on Margiana (BMAC) stone and metal seals. These birds are usually interpreted as eagles, and the bones of a small eagle were found from Gonur south, Room 84 (domestic architecture).

There is no reason to look outside Central Asia for the inspiration for the animal images. On the contrary, BMAC designs appear to be strongly influenced by the desert which surrounds the oases.

#### **Conclusion**

The economic base for the Oxus Civilization rested upon plants and animals domesticated in the Near East. There are several distinctive features to this adaptation, however. Since dry-farming is not possible in this region, the domestic plants and animals appear suddenly, and we have few archaeological remains which indicate the period of clearing, canal-digging and adjustment to the new region by colonists from the Kopet dag. Faint indications of the development of the regional economy are the decline in the use (and perhaps presence) of the wild pig, and the late appearance of exotic, specialized, varieties of wheat. We also have little good information to date on the eventual decline and collapse of this agricultural system in the later Bronze Age.

The indications of nomadic connections to

desert and steppe regions to the north and west remind us that we may underestimate the importance and complexity of animal production by relying on a sample of large permanent settlements. The remains of animals for transport con-

tinue to provide an ambiguous picture. Evidence for grain, legume and fruit production reminds us of the direct exchange of seed materials and expertise that must have flowed from the southwest and south in the establishment of the oasis.

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